

Bibliography

- 3M Health Information Systems (updated annually). *AP-DRGs: All Patient Diagnosis Related Groups*. Wallingford, CT: 3M Health Care.
- A. Foster Higgins & Co. Inc. (1997). *Foster Higgins National Survey of Employer-sponsored Health Plans*.
- Abbey, L.M., Zimmerman, J. (eds.) (1991). *Dental Informatics, Integrating Technology into the Dental Environment*. New York: Springer-Verlag.
- Abromowitz, K. (1996). *HMO's: Cycle Bottoming; Secular Opportunity Undiminished*.: Berstein Research.
- Ackerman, M.J. (1991). The Visible Human Project. *Journal of Biocommunication*, 18(2):14.
- ADAM (1995). *ADAM Software* [CD-ROM]: ADAM Scholar Series.
- Adams, I.D., Chan, M., Clifford, P.C., Cooke, W.M., Dallos, V., de Dombal, F.T., Edwards, M.H., Hancock, D.M., Hewett, D.J., McIntyre, N. (1986). Computer aided diagnosis of acute abdominal pain: A multicenter study. *British Medical Journal*, 293(6550):800–804.
- Adderley, D., Hyde, C., Mauseth, P. (1997). The computer age impacts nurses. *Computers in Nursing*, 15(1):43–46.
- Adhikari, N., Lapinsky, S.E. (2003). Medical Informatics in the intensive care unit: Overview of technology assessment. *J Crit Care* 18(1):41–47
- Afrin, J. N. & Critchfield, A. B. (1997). Low-cost telepsychiatry for the deaf in South Carolina. *Proceeding of the AMIA Fall Symposium*, p. 901.
- Agrawal, M., Harwood, D., Duraiswami, R., Davis, L. S., & Luther, P. W. (2000). Three-dimensional ultrastructure from transmission electron microscope tilt series, *Proceedings, Second Indian Conference on Vision, Graphics and Image Processing*. Bangalore, India.
- Ahrens, E. T., Laidlaw, D. H., Readhead, C., Brosnan, C. F., & Fraser, S. E. (1998). MR microscopy of transgenic mice that spontaneously acquire experimental allergic encephalomyelitis. *Magnetic Resonance in Medicine*, 40(1):119–132.
- Aine, C.J. (1995). A conceptual overview and critique of functional neuroimaging techniques in humans: I. MRI/fMRI and PET. *Critical Reviews in Neurobiology* 9(2-3):229–309.
- Akin, O. (1982). *The Psychology of Architecture Design*. London: Pion.
- Allaërt F.A., Dusserne L. (1992). Decision support systems and medical liability. *Proceedings of the 16th Annual Symposium on Computer Applications in Medical Care*, Baltimore, MD., pp. 750–753.
- Allard, F., & Starkes, J. L. (1991). Motor-skill experts in sports, dance, and other domains. In K.A. Ericsson & J. Smith (eds.), *Toward a General Theory of Expertise: Prospects and Limits*. New York: Cambridge University Press, pp. 126–152.
- Allen, J. (1995). *Natural Language Understanding* (2nd Edition). Redwood City, CA: Benjamin Cummings.

- Alpert, S.A. (1998). Health care information: access, confidentiality, and good practice. In Goodman K.W. (ed.), *Ethics, Computing, and Medicine: Informatics and the Transformation of Health Care*. Cambridge: Cambridge University Press, pp.75–101.
- Altman, R.B. (1997). Informatics in the care of patients: Ten notable challenges. *Western Journal of Medicine* 166(6):118–122.
- Altman, R.B. (2003). Complexities of managing biomedical information. *OMICS* 7(1):127–9.
- Altman, R.B., Dunker, A.K., Hunter, L., Klein T.E. (eds.) (1998). *Pacific Symposium on Biocomputing '98*. Singapore: World Scientific Publishing.
- Altman, R.B., Dunker, A.K., Hunter, L., Klein, T.E. (2003). *Pacific Symposium on Biocomputing '03*. Singapore: World Scientific Publishing.
- Altschul, S.F., Gish, W., Miller, W., Myers, E.W., Lipman, D.J. (1990). Basic local alignment search tool. *Journal of Molecular Biology* 215(3):403–410.
- American Association of Health Plans (1995). AAHP HMO and PPO Trends Report. *AMCRA Census Database and AAHP Sample Survey of HMOs and PPOs*.
- American College of Pathologists (1982). *SNOMED*. Skokie, IL: College of American Pathology.
- American Medical Association (updated annually). *Current Procedural Terminology*. Chicago, IL: The American Medical Association.
- American Nurses Association (1995). *Scope of practice for nursing informatics*. Washington, DC: American Nurses Publishing.
- American Nurses Association (1997). *NIDSEC standards and scoring guidelines*. Washington, DC: American Nurses Publishing.
- American Psychiatric Association Committee on Nomenclature and Statistics (1987). *Diagnostic and Statistical Manual of Mental Disorders*. (Rev. 3rd ed.). Washington, D.C.: The American Psychiatric Association.
- American Psychiatric Association Committee on Nomenclature and Statistics (1994). *Diagnostic and Statistical Manual of Mental Disorders*. (4th ed.). Washington, D.C.: The American Psychiatric Association.
- American Society for Testing and Materials (1999). *Standard Guide for Properties of a Universal Healthcare Identifier (UHID)*. (E1714-95.) West Conshohocken, PA: American Society for Testing and Materials.
- Amir, M., Shabot, M.M., Karlan, B.Y. (1997). Surgical intensive care unit care after ovarian cancer surgery: An analysis of indications. *American Journal of Obstetrics and Gynecology*, 176(6):1389–93.
- Anderson, J.G., Aydin, C.E. (1994). Overview: Theoretical perspectives and methodologies for the evaluation of health care information systems. In Anderson J.G., Aydin C.E., Jay S.J. (eds.), *Evaluating Health Care Information Systems: Methods and Applications*. Thousand Oaks, CA: Sage.
- Anderson, J.G., Aydin, C.E. (1998). Evaluating medical information systems: social contexts and ethical challenges. In Goodman K.W. (ed.), *Ethics, Computing, and Medicine: Informatics and the Transformation of Health Care*. (, pp.57–74) Cambridge: Cambridge University Press.
- Anderson, J.G., Aydin, C.E., Jay, S.J. (eds.) (1994). *Evaluating Health Care Information Systems: Methods and Applications*. Thousand Oaks, CA: Sage Publications.
- Anderson, J.G., Aydin, C.E., Jay, S.J. (eds.) (1995). *Computers in health care: research and evaluation*. Newbury Park, CA: Sage Publications.
- Anderson, J.G., Jay, S.J. (eds.) (1987). *Use and Impact of Computers in Clinical Medicine*. New York: Springer-Verlag.
- Anderson, J.R. (1983). *The Architecture of Cognition*. Mahwah, N.J.: L. Erlbaum Associates.
- Anderson, J.R. (1985). *Cognitive Psychology and its Implications*. New York: W.H. Freeman.
- Anderson, J., Rainey, M., et al. (2003). The impact of CyberHealthcare on the physician-patient relationship. *Journal of Medical Systems*, 27: 67–84.

- Anderson, R. E. (1998). Imagery and spatial representation. In W. Bechtel & G. Graham (eds.), *A Companion to Cognitive Science*. Malden, MA: Blackwell Publishers.
- Anonymous (1879). Practice by Telephone. *Lancet* 2, 819.
- Anonymous (1993a). *Draft Application Protocol for Electronic Exchange in Health Care Environments*. (Vol. Version 2.2, HL7).
- Anonymous (1993b). *Standard for Health Care Data Interchange – Information Model Methods*. Draft P1157.1, IEEE.
- Anonymous (1994). *NCPDP Data Dictionary*. June 1, 1994.
- Anonymous (1999). *Dublin Core Metadata Element Set*, Version 1.1: Reference Description. Dublin Core Metadata Initiative. (Accessed 2005 at: <http://www.dublincore.org/documents/dces/>)
- Anonymous (2000a). *Cataloging Practices*. National Library of Medicine. (Accessed 2005 at: <http://www.nlm.nih.gov/mesh/catpractices2004.html>)
- Anonymous (2000b). *Features of the MeSH Vocabulary*. National Library of Medicine. (Accessed 2005 at: http://www.nlm.nih.gov/mesh/intro_features2005.html)
- Anonymous (2000c). *Organization of National Library of Medicine Bibliographic Databases*. National Library of Medicine. (Accessed 2005 at: http://www.nlm.nih.gov/pubs/techbull/mj00/mj00_buckets.html)
- Anonymous (2001a). *Digital Libraries: Universal Access to Human Knowledge*. President's Information Technology Advisory Committee. (Accessed 2005 at: <http://www.nitrd.gov/pubs/pitac/pitac-dl-9feb01.pdf>)
- Anonymous (2001b). *The Dublin Core Metadata Element Set*. Dublin Core Metadata Initiative. (Accessed 2005 at: <http://www.niso.org/standards/resources/Z39-85.pdf>)
- Anonymous (2001c). The future of the electronic scientific literature. *Nature*, 413:1–3.
- Anonymous (2001d). *PubMed Help*. National Library of Medicine. (Accessed 2005 at: <http://www.ncbi.nlm.nih.gov/entrez/query/static/help/pmhhelp.html>)
- Anonymous (2001e). *Transforming Health Care Through Information Technology*. President's Information Technology Advisory Committee. (Accessed 2005 at: <http://www.nitrd.gov/pubs/pitac/pitac-hc-9feb01.pdf>)
- Anonymous (2001f). *Using Information Technology to Transform the Way We Learn*. President's Information Technology Advisory Committee. (Accessed 2005 at: <http://www.nitrd.gov/pubs/pitac/pitac-tl-9feb01.pdf>)
- Arenson, R.L. (1984). Automation of the radiology management function. *Radiology*, 153:65–68.
- Arenson, R.L., Gitlin, J.N., London, J.W. (1982). The formation of a radiology computer consortium. *Proceedings of the 7th Conference on Computer Applications in Radiology*, Boston, MA, 153–164, April.
- Arenson, R.L., Seshadri, S., Kundel, H.L., DeSimone, D., Van der Voorde, F., Gefter, W.B., Epstein, D.M., Miller, W.T., Aronchick, J.M., Simson, M.B. (1988). Clinical evaluation of a medical image management system for chest images. *American Journal of Roentgenology*, 150(1):55–59.
- Arms, W., Hillmann, D., et al. (2002). A spectrum of interoperability: the site for science prototype for the NSDL. *D-Lib Magazine*, 8. (Accessed 2005 at: <http://www.dlib.org/dlib/january02/arms/0Aarms.html>)
- Aronow, D.B., Cooley, J.R., Soderland, S. (1995). Automated identification of episodes of asthma exacerbation for quality measurement in a computer-based medical record. *Proc Annu Symp Comput Appl Med Care*, pp.309–313.
- Aronow, D.B., Soderland, S., Ponte, J.M., Feng, F., Croft, W.B., Lehnert, W.G. (1995). Automated classification of encounter notes in a computer based medical record. *Proceedings of Medinfo 1995*, Pt 1:8–12.
- Aronow, D.B., Feng, F., Croft, W.B. (1999). Ad hoc classification of radiology reports. *Journal of the American Medical Informatics Association*, 6(5):343–411.

- Aronson, A.R. (2001). Effective mapping of biomedical text to the UMLS metathesaurus: the MetaMap program. *Proceedings of the AMIA Annual Symposium*: Hanley & Belfus, pp. 17–21.
- Aronson, A., Bodenreider, O., et al. (2000). The NLM indexing initiative. *Proceedings of the AMIA Annual Symposium*, Los Angeles, CA. Hanley & Belfus, pp. 17–21.
- Arroll, B., Pandit, S., et al. (2002). Use of information sources among New Zealand family physicians with high access to computers. *Journal of Family Practice*, 51:8.
- Ascioli, G. A. (1999). Progress and perspectives in computational neuroanatomy. *Anatomical Record (New Anat.)*, 257(6),195–207.
- Ash, J. (1997). Organizational factors that influence information technology diffusion in academic health centers. *Journal of the American Medical Informatics Association*, 4(2):102–111.
- Ash, J. S., Gorman, P. N., Lavelle, M., Payne, T. H., Massaro, T. A., Frantz, G. L., Lyman JA. (2003). A cross-site qualitative study of physician order entry. *Journal of the American Medical Informatics Association*, 10(2),188–200.
- Ashburner, J., & Friston, K. J. (1997). Multimodal image coregistration and partitioning - a unified framework. *Neuroimage*, 6(3),209–217.
- Aspden, P., Corrigan, J.M., Wolcott, J., Erickson, S.M. (editors) and the Committee on Data Standards for Patient Safety (2004). *Patient Safety: Achieving a New Standard for Care*, National Academies Press (Issued November 20, 2003).
- Association of American Medical Colleges (1986). *Medical Education in the Information Age, Proceedings of the Symposium on Medical Informatics*. Washington D.C.: Association of American Medical Colleges.
- ASTM (1989). *Standard Guide for Nosologic Standards and Guides for Construction of New Biomedical Nomenclature*. (Standard E1284-89.) Philadelphia: ASTM.
- ASTM (1994). *A Standard Specification for Representing Clinical Laboratory Test and Analyte Names*. (Standard E3113.2 (Draft).) Philadelphia: ASTM.
- Atkinson W, Orenstein W, Krugman S (1992). The resurgence of measles in the United States, 1989-90. *Annual Rev Med* 43:451– 463.
- Atkinson, R., & Shiffrin, R. (1968). Human memory: A proposed system and its control processes. In *Spence, K.W and Spence, J.T., The Psychology of Learning and Motivation: II*.
- Axford, R., Carter, B. (1996). Impact of clinical information systems on nursing practice: Nurses' perspectives. *Computers in Nursing*, 14(3):156–163.
- Ayers, S. (1983). NIH consensus conference. Critical care medicine. *Journal of the American Medical Association*, 250(6):798–804.
- Babior, B.M., Matzner, Y. (1997). The familial Mediterranean fever gene—cloned at last. *New England Journal of Medicine*, 337(21):1548–1549.
- Bachant, J., McDermott, J. (1984). R1 revisited: Four years in the trenches. *AI Magazine*, 5:3.
- Bachrach, C., Charen, T. (1978). Selection of MEDLINE contents, the development of its thesaurus, and the indexing process. *Medical Informatics*, 3(3):237–254.
- Bader, S. (1993). Recognition of computer-based materials in the promotion guidelines of U.S. medical schools. *Academic Medicine*, 68:S16–S17.
- Baeza-Yates, R. and Ribeiro-Neto, B., eds. (1999). *Modern Information Retrieval*. New York: McGraw-Hill.
- Bahls, C., Weitzman, J., et al. (2003). Biology's models. *The Scientist*, 17: 5.
- Bai, C., Elledge, S.J. (1997). Gene identification using the yeast two-hybrid system. *Methods of Enzymology*, 283:141–56.
- Baker, E.L., Friede, A., Moulton, A.D., Ross, D.A. (1995). CDC's information network for public health officials (INPHO): A framework for integrated public health information and practice. *Journal of Public Health Management and Practice*, 1:43– 47.
- Baker, L., Wagner, T., et al. (2003). Use of the Internet and e-mail for health care information: Results from a national survey. *Journal of the American Medical Association*, 289:2400–2406.

- Bakken, S., Cimino, J. J., Haskell, R., Kukafka, R., Matsumoto, C., Chan, G. K., Huff, S. MK. (2000) Evaluation of the clinical LOINC (Logical Observation Identifiers, Names, and Codes) semantic structure as a terminology model for standardized assessment measures. *Journal of the American Medical Informatics Association*, 7(6):529–538.
- Bakken, S., Curran, C., Delaleu-McIntosh, J., Desjardins, K., Hyun, S., Jenkins, M., John, R., Ramirez, A-M., Tamayo, R. (2003). Informatics for evidence-based nurse practitioner practice at the Columbia University School of Nursing. *Proceedings of NI 2003*. Rio de Janeiro, Brazil.
- Balas, E.A., Austin, S.M., Mitchell, J.A., Ewigman, B.G., Bopp, K.D., Brown, G.D. (1996). The clinical value of computerized information services: A review of 98 randomized clinical trials. *Archives of Family Medicine*, 5(5):271–278.
- Balas, E.A. and Boren, S.A. (2000). Managing clinical knowledge for health care improvement. *IMIA Yearbook of Medical Informatics* (R. Haux and A.T. McCray, eds), pp.65–70, Stuttgart, Germany: Schattauer Publishing Company.
- Baldi, P., Brunak, S. (1998). *Bioinformatics: The Machine Learning Approach*. Cambridge, MA: MIT Press.
- Baldi, P, Hatfield, G.W. (2002) *DNA Microarrays and Gene Expression*. Cambridge University Press.
- Ball, M. (ed.) (1995). *Introduction to Nursing Informatics*. New York: Springer.
- Bansler, J.P., Bødker, K. (1993). A reappraisal of structured analysis: Design in an organizational context. *Proceedings of the ACM Transactions on Information Systems*, 11:165–193.
- Barfield, W., Furness, T. (eds.) (1995). *Virtual Environments and Advanced Interface Design*. New York: Oxford University Press.
- Barnett, G.O. (1976). *Computer-Stored Ambulatory Record (COSTAR)*. (DHEW (HRA) 76-3145): Department of Health, Education, and Welfare.
- Barnett, G.O. (1984). The application of computer-based medical-record systems in ambulatory practice. *New England Journal of Medicine*, 310(25):1643–1650.
- Barnett, G.O., Cimino, J.J., Hupp, J.A., Hoffer, E.P. (1987). DXplain: An evolving diagnostic decision-support system. *Journal of the American Medical Association*, 258(1):67–74.
- Barrows Jr., R.C., Clayton, P.D. (1996). Privacy, confidentiality, and electronic medical records. *Journal of the American Medical Informatics Association*, 3(2):139–148.
- Barnett, GO, Famiglietti, KT, Kim, RJ, Hoffer, EP, Feldman, MJ. (1998). DXplain on the Internet. *Proceedings of the AMIA Annual Fall Symposium*, pp. 607–611.
- Bashshur, R.L., Mandil, S.H., Shannon, G.W. (eds). Telemedicine/telehealth: An international perspective. (2002) *Telemedicine Journal and e-Health*. 8(1):95–107.
- Bashshur, R., Sanders, J., & Shannon, G. (1997). *Telemedicine: Theory and Practice* Charles C. Thomas, Springfield, IL.
- Bass, D.M., McClendon, M.J., Brennan, P.F., McCarthy, C. (1998). The buffering effect of a computer support network on caregiver strain. *Journal of Aging and Health*, 10(1):20–43.
- Bass, D.M., McClendon, M.J., Brennan, P.F., McCarthy, C. (1998) The buffering effect of a computer support network on caregiver strain. *Journal of Aging & Health*. 10(1):20–43.
- Bates, D.W. (2000). Using information technology in hospitals to reduce rates of medication errors in hospitals. *BMJ* 320:788–91.
- Bates, D.W., Ebell, M., Gotlieb, E., Zapp, J., Mullins, H.C., (2003). A proposal for electronic medical records in U.S. primary care. *J Am Med Inform Assoc*. 10(1):1–10.
- Bates, D.W., Evans, R.S., Murff, H., Stetson, P.D., Pizziferri, L., Hripcsak, G.(2003). Detecting adverse events using information technology. *J Am Med Inform Assoc*; 10(2):115–128.
- Bates, D.W., Gawande, A.A. (2003). Patient safety: improving safety with information technology. *The New England Journal of Medicine*, 348(25):2526–34.
- Bates, D.W., Leape, L.L., Cullen, D.J., et al (1998). Effect of computerized physician order entry and a team intervention on prevention of serious medication errors. *Journal of the American Medical Association* 280(15):1311–1316.

- Bates, D.W., Spell, N., Cullen, D.J., Burdick, E., Laird, N., Petersen, L.A., Small, S.D., Sweitzer, B.J., Leape, L.L. (1997). The costs of adverse drug events in hospitalized patients. *Journal of the American Medical Association*, 277(4):307–311.
- Baud, R., Lovis, C., Rassinoux, A.M., Michel, P.A., Scherrer, J.R. Automatic extraction of linguistic knowledge from an international classification (1998). *Medinfo 1998 Pt 1*:581–5.
- Bauman, R.A., Arenson, R.L., Barnett, G.O. (1975a). Computer-based master folder tracking and automated file room operations. *Proceedings of the 4th Conference on Computer Applications in Radiology*, Las Vegas, NV, 469–480.
- Bauman, R.A., Arenson, R.L., Barnett, G.O. (1975b). Fully automated scheduling of radiology appointments. *Proceedings of the 4th Conference on Computer Applications in Radiology*, Las Vegas, NV, 461–46.
- Bauman, R.A., Gell, G., Dwyer, 3rd S.J. (1996). Large picture archiving and communication systems of the world-Part 2. *Journal of Digital Imaging*, 9(4):172–177.
- Bauman, R.A., Pendergrass, H.P., Greenes, R.A. (1972). Further development of an on-line computer system for radiology reporting. *Proceedings of the Conference on Computer Applications in Radiology*, 409–422.
- Baxevanis, A. (2003). The Molecular Biology Database Collection: 2003 update. *Nucleic Acids Research*, 31: 1–12.
- Beagrie, N. (2002). An update on the Digital Preservation Coalition. *D-Lib Magazine*, 8. (Accessed 2005 at: <http://www.dlib.org/dlib/april02/beagrie/04beagrie.html>)
- Bechtel, W., Abrahamsen, A., & Graham, G. (1998). Part I: The life of cognitive science. In W. Bechtel, G. Graham & D.A. Balota (eds.), *A Companion to Cognitive Science* (Blackwell Companions to Philosophy, Vol. 13, pp. 2–104). Malden, MA: Blackwell.
- Bechtel, W., Graham, G., & Balota, D. A. (1998). *A Companion to Cognitive Science*. Malden, Mass.: Blackwell.
- Beck, J.R., Pauker, S.G. (1983). The Markov process in medical prognosis. *Medical Decision Making*, 3(4):419–58.
- Beckett, D., Miller, E., et al. (2000). Using Dublin Core in XML. *Dublin Core Metadata Initiative*. (Accessed 2005 at: <http://dublincore.org/documents/dcmes-xml/>)
- Bell, D.S., Greenes, R.A. (1994). Evaluation of UltraSTAR: Performance of a collaborative structured data entry system. *Proceedings of the 18th Annual Symposium on Computer Applications in Medical Care*, Washington, D.C., pp. 216–221.
- Benko, L.B. (2003). Back to the drawing board; Cedars-Sinai's physician order-entry system suspended. *Modern Healthcare*, 12.
- Benson, D.A., Karsch-Mizrachi, I, Lipman, DJ, Ostell, J, Wheeler, DL. GenBank. *Nucleic Acids Res.* 2003;31(1):23–7.
- Bentt, L.R., Santora, T.A., Leyerle, B.J., LoBue, M., Shabot, M.M. (1990). Accuracy and utility of pulse oximetry in a surgical ICU. *Current Surgery*, 47(4):267–268.
- Berenson, R. (1984). *Health Technology Case Study 28: Intensive Care Units (ICUs)-Clinical Outcomes, Costs and Decisionmaking*. Washington, DC: Office of Technology Assessment.
- Berg, M. (1997). *Rationalizing Medical Work: Decision Support Techniques and Medical Practices*. Cambridge, MA: MIT Press.
- Berg, M. (1999). Patient care information systems and health care work: a sociotechnical approach. *International Journal of Medical Informatics*, 55(2),87–101.
- Bergeron, B.P., Greenes, R.A. (1989). Clinical skill-building simulations in cardiology: HeartLab and EKGLab. *Computer Methods and Programs in Biomedicine*, 30(2-3):111–126.
- Berland, G., Elliott, M., et al. (2001). Health information on the Internet: Accessibility, quality, and readability in English and Spanish. *Journal of the American Medical Association*, 285:2612–2621.

- Berman, J.J., Edgerton, M.E., Friedman, B.A. (2003). The tissue microarray data exchange specification: A community-based, open source tool for sharing tissue microarray data. *BMC Med Inform Decis Mak.* 3(1):5.
- Berners-Lee, T., Cailliau, R., Luotonen, A., Nielsen, H., Secret, A. (1994). The World-Wide-Web. *Communications of the Association for Computing Machinery*, 37:76–82.
- Bero, L., Rennie, D. (1996). The Cochrane Collaboration: Preparing, maintaining, and disseminating systematic reviews of the effects of health care. *Journal of the American Medical Association*, 274:1935–1938.
- Besser, H. (2002). The next stage: Moving from isolated digital collections to interoperable digital libraries. *First Monday*, 7: 6. (Available 2005 at: http://www.firstmonday.dk/issues/issue7_6/besser/)
- Bickel, R.G. (1979). The TRIMIS concept. *Proceedings of the 3rd Annual Symposium for Computer Applications in Medical Care*, Washington, DC, pp. 839–842.
- Bidgood, W.D. Jr.(1998). Clinical importance of the DICOM structured reporting standard. *Int J Card Imaging.* 14(5):307–15.
- Bidgood, W.D., Horii, S.C., Prior, F.W., Van Syckle, D.E. (1997). Understanding and using DICOM, the data interchange standard for biomedical imaging. *Journal of the American Medical Informatics Association*, 4(3):199–212.
- Biondich, P.G., Anand, V., Downs, S.M., McDonald, C.J. (2003). *Proceedings AMIA Annu Symp*, pp. 86–90.
- Bishop, M., Rawlings, C. (eds.) (1997). *DNA and Protein Sequence Analysis—A Practical Approach*: IRL Press at Oxford University Press.
- Blaine, G.J., Hill, R.L., Cox, J.R. (1983). PACS workbench at Mallinckrodt Institute of Radiology (MIR). *Proceedings of the SPIE (Society of Photo-optical Instrumentation Engineers)*, Kansas City, MO, 418 (PACSI):80–86.
- Blake, J.A., Richardson, J.E., Bult, C.J., Kadin, J.A., Eppig, J.T., and the members of the Mouse Genome Database Group (2003). MGD: The Mouse Genome Database. *Nucleic Acids Res*, 31:193–195.
- Bleich, H. (1972). Computer-based consultation: Electrolyte and acid-base disorders. *American Journal of Medicine*, 53:285–291.
- Bleich, H.L., Beckley, R.F., Horowitz, G.L., Jackson, J.D., Moody, E.S., Franklin, C., Goodman, S.R., McKay, M.W., Pope, R.A., Walden, T., Bloom, S.A., Slack, W.V. (1985). Clinical computing in a teaching hospital. *New England Journal of Medicine*, 312(12):756–764.
- Bleich, H.L., Safra, n C., Slack, W.V. (1989). Departmental and laboratory computing in two hospitals. *MD Computing*, 6(3):149–155.
- Bliss-Holtz, J. (1995). Computerized support for case management: ISAACC. *Computers in Nursing*, 13(6):289–294.
- Blois, M.S. (1984). *Information and Medicine: The Nature of Medical Descriptions*. Berkeley: University of California Press.
- Bloom, F.E., & Young, W.G. (1993). *Brain Browser* (Scripps, Trans.). New York: Academic Press.
- Blum, B. (1992). *Software Engineering, A Holistic Approach*: Oxford University Press.
- Blum, B.I. (1986a). *Clinical Information Systems*. New York: Springer-Verlag.
- Blum, B.I. (1986b). Clinical Information Systems: A review. *Western Journal of Medicine*, 145(6):791–797.
- Boeckmann B., Bairoch A., Apweiler R., Blatter M.-C., Estreicher A., Gasteiger E., Martin M.J., Michoud K., O'Donovan C., Phan I., Pilbout S., Schneider M. (2003). The SWISS-PROT protein knowledgebase and its supplement TrEMBL in 2003. *Nucleic Acids Res* 31:365–370.
- Boehm, B. (1999): Managing software productivity and reuse; *IEEE Computer*, 31(9):111–113.

- Boehm, B., Egyed, A., Kwan, J., Port, D., Shah, A., Madachy, R. (1998). Using the Win Win Spiral Model: A Case Study. *IEEE Computer*, 31(7):33–44.
- Boland, P. (1985). *The New Healthcare Market: A Guide to PPOs for Purchasers, Payers and Providers*. Homewood, Illinois: Dow Jones Irwin.
- Bone, R.C. (1995). Standards of evidence for the safety and effectiveness of critical care monitoring devices and related interventions. *Critical Care in Medicine*, 23(10):1756–1763.
- Booch, G. (1994). *Object-Oriented Design with Applications*. (2nd ed.): Benjamin-Cummins.
- Bookstein, F.L. (1989). Principal warps: thin-plate splines and the decomposition of deformations. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 11(6):567–585.
- Bookstein, F.L. (1997). Biometrics and brain maps: The promise of the morphometric synthesis. In: Koslow SH, Huerta MF, editors. *Neuroinformatics: An Overview of the Human Brain Project*. pp. 203–254. Mahwah, New Jersey: Lawrence Erlbaum Associates.
- Bookstein, F.L., Green, W.D.K. (2001). *The Edgewarp 3D Browser*. Accessed 2005 from <http://vhp.med.umich.edu/edgewarpss.html>.
- Bopp, K. (2000). Information services that make patients co-producers of quality health care. *Studies in Health Technology and Informatics*, 76:93–106.
- Borgman, C. (1999). What are digital libraries? Competing visions. *Information Processing and Management*, 35:227–244.
- Bowden, D.M., Martin, R.F. (1995). Neuronames brain hierarchy. *Neuroimage*, 2:63–83.
- Bowie, J., Barnett G.O. (1976). MUMPS: An economical and efficient time-sharing system for information management. *Comput Programs Biomed* 6:11–22.
- Bowker, G. C., Star, S. L. (1999). *Sorting Things Out: Classification and its Consequences*. Cambridge, Mass.: MIT Press.
- Boxwala, A.A., Peleg, M., Tu, S, Ogunyemi, O., Zeng, Q.T., Wang, D., Patel, V.L., Greenes, R., and Shortliffe, E.H. (2004). GLIF3: A representation format for sharable computer-interpretable clinical practice guidelines. *Journal of Biomedical Informatics*, 37(3):147–161.
- Boyd, S. and Herkovic, A. (1999). *Crisis in Scholarly Publishing: Executive Summary*. Stanford Academic Council Committee on Libraries. (Accessed 2005 at: http://www.stanford.edu/~boyd/schol_pub_crisis.html)
- Boynton, J., Glanville, J., et al. (1998). Identifying systematic reviews in MEDLINE: developing an objective approach to search strategy design. *Journal of Information Science*, 24:137–157.
- Bradshaw, K.E., Gardner, R.M., Clemmer, T.P., Orme, J.F., Thomas, F., West, B.J. (1984). Physician decision-making: Evaluation of data used in a computerized ICU. *International Journal of Clinical Monitoring and Computing*, 1(2):81–91.
- Bradshaw, K.E., Sittig, D.F., Gardner, R.M., Pryor, T.A., Budd, M. (1988). Improving efficiency and quality in a computerized ICU. *Proceedings of the 12th Annual Symposium on Computer Applications in Medical Care*, Washington, D.C., 763–767.
- Brahams, D., Wyatt, J.C. (1989). Decision aids and the law. *Lancet*, 2(8663):632–634.
- Brailer, D.J. (2002). Personal Communication.
- Brain Innovation, B.V. (2001). *Brain Voyager*. Accessed 2005 at <http://www.BrainVoyager.de/>
- Brannigan V.M. (1991). Software quality regulation under the safe medical devices act of 1990: Hospitals are now the canaries in the software mine. *Proceedings of the 15th Annual Symposium on Computer Applications in Medical Care*, Washington, DC, 238–242.
- Bransford, J.D.E., Brown, A.L.E., & Cocking, R.R.E. (1999). *How People Learn: Brain, Mind, Experience, and School*. Washington, DC: National Academies Press.
- Brazma, A, Hingamp, P, Quackenbush, J, et. al. (2001). Minimum information about a microarray experiment (MIAME): Toward standards for microarray data. *Nat Genet*. 29(4):365–71.
- Brennan, P.F. (1996). The future of clinical communication in an electronic environment. *Holistic Nursing Practice*, 11(1):97–104.

- Brennan, P.F. (1998). Computer network home care demonstration: A randomized trial in persons living with AIDS. *Computers in Biology and Medicine*, 28(5):489–508.
- Brennan, P.F., Moore, S.M., Bjornsdottir, G., Jones, J., Visovsky, C., Rogers, M. (2001). HeartCare: an Internet-based information and support system for patient home recovery after coronary artery bypass graft (CABG) surgery. *Journal of Advanced Nursing*, 35(5):699–708.
- Brennan, P.F., Moore, S.M., Smyth, K.A. (1995). The effects of a special computer network on caregivers of persons with Alzheimer's Disease. *Nursing Research*, 44(3):166–172.
- Brennan, P.F., Ripich, S. (1994). Use of a home care computer network by persons with AIDS. *International Journal of Technology Assessment in Health Care*, 10(2):258–272.
- Brennan, P., Strombom, I. (1998). Improving health care by understanding patient preferences: The role of computer technology. *Journal of the American Medical Informatics Association*, 5:257–262.
- Brenner, S. McKinin, E. (1989). CINAHL and MEDLINE: a comparison of indexing practices. *Bulletin of the Medical Library Association*, 77:366–371.
- Brin, S., Page, L. (1998). The anatomy of a large-scale hypertextual Web search engine. *Computer Networks*, 30:107–117.
- Brigham, C.R., Kamp, M. (1974). The current status of computer-assisted instruction in the health sciences. *Journal of Medical Education*, 49(3):278–279.
- Brimm, J. (1987). Computers in critical care. *Critical Care Nursing Quarterly*, 9(4):53.
- Brin, S. and Page, L. (1998). The anatomy of a large-scale hypertextual Web search engine. *Computer Networks*, 30:107–117.
- Brinkley, J. F. (1985). Knowledge-driven ultrasonic three-dimensional organ modelling. *PAMI*, 7(4):431–441.
- Brinkley, J.F. (1991). Structural informatics and its applications in medicine and biology. *Academic Medicine*, 66:589–591.
- Brinkley, J. F. (1992). Hierarchical geometric constraint networks as a representation for spatial structural knowledge (UW, Trans.), *Proceedings of the 16th Annual Symposium on Computer Applications in Medical Care*, pp. 140–144.
- Brinkley, J. F. (1993a). A flexible, generic model for anatomic shape: Application to interactive two-dimensional medical image segmentation and matching. *Computers and Biomedical Research*, 26, 121–142.
- Brinkley, J.F. (1993b). The potential for three-dimensional ultrasound. In Chervenak F.A., Isaacson G.C., Campbell S. (eds.), *Ultrasound in Obstetrics and Gynecology*. Boston: Little, Brown and Company.
- Brinkley, J. F., Bradley, S. W., Sundsten, J. W., & Rosse, C. (1997). The Digital Anatomist information system and its use in the generation and delivery of Web-based anatomy atlases. *Computers and Biomedical Research*, 30:472–503.
- Brinkley, J.F., Moritz, W.E., Baker, D.W. (1978). Ultrasonic three-dimensional imaging and volume from a series of arbitrary sector scans. *Ultrasound in Medicine and Biology*, 4:317–327.
- Brinkley, J.F., Myers, L.M., Prothero, J.S., Heil, G.H., Tsuruda, J.S., Maravilla, K.R., Ojemann, G.A., Rosse, C. (1997). A structural information framework for brain mapping. In Koslow S.H., Huerta M.F. (eds.), *Neuroinformatics: An Overview of the Human Brain Project*, pp.309–334. Mahwah, NJ: Lawrence Erlbaum.
- Brinkley, J.F., Rosse, C. (1997). The Digital Anatomist distributed framework and its applications to knowledge based medical imaging. *Journal of the American Medical Informatics Association*, 4(3):165–183.
- Brinkley, J. F., Rosse, C. (2002). Imaging and the Human Brain Project: a review. *Methods of Information in Medicine*, 41:245–260.
- Brinkley, J. F., Wong, B. A., Hinshaw, K. P., & Rosse, C. (1999). Design of an anatomy information system. *Computer Graphics and Applications*, 19(3):38–48.

- Brody, B.A. (1989). The ethics of using ICU scoring systems in individual patient management. *Problems in Critical Care*, 3:662–670.
- Brown, C.L., Howarth, S.P. (2004). The power of picture archiving and communication systems: Strategic hospital considerations. *J Health Inf Manag.* 18(4):19–26.
- Brown, SH, Lincoln, MJ, Groen, PJ, Kolodner, RM. (2003). VistA—U.S. Department of Veterans Affairs national-scale HIS. *Int J Med Inf.* 69(2-3):135–56.
- Bruer, J. T. (1993). *Schools for Thought: A Science of Learning in the Classroom*. Cambridge, MA: MIT Press.
- Bryant, G.D., Norman, G.R. (1980). Expressions of probability: Words and numbers. *The New England Journal of Medicine*, 302:411.
- Buchman, T.G. (1995). Computers in the intensive care unit: Promises yet to be fulfilled. *Journal of Intensive Care Medicine*, 10:234–240.
- Bulechek, G.M., McCloskey, J.C., Donahue, W.J. (1995). Nursing Interventions Classification (NIC): A language to describe nursing treatments, *Nursing Data Systems: The Emerging Framework*, pp.115-131. Washington, D.C.: American Nurses Publishing.
- Burley, S.K., Bonanno, J.B. (2002). Structuring the universe of proteins. *Annual Review of Genomics and Human Genetics.* 3:243–62.
- Byrne, MD. (2003). Cognitive architecture. In J. Jacko & A. Sears (Eds), *Human-Computer Interaction Handbook* (pp. 97–117). Mahwah, N.J.: Lawrence Erlbaum Associates.
- California Managed Health Care Improvement Task Force (1998). Public perceptions and experiences with managed care, *Improving Managed Health Care in California*. (Vol. 2:13– 42 & Vol. 3:207–212), Sacramento, CA.
- California Office of Statewide Health Planning and Development (1992). *Volume of Coronary Artery Bypass Grafts for 1989–1992 from the Patient Discharge Data Set*.
- Callan, J. (1994). Passage level evidence in document retrieval. *Proceedings of the 17th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval*, Dublin, Ireland: Springer-Verlag, pp. 302–310.
- Campbell, J.R., Carpenter, P., Sneiderman, C., Cohn, S., Chute, C.G., Warren, J. (1997). Phase II evaluation of clinical coding schemes: Completeness, taxonomy, mapping, definitions, and clarity. CPRI Work Group on Codes and Structures. *Journal of the American Medical Informatics Association*, 4(3):238–251.
- Campbell, K.E., Tuttle, M.S., Spackman, K.A. (1998). A “lexically-suggested logical closure” metric for medical terminology maturity. *Proceedings of the 1998 AMIA Annual Fall Symposium*, Orlando, FL, pp. 785–789.
- Capin, T.K., Noser, H., Thalmann, D., Pandzic, I.S., Thalmann, N.M. (1997). Virtual human representation and communication in VLNet. *IEEE Computer Graphics and Applications*, 17(2):42–53.
- Card, S. K., Mackinlay, J. D., Shneiderman, B. (1999). *Readings in Information Visualization: Using Vision to Think*. San Francisco, Calif.: Morgan Kaufmann Publishers.
- Card, S. K., Moran, T. P., & Newell, A. (1983). *The Psychology of Human-Computer Interaction*. Hillsdale, N.J.: L. Erlbaum Associates.
- Carroll, J. M. (1997). Human-computer interaction: Psychology as a science of design. *Annual Review of Psychology*, 48(1):61–83.
- Carroll, J. M. (ed.) (2002). *Human-Computer Interaction in the New Millenium*. New York: Addison-Wesley.
- Carroll, J. M. (2003). *HCI Models, Theories, and Frameworks: Toward a Multidisciplinary Science*. San Francisco, Calif.: Morgan Kaufmann.
- Caruso, D. (2000). Digital Commerce; If the AOL-Time Warner deal is about proprietary content, where does that leave a noncommercial directory it will own? *New York Times*. January 17, 2000.

- Caviness, V. S., Meyer, J., Makris, N., & Kennedy, D. N. (1996). MRI-based topographic parcelation of human neocortex: an anatomically specified method with estimate of reliability. *Journal of Cognitive Neuroscience*, 8(6):566–587.
- Cawley, J., Chernew, M., McLaughlin, C. (2002). CMS payments necessary to support HMO participation in Medicare Managed Care. In Alan M. Garber, ed., *Frontiers in Health Policy Research*, Volume 5, pp1–25. Cambridge, MA: MIT Press.
- Cech, TR. (2000) Structural Biology. The ribosome is a ribozyme. *Science* 289(5481):878–879.
- Centers for Disease Control and Prevention (1997). *Community Immunization Registries Manual*. (Accessed 2005 at: <http://www.cdc.gov/nip/registry/cir-manual.htm>)
- Centers for Disease Control and Prevention (2002). Immunization Registry Progress —United States, 2002. *Morbidity and Mortality Weekly Report*. August 30, 2002 / 51(34):760–762.
- Centers for Disease Control and Prevention (2003). *Public Health Information Network Conference*.
- Centers for Medicare & Medicaid Services (1999). *Medicare Current Beneficiary Survey*.
- CFO (1996). The Third Annual Survey: Holding the Line on SG&A. *CFO*, December 1996:28–36.
- Chalmers, I., Altman D. (eds.) (1995). *Systematic Reviews*. London: BMJ Publishing Group.
- Chandler, P., & Sweller, J. (1991). Cognitive load theory and the format of instruction. *Cognition and Instruction*, 8(4):293–332.
- Chandra, M., Wagner, W.H., Shabot, M.M. (1995). ICU care after infrainguinal arterial surgery: A critical analysis of outcomes. *The American Surgeon*, 61(10):904–907.
- Channin, D.S. (2002). Integrating the healthcare enterprise: a primer. Part 6: the fellowship of IHE. *Radiographics*, 22(6):1555–60.
- Chapman, K.A., Moulton, A.D. (1995). The Georgia Information Network for Public Health Officials: A demonstration of the CDC INPHO concept. *Journal of Public Health Management & Practice*, 1(2):39–43.
- Charen, T. (1976). *MEDLARS Indexing Manual, Part I: Bibliographic Principles and Descriptive Indexing*. Springfield, VA: National Technical Information Service.
- Charen, T. (1983). *MEDLARS Indexing Manual, Part II*. Springfield, VA: National Technical Information Service.
- Charniak, E. (1993). *Statistical Language Learning*. Cambridge: MIT Press.
- Chase, W. G., Simon, H. A. (1973). Perception in chess. *Cognitive Psychology*, 4(1):55–81.
- Chen, R., Felciano, R., Altman, R.B. (1997). RIBOWEB: Linking structural computations to a knowledge base of published experimental data. *Intelligent Systems for Molecular Biology*, 5:84–87.
- Cheung, N.T., Fung, K.W., Wong, K.C., Cheung, A., Cheung, J., Ho, W., Cheung, C., Shung, E., Fung, V., Fung, H. (2001). Medical informatics – the state of the art in the Hospital Authority. *Int J Med Inf*. 62:113–119.
- Chi, M.T.H., Feltovich, P.J., Glaser, R. (1981). Categorization and representation of physics problems by experts and novices. *Cognitive Science*, 5:121–152.
- Chi, M.T.H., Glaser, R. (1981). Categorization and representation of physics problems by experts and novices. *Cognitive Science*, 5:121–152.
- Chi, M.T.H., Glaser, R., Farr, M.J. (1988). *The Nature of Expertise*. Hillsdale, N.J.: L. Erlbaum Associates.
- Chin, T (2003). February 17, 2003. *American Medical News*.
- Chinchor, N.A. (1998). Overview of MUC-7/MET-2. Proceedings of the 7th Message Understanding Conference, April 1998.
- Choi, H.S., Haynor, D.R., & Kim, Y. (1991). Partial volume tissue classification of multichannel magnetic resonance images -a mixel model. *IEEE Trans. Med. Imaging*, 10(3):395–407.
- Christensen, L., Haug, P., Fiszman, P. (2002). MPLUS: A probabilistic medical language understanding system. *Natural Language Processing in the Biomedical Domain*. Association for Computational Linguistics.

- Christensen, G.E., Miller, M.I., Vannier, M.W. (1996). Individualizing neuroanatomical atlases using a massively parallel computer. *IEEE Computer*, 29(1):32–38.
- Christensen, G. E., Rabbitt, R. D., & Miller, M. I. (1996). Deformable templates using large deformation kinematics. *IEEE Trans. Image Processing*, 5(10):1435–1447.
- Chu, S., Cesnik, B. (2000). A three-tier clinical information systems design model. *Int J Med Inform.* 57(2-3):91–107.
- Chuang, J.H., Friedman, C., Hripcsak, G. (2002). A comparison of the Charlson comorbidities derived from medical language processing and administrative data. *Proc AMIA Fall Symp*, pp. 160–164.
- Chueh, H.C., Barnett, G.O. (1997) “Just In Time” Clinical Information. *Academic Medicine*, 72(6):512–517
- Chute, C.G. (2000). Clinical classification and terminology: Some history and current observations. *J Am Med Inform Assoc.* 7(3):298–303.
- Chute, C.G., Cohn, S.P., Campbell, K.E., Oliver, D.E., Campbell, J.R. (1996). The content coverage of clinical classifications. *Journal of the American Medical Informatics Association*, 3:224–233.
- Cimino, J. (1996). Linking patient information systems to bibliographic resources. *Methods of Information in Medicine*, 35:122–126.
- Cimino, J.J. (1998). Desiderata for controlled medical vocabularies in the twenty-first century. *Methods Inf Med.* 37(4-5):394–403.
- Cimino, J.J., Elhanan, G., Zeng, Q. (1997). Supporting infobuttons with terminological knowledge. *Proc AMIA Annual Fall Symp*, pp. 528–532.
- Cimino, J.J., Huang, X., Patel, V., Sengupta, S., Kushniruk, A. (1998). PatCIS: Support for informed patient decision-making. *Proceeding of the AMIA Fall Symposium*, p. 47.
- Cimino, J.J., Johnson, S.B., Aguirre, A., Roderer, N., Clayton, P.D. (1992). The MEDLINE button. *Proceedings of the 16th Annual Symposium on Computer Applications in Medical Care*, Baltimore, MD, pp. 81–85.
- Cimino, J.J., Li, J., Bakken, S., Patel, V (2002). Theoretical, empirical, and practical approaches to resolving the unmet information needs of clinical information systems users. *Proceedings of the AMIA Symposium*, pp.170–4.
- Cimino, J.J., Li, J., Mendonca, E.A., Sengupta, S., Patel, V.L., Kushniruk, A.W. (2000). An evaluation of patient access to their electronic medical records via the World Wide Web. *Proc AMIA Fall Symp*, pp. 151–155.
- Cimino, J.J., Li, J., Graham, M., Currie, L.M., Allen, M., Bakken, S., Patel, V.L., (2003). Use of online resources while using a clinical information system. *Proceedings AMIA Annu Sym* pp. 175–179.
- Cimino, J.J., Patel, V.L., Kushniruk, A.W. (2002). The patient clinical information system (PatCIS): Technical solutions for and experience with giving patients access to their electronic medical records. *Int J Med Inf.* 18;68(1-3):113–27.
- Clancey, W.J. (1984). The epistemology of a rule-based expert system: A framework for explanation. *Artificial Intelligence*, 20:215–251.
- Clancey, W. J. (1986). From GUIDON to NEOMYCIN and HERACLES in twenty short lessons: ORN final report 1979-1985. *AI Magazine*, 7(3):40–60.
- Clancey W.J. (1989). Viewing knowledge bases as qualitative models. *IEEE Expert*, 4(2):9–23.
- Clancey, W.J., Shortliffe, E.H. (1984). *Readings in Medical Artificial Intelligence: The First Decade*. Reading, Mass: Addison-Wesley.
- Clark, J., Lang, N.M. (1992). Nursing’s next advance: An international classification for nursing practice. *International Nursing Review*, 39(4):109–112.
- Clarysse, P., Friboulet, D., Magnin, I.E. (1997). Tracking geometrical descriptors on 3-D deformable surfaces: application to the left-ventricular surface of the heart. *IEEE Transactions on Medical Imaging*, 16(4):392–404.

- Classen, D.C., Pestotnik, S.L., Evans, R.S., Lloyd, J.F., Burke, J.P. (1997). Adverse drug events in hospitalized patients. Excess length of stay, extra costs, and attributable mortality. *Journal of the American Medical Association*, 277(4):301–306.
- Clemmer, T.P., Spuhler, V.J., Oniki, T.A., Horn, S.D. (1999) Results of a collaborative quality improvement program on outcomes and costs in a tertiary critical care unit. *Crit Care Med*, 27(9):1768–1774.
- Coenen, A., McNeil, B., Bakken, S., Bickford, C., Warren, J.J. and the American Nurses Association Committee on Nursing Practice Information Infrastructure (2001). Toward comparable nursing data: American Nurses Association criteria for data sets, classification systems, and nomenclatures. *Comput Nurs*, 19(6):240–6.
- Cohen, J.D. (2001). *FisWidgets*. University of Pittsburgh. (Accessed 2005 at: <http://neurocog.lrdc.pitt.edu/fiswidgets/>)
- Cohen, P.R. (1995). *Empirical Methods for Artificial Intelligence*. Cambridge, MA: MIT Press.
- Cole, M., Engestroem, Y. (1997). A cultural-historical approach to distributed cognition. In G. Salomon (ed.), *Distributed Cognitions: Psychological and Educational Considerations (Learning in Doing: Social, Cognitive, and Computational Perspectives)*, pp. 1–46. Cambridge University Press.
- Cole, W.G., Stewart, J.G. (1994). Human performance evaluation of a metaphor graphic display for respiratory data. *Methods of Information in Medicine*, 33:390–396.
- College of American Pathologists (1971). *Systematized Nomenclature of Pathology*. Chicago: The College of American Pathologists.
- Collen, M.F. (1983). The functions of an HIS: An overview. *Proceedings of MEDINFO 83*, Amsterdam: North Holland, pp. 61–64.
- Collen, M.F. (1995). *A History of Medical Informatics in the United States: 1950 to 1990*. Bethesda, MD: American Medical Informatics Association, Hartman Publishing.
- Coletti, M., Bleich, H. (2001). Medical subject headings used to search the biomedical literature. *Journal of the American Medical Informatics Association*, 8:317–323.
- Collins, D.L., Holmes, D J., Peters, T.M., & Evans, A.C. (1995). Automatic 3-D model-based neuroanatomical segmentation. *Hum Brain Mapp*, 3:190–208.
- Collins, D.L., Neelin, P., Peters, T.M., Evans, A.C. (1994). Automatic 3-D intersubject registration of MR volumetric data in standardized Talairach space. *Journal of Computer Assisted Tomography*, 18(2):192–205.
- Commission on Professional and Hospital Activities (1978). *International Classification of Diseases, Ninth Revision, with Clinical Modifications (ICD-9-CM)*. Ann Arbor: American Hospital Association.
- Committee on Quality of Health Care in America, Institute of Medicine (2001). *Crossing the Quality Chasm: A New Health System for the 21st Century*, Washington, DC: National Academies Press.
- Committee on Ways and Means (1997). *Medicare and Health Care Chartbook*. U.S. House of Representatives.
- Congressional Budget Office (1996). *Reducing the Deficit: Spending and Revenue Options*. Washington, D.C.: U.S. Government Printing Office.
- Congressional Budget Office, *Budget Options*, February 2001.
- Conley, D.M., Sundsten, J.W., Ratiu, P., Rauschnig, W., Rosse, C. (1995). The Digital Anatomist series: 3-D, segmented, dynamic atlases of body regions. *Proceedings of the 19th Symposium on Computer Applications in Medical Care*, New Orleans, p. 1016.
- Connolly, D. (ed.) (1997). *XML: Principles, Tools, and Techniques*. Cambridge, MA: O'Reilly & Associates.
- Cooke, J.T., Barie, P.S. (1998). Information management and decision support systems in the intensive care unit. *Surgical Technology International*, VI.

- Corina, D.P., Poliakov, A.V., Steury, K., Martin, R.F., Brinkley, J.F., Mulligan, K.A., Ojemann, G.A. (2000). Correspondences between language cortex identified by cortical stimulation mapping and fMRI. *Neuroimage (Human Brain Mapping Annual Meeting, June 12-16)*, 11(5), S295.
- Côté, R.A., Robboy, S. (1980). Progress in medical information management: Systematized nomenclature of medicine (SNOMED). *Journal of the American Medical Association*, 243:756.
- Côté, R.A., Rothwell, D.J. (1993). *The Systematised Nomenclature of Human and Veterinary Medicine*. Northfield, IL: College of American Pathologists.
- Côté, R.A., Rothwell, D.J., Palotay, J.L., Beckett, R.S., Brochu, L. (eds.) (1993). *The Systematized Nomenclature of Medicine: SNOMED International*. Northfield, IL: College of American Pathologists.
- Council, N.R. (1997). *Assessment of Performance Measures for Public Health, Substance Abuse, and Mental Health*. Washington, DC: National Academy Press.
- Covell, D.G., Uman, G.C., Manning, P.R. (1985). Information needs in office practice: are they being met? *Annals of Internal Medicine*, 103(4):596–599.
- Covitz, P.A., Hartel, F., Schaefer, C., De Coronado, S., Fragoso, G., Sahni, H., Gustafson, S., Buetow, K.H. (2003). caCORE: A common infrastructure for cancer informatics. *Bioinformatics*, 19(18):2404–12.
- Cox Jr., J. (1972). Digital analysis of the electroencephalogram, the blood pressure wave, and the electrocardiogram. *Proceedings of the IEEE*, 60:1137.
- Cox, R.W. (1996). AFNI: Software for analysis and visualization of functional magnetic resonance neuroimages. *Computers and Biomedical Research*, 29, 162–173.
- CPR Systems Evaluation Work Group (1994). *Draft CPR Project Evaluation Criteria*. (Available from the Computer-based Patient Record Institute, 919 N. Michigan Ave., Chicago, IL 60611).
- Crocco, A., Villasis-Keever, M., et al. (2002). Analysis of cases of harm associated with use of health information on the internet. *Journal of the American Medical Association*, 287:2869–2871.
- Crowley, R.S., Naus, G.J., Stewart, J., Friedman, C. P. (2003). Development of visual diagnostic expertise in pathology – an information-processing study. *Journal of the American Medical Informatics Association*, 10(1):39–51.
- Cunneen, S.A., Shabot, M.M., Wagner, W.H. (1998). Outcomes from abdominal aortic aneurysm resection: Does SICU length of stay make a difference? *American Surgeon*, 64(2):196–199.
- Curran, W.J., Stearns, B., Kaplan, H. (1969). Privacy, confidentiality, and other legal considerations in the establishment of a centralized health-data system. *New England Journal of Medicine*, 281(5):241–248.
- Cushing, H. (1903). On routine determination of arterial tension in operating room and clinic. *Boston Medical Surgical Journal*, 148:250.
- Dacey, D. (1999). Primate retina: cell types, circuits and color opponency. *Prog Retin Eye Res*, 18(6):737–763.
- Dager, S.R., Steen, R.G. (1992). Applications of magnetic resonance spectroscopy to the investigation of neuropsychiatric disorders. *Neuropsychopharmacology*, 6(4):249–266.
- Dale, A.M., Fischl, B., Sereno, M.I. (1999). Cortical surface-based analysis. I. Segmentation and surface reconstruction. *Neuroimage*, 9(2):179–194.
- Dalto, J.D., Johnson, K.V., Gardner, R.M., Spuhler, V.J., Egbert, L. (1997). Medical Information Bus usage for automated IV pump data acquisition: evaluation of usage patterns. *International Journal of Clinical Monitoring and Computing*, 14(3):151–154.
- Dansky, K.H., Palmer, L., Shea, D., & Bowles, K.H. (2001). Cost analysis of telehomecare. *Telemed J E Health*, 7(3):225–232.
- Darmoni, S., Leroy, J., et al. (2000). CISMef: a structured health resource guide. *Methods of Information in Medicine*, 9:30–35.

- Davatzikos, C. (1997). Spatial transformation and registration of brain images using elastically deformable models. *Computer Vision and Image Understanding*, 66(2):207–222.
- Davatzikos, C., Bryan, R.N. (1996). Using a deformable surface model to obtain a shape representation of the cortex. *IEEE Trans. Medical Imaging*, 15(6):785–795.
- David, J.M., Krivine, J.P., Simmons, R. (eds.) (1993). *Second Generation Expert Systems*. Berlin: Springer-Verlag.
- Davis, R., Buchanan, B.G., Shortliffe, E.H. (1977). Production rules as a representation for a knowledge-based consultation program. *Artificial Intelligence*, 8:15–45.
- Davis, W.S. (1994). *Business Systems Design and Analysis*. Belmont, CA: Wadsworth Publishing.
- Day, H. (1963). An intensive coronary care area. *Diseases of the Chest*, 44:423.
- Dayhoff, M.O. (1974). Computer analysis of protein sequences. *Federal Proceedings*, 33(12):2314–2316.
- Dayhoff, M.O., Barker, W.C., McLaughlin, P.J. (1974). Inferences from protein and nucleic acid sequences: Early molecular evolution, divergence of kingdoms and rates of change. *Origins of Life*, 5(3):311–330.
- DeBakey, M. (1991). The National Library of Medicine: Evolution of a premier information center. *Journal of the American Medical Association*, 266:1252–1258.
- de Blik, R., Friedman, C.P., Blaschke, T.F., France, C.L., Speedie, S.M. (1988). Practitioner preferences and receptivity for patient-specific advice from a therapeutic monitoring system. *Proceedings of the 12th Annual Symposium on Computer Applications in Medical Care*, Washington, DC, pp. 225–228.
- de Dombal, F.T. (1987). Ethical considerations concerning computers in medicine in the 1980s. *Journal of Medical Ethics*, 13(4):179–84.
- de Dombal, F.T., Leaper, D.J., Staniland, J.R., McCann, A.P., Horrocks, J.C. (1972). Computer-aided diagnosis of acute abdominal pain. *British Medical Journal*, 1:376–380.
- Dean, A.G., Dean, J.A., Burton, A.H., Dicker, R.C. (1991). EpiInfo: a general purpose micro-computer program for public health information systems. *American Journal of Preventive Medicine*, 7(3):178–182.
- Degoulet, P., Phister, B., Fieschi, M. (1997). *Introduction to Clinical Informatics*. New York: Springer-Verlag.
- deGroot, A.D. (1965). *Thought and Choice in Chess*. The Hague: Mouton.
- Deibel, S.R., Greenes, R.A. (1995). An infrastructure for the development of health care information systems from distributed components. *Journal of the American Society for Information Science*, 26:765–771.
- Deibel, S.R., Greenes, R.A. (1996). Radiology systems architectures. In Greenes, R.A. & Bauman, R.A. (eds.) *Imaging and information management: computer systems for a changing health care environment. The Radiology Clinics of North America*, 34(3):681–696.
- Department of Health and Human Services (1994). Essential Public Health Functions. *Public Health in America*. (Accessed 2005 at: <http://www.health.gov/phfunctions/public.htm>)
- Department of Health and Human Services (2000). Immunization and Infectious Diseases. *Healthy People 2010 – Conference Edition*, Objective 14-26: Immunization Registries. (Accessed 2005 at: <http://www.cdc.gov/nip/registry/hp2010.htm>)
- Department of Health and Human Services (2003). *Building the National Health Information Infrastructure*. (Accessed 2005 at: <http://aspe.hhs.gov/sp/nhi/>)
- DeQuardo, J.R., Keshavan, M.S., Bookstein, F.L., Bagwell, W.W., Green, W.D.K., Sweeney, J.A., Haas, G.L., Tandon, R., Schooler, N.R., Pettegrew, J.W. (1999). Landmark-based morphometric analysis of first-episode schizophrenia. *Biological Psychiatry*, 45(10):1321–1328.
- Detmer, W.M., Barnett, G.O., Hersh, W.R. (1997). MedWeaver: integrating decision support, literature searching, and Web exploration using the UMLS Metathesaurus. *Proceedings of the 1997 AMIA Annual Fall Symposium*, Nashville, TN, pp. 490–494.

- Detmer, W.M., Friedman, C.P. (1994). Academic physicians' assessment of the effects of computers on health care. *Proceedings of the 18th Annual Symposium on Computer Applications in Medical Care*, Washington, D.C., pp. 558–562.
- Detmer, W.M., Shortliffe, E.H. (1995). A model of clinical query management that supports integration of biomedical information over the World Wide Web. *Proceedings of the 19th Annual Symposium on Computer Applications in Medical Care*, New Orleans, LA, pp. 898–902.
- Detmer, W.M., Shortliffe, E.H. (1997). Using the Internet to improve knowledge diffusion in medicine. *Communications of the ACM*, 40:101–108.
- Dev, P., Pichumani, R., Walker, D., Heinrichs, W.L., Karadi, C., Lorie, W. (1998). Formative design of a virtual learning environment, *Medicine Meets Virtual Reality*, p. 6. Amsterdam: IOS Press.
- Dexter, P.R., Perkins, S., Overhage, J.M., Maharry, K., Kohler, R.B., McDonald, C.J. (2001). A computerized reminder system to increase the use of preventive care for hospitalized patients. *N Engl J Med*, 345(13): 965–970.
- Dhenain, M., Ruffins, S.W., Jacobs, R.E. (2001). Three-dimensional digital mouse atlas using high-resolution MRI. *Dev. Biol.*, 232(2):458–470.
- Diabetes Control and Complications Trial Research Group (1996). Lifetime benefits and costs of intensive therapy as practiced in the diabetes control and complications trial. *JAMA*, 276(17):1409–15.
- Dick, R., Steen, E. (eds.) (1991 (Revised 1997)). *The Computer-Based Patient Record: An Essential Technology for Health Care*. Washington, D.C.: Institute of Medicine, National Academy Press.
- Dohi, T., Kikinis, R. (Eds.) (2002). *Proceedings of Medical Image Computing and Computer-Assisted Intervention - MICCAI 2002*, 5th International Conference, Tokyo, Japan, September 25–28, Parts I and II.
- Dolin, R., Alschuler, L., et al. (2001). The HL7 Clinical Document Architecture. *Journal of the American Medical Informatics Association*, 8:552–569.
- Donabedian, A. (1996). Evaluating the quality of medical care. *Millbank Memorial Quarterly*, 44:166–206.
- Doolan, D.F., Bates, D.W., James, B.C. (2003). The use of computers for clinical care: A case series of advanced U.S. sites. *Journal of the American Medical Informatics Association*, 10(1), 94–107.
- Dowell, R.D., Jokerst, R.M., Day, A., Eddy, S.R., Stein, L. (2001). The distributed annotation system. *BMC Bioinformatics*. 2(1):7.
- D'Orsi, C.J., Kopans, D.B. (1997). Mammography interpretation: the BI-RADS method. *American Family Physician*, 55(5):1548–1550.
- Downs, S.M., Carroll, A.E., Anand, V., Biondich, P.G. (2005). Human and system errors: Using adaptive turnaround documents to capture data in a busy practice. *Proceedings AMIA Annu Symp.* pp. 211–215.
- Drazen, E., Metzger, J. (1999). *Strategies for Integrated Health Care: Emerging Practices in Information Management and Cross-Continuum Care*. San Francisco: Jossey-Bass Publishers.
- Dhenain, M., Ruffins, S.W., Jacobs, R.E. (2001). Three-dimensional digital mouse atlas using high-resolution MRI. *Dev. Biol.*, 232(2), 458–470.
- Drury, H.A., Van Essen, D.C. (1997). Analysis of functional specialization in human cerebral cortex using the visible man surface based atlas. *Hum Brain Mapp*, 5:233–237.
- Duda, R.O., Shortliffe, E.H. (1983). Expert systems research. *Science*, 220(4594):261–268.
- Duncan, R.G., Saperia, D., Dulbandzhyan, R., Shabot, M.M., Polaschek, J.X., Jones, D.T. (2001). Integrated web-based viewing and secure remote access to a clinical data repository and diverse clinical systems. *Proc AMIA Fall Symp*, pp. 149–53.
- Durbin, R., Eddy, R., Krogh, A., Mitchison, G. (1998). *Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids*. Cambridge, UK: Cambridge University Press.
- Durfy, S.J. (1993). Ethics and the Human Genome Project. *Archives of Pathology and Laboratory Medicine*, 117(5):466–469.

- Dwyer, S.J. (1996). Imaging system architectures for picture archiving and communication systems. In Greenes, R.A. & Bauman, R.A. (eds.) *Imaging and information management: computer systems for a changing health care environment. The Radiology Clinics of North America*, 34(3):495–503.
- East, T.D., Bohm, S.H., Wallace, C.J., Clemmer, T.P., Weaver, L.K., Orme Jr., J.F., Morris, A.H. (1992). A successful computerized protocol for clinical management of pressure control inverse ration ventilation. *Chest*, 101(3):697–710.
- Eddy, D.M. (1992). *A Manual for Assessing Health Practices and Designing Practice Policies: The Explicit Approach*. Philadelphia: American College of Physicians.
- Editorial (1997). Electronic threats to medical privacy. *The New York Times*: March 11, 1997, A14.
- Egan, D., Remde, J., Gomez, L., Landauer, T., Eberhardt, J., Lochbaum, C. (1989). Formative design-evaluation of Superbook. *ACM Transactions on Information Systems*, 7:30–57.
- Eisner, E.W. (1991). *The Enlightened Eye: Qualitative Inquiry and the Enhancement of Educational Practice*. New York: McMillan Publishing Co.
- Eliot, C.R., Williams, K.A., Woolf, B.P. (1996). An intelligent learning environment for advanced cardiac life support. *Proceedings of the AMIA Annual Fall Symposium*, Washington, DC, pp. 7–11.
- Elkin, P L., Sorensen, B., De Palo, D., Poland, G., Bailey, K.R., Wood, D.L., et al. (2002). Optimization of a research Web environment for academic internal medicine faculty. *J Am Med Inform Assoc*, 9(5):472–478.
- Ellwood Jr., P.M., Anderson, N.N., Billings, J.E., Carlson, R.J., Hoagberg, E.J., McClure, W. (1971). Health maintenance strategy. *Medical Care*, 9(3):291–298.
- Ellwood, P.M. (1988). Shattuck lecture—Outcomes management: A technology of patient experience. *New England Journal of Medicine*, 318(23):1549–1556.
- Elstein A.S., Shulman L.S., Sprafka S.A. (1978). *Medical Problem Solving: An Analysis of Clinical Reasoning*. Cambridge, MA: Harvard University Press.
- Elting, L., Martin, C., Cantor, S.B., & Rubenstein, E.B. (1999). Influence of data display on physician investigators' decisions to stop trials: Prospective trial with repeated measures. *British Medical Journal*, 317:1527–1531.
- Ely, J., Osheroff, J., et al. (1999). Analysis of questions asked by family doctors regarding patient care. *British Medical Journal*, 319:358–361.
- Ely, J., Osheroff, J., et al. (2002). Obstacles to answering doctors' questions about patient care with evidence: Qualitative study. *British Medical Journal*, 324:710–713.
- Employee Benefit Research Institute (EBRI) (1995). *Sources of Health Insurance and Characteristics of the Uninsured: Analysis of the March 1994 Current Population Survey*.
- Employer Health Benefits (2002). *Annual Survey*, Menlo Park, CA and Chicago, IL: Henry J. Kaiser Family Foundation and Health Research and Educational Trust.
- Enthoven, A.C. (1993). The history and principles of managed competition. *Health Affairs*, 12(Supplement):24–48.
- Enthoven, A.C. (1997). Market based reform of US health care financing and delivery: Managed care and managed competition. *Innovations in Health Care Financing: Proceedings of a World Bank Conference*, March 10–11, pp. 195–214, .
- Enthoven, A.C. (2003). Employment-based health insurance is failing: Now what? *Health Affairs*, W3:237-249, 28 May.
- Enthoven A.C., Singer S.J. (1997). *Reforming medicare before it's too late*. (Research Paper Series, No. 1411): Stanford University Graduate School of Business.
- Ericsson, K.A (ed.) (1996). *The Road to Excellence: The Acquisition of Expert Performance in the Arts and Sciences, Sports and Games*. Hillsdale, NJ: Lawrence Erlbaum Publishers.
- Ericsson, K. A., Simon, H. A. (1993). *Protocol Analysis: Verbal Reports as Data* (Revised ed.). Cambridge, Mass: MIT Press.

- Ericsson, K. A., Smith, J. (1991). *Toward a General Theory of Expertise: Prospects and Limits*. New York: Cambridge University Press.
- Eriksson, H., Musen, M.A. (1993). Metatools for knowledge acquisition. *IEEE Software*, 10(3):23–29.
- Eriksson H., Puerta A.R., Musen M.A. (1994). Generation of knowledge-acquisition tools from domain ontologies. *International Journal of Human-Computer Studies*, 41:425–453.
- Eriksson, H., Shahar, Y., Tu, S.W., Puerta, A.R., Musen, M.A. (1995). Task modeling with reusable problem-solving methods. *Artificial Intelligence*, 79(2):293–326.
- Estes, W.K. (1975). *Handbook of Learning and Cognitive Processes*. Hillsdale, N.J.: L. Erlbaum Associates.
- EUCLIDES Foundation International (1994). *EUCLIDES Coding System Version 4.0*: The EUCLIDES Foundation.
- Evans, D.A., Cimino, J.J., Hersh, W., Huff, S.M., Bell D.S. (1994). Toward a medical-concept representation language. The Canon Group. *J Am Med Inform Assoc*. 1(3):207–217.
- Evans, A.C., Collins, D.L., Neelin, P., MacDonald, D., Kamber, M., Marrett, T.S. (1994). Three-dimensional correlative imaging: applications in human brain mapping. In R.W. Thatcher, M. Hallett, T. Zeffiro, E.R. John, M. Heurta (eds.), *Functional Neuroimaging: Technical Foundations*, pp. 145–162. San Diego: Academic Press.
- Evans, D.A., Gadd, C.S. (1989). Managing coherence and context in medical problem-solving discourse. In D. A. Evans & V. L. Patel (eds.), *Cognitive Science in Medicine*: pp. 211–255. Cambridge, Mass: MIT Press.
- Evans, D., Patel, V. (eds.) (1989). *Cognitive Science in Medicine: Biomedical Modeling*. Cambridge, Mass: MIT Press.
- Evans, R.S., Larson, R.A., Burke, J.P., Gardner, R.M., Meier, F.A., Jacobson, J.A., Conti, M.T., Jacobson, J.T., Hulse, R.K. (1986). Computer surveillance of hospital-acquired infections and antibiotic use. *Journal of the American Medical Association*, 256(8):1007–1011.
- Evans, R.S., Pestotnik, S.L., Classen, D.C., Burke, J.P. (1999). Evaluation of a computer-assisted antibiotic-dose monitor. *Ann Pharmacother*. 33(10):1026–1031.
- Evans, R.S., Pestotnik, S.L., Classen, D.C., Clemmer, T.P., Weaver, L.K., Orme Jr., J.F., Lloyd, J.F., Burke, J.P. (1998). A computer-assisted management program for antibiotics and other anti-infective agents. *New England Journal of Medicine*, 338(4):232–238.
- Eysenbach, G., Diepgen, T. (1998). Towards quality management of medical information on the internet: evaluation, labelling, and filtering of information. *British Medical Journal*, 317: 1496–1502.
- Eysenbach, G., Powell, J., Kuss, O., Su, E.R. (2002) Empirical studies assessing the quality of health information for consumers on the world wide web: A systematic review. *JAMA*, 287(20):2691–700.
- Eysenbach, G., Su, E., et al. (1999). Shopping around the internet today and tomorrow: Towards the millennium of cybermedicine. *British Medical Journal*, 319:1294–1298.
- Fafchamps, D., Young, C.Y., Tang, P.C. (1991). Modelling work practices: Input to the design of a physician's workstation. *Proceedings of the 15th Annual Symposium on Computer Applications in Medical Care*, Washington, D.C., pp. 788–792.
- Federative Committee on Anatomical Terminology (1998). *Terminologia Anatomica*. Stuttgart: Thieme.
- Feinstein, A.R. (1995). Meta-analysis: Statistical alchemy for the 21st century. *Journal of Clinical Epidemiology*, 48(1):71–79.
- Feltovich, P.J., Ford, K.M., Hoffman, R.R. (eds.) (1997). *Expertise in Context*. Cambridge, Mass.: MIT Press.
- Feltovich, P.J., Johnson, P.E., Moller, J.H., Swanson, D.B. (1984). LCS: The role and development of medical knowledge in diagnostic expertise. In W.J. Clancey & E.H. Shortliffe (eds.),

- Readings in Medical Artificial Intelligence: The First Decade*, pp. 275–319. Reading, Mass: Addison-Wesley.
- Ferguson, T. (2002). From patients to end users: quality of online patient networks needs more attention than quality of online health information. *British Medical Journal*, 324:555–556.
- Fiala, J.C., Harris, K.M. (2001). Extending unbiased stereology of brain ultrastructure to three-dimensional volumes. *J Am Med Ass*, 8(1),1–16.
- Field M.J. (ed.) (1996). *Telemedicine: A Guide to Assessing Telecommunications in Health Care*. Washington, D.C.: National Academy Press.
- Field, M.J., Lohr K.N. (1992). *Clinical Practice Guidelines: Directions for a New Program*. Washington, DC: National Academies Press.
- Fielding, N.G., Lee R.M. (1991). *Using Computers in Qualitative Research*. Newbury Park, CA: Sage Publications.
- Finkel, A. (ed.) (1977). *CPT4: Physician's Current Procedural Terminology* (4th ed.). Chicago: American Medical Association.
- Fischl, B., Sereno, M.I., Dale, A.M. (1999). Cortical surface-based analysis. II: Inflation, flattening, and a surface-based coordinate system. *Neuroimage*, 9(2),195–207.
- Flexner, A. (1910). *Medical Education in the United States and Canada: A Report to the Carnegie Foundation for the Advancement of Teaching*. Boston, MA: Merrymount Press.
- Flickner, M., Sawhney, H., Niblack, W., Ashley, J., Huang, Q., Dom, B., Gorkani, M., Hafner, J., Lee, D., Petkovic, D., Steele, D., Yanker, P. (1995). Query by image and video content: The QBIC system. *IEEE Computer*, 28(9):23–32.
- The FlyBase Consortium (2003). The FlyBase database of the Drosophila genome projects and community literature. *Nucleic Acids Research*;31:172–175.
- FMRIB Image Analysis Group (2001). *FSL -The FMRIB Software Library*. (Accessed 2005 at: <http://www.fmrib.ox.ac.uk/fsl/index.html>)
- Foley, J.D. (2001). *Computer Graphics: Principles and Practice*. Reading, Mass.: Addison-Wesley.
- Foley, DD., Van Dam, A., Feiner, S.K., Hughes, J.F. (1990). *Computer Graphics: Principles and Practice*. Reading, MA: Addison-Wesley.
- Force, U.S.P.S.T. (1996). *Guide to Clinical Preventive Services*. (2nd. ed.). Baltimore: Williams & Williams.
- Forrey, A.W., McDonald, C.J., DeMoor, G., Huff, S.M., Leavelle, D., Leland, D., Fiers, T., Charles, L., Griffin, B., Stalling, F., Tullis, A., Hutchins, K., Baenziger, J. (1996). Logical observation identifier names and codes (LOINC) database: A public use set of codes and names for electronic reporting of clinical laboratory test results. *Clinical Chemistry*, 42(1):81–90.
- Forsythe, D.E. (1992). Using ethnography to build a working system: Rethinking basic design assumptions. *Proceedings of the 16th Annual Symposium on Computer Applications in Medical Care*, Baltimore, MD, pp. 505–509.
- Forsythe, D.E., Buchanan, B.G. (1992). Broadening our approach to evaluating medical information systems. *Proceedings of the 16th Annual Symposium on Computer Applications in Medical Care*, Baltimore, MD, pp. 8–12.
- Fougerousse, F., Bullen, P., Herasse, M., Lindsay, S., Richard, I., Wilson, D., Suel, L., Durand, M., Robson, S., Abitbol, M., Beckmann, J. S., & Strachan, T. (2000). Human-mouse differences in the embryonic expression of developmental control genes and disease genes. *Human Molecular Genetics*, 9(2),165–173.
- Fox, C. (1992). Lexical analysis and stop lists. In Frakes, W. and Baeza-Yates, R., eds. *Information Retrieval: Data Structures and Algorithms*, pp. 102-130. Englewood Cliffs, NJ: Prentice-Hall.
- Fox, E.A., Marchionini, G. (1998). Toward a worldwide digital library. *Communications of the ACM*, 41(4):29–98.

- Fox, J., Das, S. (2000). *Safe and Sound: Artificial Intelligence in Hazardous Applications*. Cambridge, MA: AAAI and MIT Press.
- Fox, J., Johns, N., Rahmzadeh, A. (1998). Disseminating medical knowledge: The PROforma approach. *Artificial Intelligence in Medicine*, 14:157–181.
- Fox, M. (2001). Seal of approval issued to 13 health web sites. *Reuters*. (Accessed 2005 at: <http://www.cancerpage.com/news/article.asp?id=3743>)
- Fox, P.T. (ed.) (2001). *Human Brain Mapping*. New York: John Wiley & Sons.
- Frackowiak, R.S.J., Friston, K.J., Frith, C.D., Dolan, R.J., Mazziotta, J.C. (eds.) (1997). *Human Brain Function*. New York: Academic Press.
- Frakes, W. (1992). Stemming algorithms. In Frakes, W. and Baeza-Yates, R., eds. *Information Retrieval: Data Structures and Algorithms*, pp.131-160. Englewood Cliffs, NJ: Prentice-Hall.
- Frakes, W.B., Baeza-Yates, R. (1992). *Information Retrieval: Data Structures and Algorithms*. Englewood Cliffs, NJ: Prentice-Hall.
- Frank, S.J. (1988). What AI practitioners should know about the law. *AI Magazine*, Part One, 9:63–75 & Part Two, 9:109–114.
- Franklin, K.B.J., Paxinos, G. (1997). *The Mouse Brain in Stereotactic Coordinates*. San Diego: Academic Press.
- Frederiksen, C.H. (1975). Representing logical and semantic structure of knowledge acquired from discourse. *Cognitive Psychology*, 7(3):371–458.
- Freiman, J.A., Chalmers, T.C., Smith, H., Kuebler, R.R. (1978). The importance of beta, the Type II error and sample size in the design and interpretation of the randomized controlled trial. *New England Journal of Medicine*, 299:690–694.
- Friede, A., Freedman, M.A., Paul, J.E., Rizzo, N.P., Pawate, V.I., Turczyn, K.M. (1994). DATA2000: A computer system to link HP2000 objectives, data sources, and contacts. *American Journal of Preventive Medicine*, 10:230–234.
- Friede A., McDonald M.C., Blum H. (1995). Public health informatics: How information-age technology can strengthen public health. *Annual Review Public Health*, 16:239–252.
- Friede, A., O'Carroll, P.W. (1996). CDC and ATSDR Electronic Information Resources for Health Officers. *Journal of Public Health Practice Management*, 2:10–24
- Friede, A., O'Carroll, P.W. (1998). Public health informatics. In Last JM (ed.), *Last Public Health and Preventive Medicine, 14th Edition*. Norwalk, CT: Appleton & Lange, pp. 59-65.
- Friede, A., O'Carroll, P.W., Thralls, R.B., Reid, J.A. (1996). CDC WONDER on the Web. *Proceedings of the AMIA Annual Fall Symposium*, Washington, DC, pp. 408–412.
- Friede, A., Rosen, D.H., Reid, J.A. (1994). CDC WONDER: Cooperative processing for public health informatics. *Journal of the American Medical Informatics Association*, 1(4):303–312.
- Friedlander, A. (2002). The National Digital Information Infrastructure Preservation Program: Expectations, realities, choices, and progress to date. *D-Lib Magazine*, 8. (Accessed 2005 at: <http://www.dlib.org/dlib/april02/friedlander/04friedlander.html>)
- Friedman, B., Dieterle, M. (1987). The impact of the installation of a local area network on physicians and the laboratory information system in a large teaching hospital. *Proceedings of the 11th Annual Symposium on Computer Applications in Medical Care*, Washington, D.C., pp. 783–788.
- Friedman, C. (ed.) (2002). Special Issue: Biomedical Sublanguage. *J Biomed Inf.*:35(4).
- Friedman, C., Alderson, P.O., Austin, J., Cimino, J.J., Johnson, S.B. (1994). A general natural language text processor for clinical radiology. *JAMIA*, 1(2):161–174.
- Friedman, C.P., Dev, P., Dafoe, B., Murphy, G., Felciano, R. (1993). Initial validation of a test of spatial knowledge in anatomy. *Proceedings of the 17th Annual Symposium of Computer Applications in Medical Care*, Washington, DC, pp. 791–795.
- Friedman, C., Hripcsak, G. (1997). Evaluating natural language processors in the clinical domain. In Chute CG, editor, *Proceedings of the Conference on Natural Language and Medical Concept Representation (IMIA WG6)* Jacksonville, FL, pp. 41–52.

- Friedman, C., Hripcsak, G., Johnson, S.B., Cimino, J.J., Clayton, P.D.(1990). A generalized relational schema for an integrated clinical patient database. *Proceedings of the 14th Annual Symposium on computer Applications in Medical Care*. CA: IEEE Computer Soc. Press, pp. 335–339.
- Friedman, C., Huff, S.M., Hersh, W.R., Pattison-Gordon, E., Cimino, J.J.(1995). The Canon group's effort: working toward a merged model. *JAMIA* ; 2(1):4–18.
- Friedman, C., Kra, P., Krauthammer, M., Yu, H., Rzhetsky, A.(2001). GENIES: A natural-language processing system for the extraction of molecular pathways from journal articles. *Bioinformatics* :suppl:S74–82.
- Friedman, C., Shagina, L., Lussier, Y., Hripcsak, G. (2004). Automated encoding of clinical documents based on natural language processing. *J Am Med Inform Assoc*. 11(5):392–402.
- Friedman C.P. (1995). Where's the science in medical informatics? *Journal of the American Medical Informatics Association*, 2(1):65–67.
- Friedman, C.P., Abbas, U.L. (2003). Is medical informatics a mature science? A review of measurement practice in outcome studies of clinical systems. *Intl J Med Inf*. 69, 261–272.
- Friedman, C.P., Wyatt, J.C. (1997a). *Evaluation Methods in Medical Informatics*. New York: Springer-Verlag.
- Friedman, C.P., Wyatt, J.C. (1997b). Studying clinical information systems. In Friedman C.P., & Wyatt, J.C., (ed.), *Evaluation Methods in Medical Informatics*, pp.41–64 New York: Springer-Verlag.
- Friedland, P., Iwasaki, Y. (1985). The concept and implementation of skeletal plans, *Journal of Automated Reasoning*, 1(2),161–208.
- Friedman, R.B. (1973). A computer program for simulating the patient-physician encounter. *Journal of Medical Education*, 48(1):92–97.
- Friedman, R.B., Gustafson, D.H. (1977). Computers in clinical medicine: A critical review. *Computers and Biomedical Research*, 10(3):199–204.
- Friedman, R.B., Korst, D.R., Schultz, J.V., Beatty, E., Entine, S. (1978). Experience with the simulated patient-physician encounter. *Journal of Medical Education*, 53(10):825–830.
- Fries, J.F. (1974). Alternatives in medical record formats. *Medical Care*, 12(10):871–881.
- Frisse, M.E., Braude, R.M., Florance, V., Fuller, S. (1995). Informatics and medical libraries: changing needs and changing roles. *Academic Medicine*, 70(1):30–35.
- Friston, K.J., Holmes, A.P., Worsley, K.J., Poline, J.P., Frith, C.D., Frackowiak, R.S.J. (1995). Stastical parametric maps in functional imaging: a general linear approach. *Hum Brain Mapp*, 2,189–210.
- Fronstin, P. (2002). Can 'Consumerism' Slow the Rate of Health Benefit Cost Increases?" Issue Brief no. 247, Washington: Employee Benefit Research Institute, July.
- Fuchs, V.R. (1983). *Who Shall Live?* New York: Basic Books.
- Fuchs, V.R. (1993). *The Future of Health Policy*. Cambridge, MA: Harvard University Press.
- Fuchs, V.R., Garber A.M. (1990). The new technology assessment. *New England Journal of Medicine*, 323(20):673–677.
- Fuller, S. (1997). Regional health information systems: Applying the IAIMS model. *Journal of the American Medical Informatics Association*, 4(2):S47–S51.
- Funk, M.E., Reid, C.A., McGoogan, L.S. (1983). Indexing consistency in MEDLINE. *Bulletin of the Medical Library Association*, 71(2):176–183.
- Gaasterland, T., Karp, P., Karpplus, K., Ouzounis, C., Sander C., Valencia, A. (eds.) (1997). *Proceedings of the Fifth International Conference on Intelligent Systems for Molecular Biology*. Menlo Park, CA: AAAI Press.
- Gabrieli, E.R. (1989). A new electronic medical nomenclature. *Journal of Medical Systems*, 13(6):355–373.
- Gaba, D.M. (2004). The future vision of simulation in health care. *Qual Saf Health Care*, 13 Suppl 1:i2–i10.

- Garber, A.M., Owens, D.K. (1994). Paying for evaluative research. In Gelijns A.C., Dawkins H.V. (eds.), *Medical Innovations at the Crossroads, Volume IV: Adopting New Medical Technology*, pp.172–192. Washington, D.C.: National Academy Press.
- Garcia-Molina, H., Ullman, J.D., Widom, J.D. (2002). *Database Systems: The Complete Book*, New York: Prentice-Hall.
- Gardner, H. (1985). *The Mind's New Science: A History of the Cognitive Revolution*. New York: Basic Books.
- Gardner, R.M. (1989). *Personal Communication*. : LDS Hospital, Salt Lake City, UT.
- Gardner, R.M. (1997). Fidelity of recording: Improving the signal-to-noise ratio. In Tobin M.J. (ed.), *Principals and Practice of Intensive Care Monitoring*, pp.123–132. New York: McGraw-Hill.
- Gardner, R.M., Hawley, W.H., East, T.D., Oniki, T.A., Young, H.F. (1992). Real time data acquisition: Recommendations for the medical information bus (MIB). *International Journal of Clinical Monitoring and Computing*, 8(4):251–258.
- Gardner, R.M., Lundsgaarde, H.P. (1994). Evaluation of user acceptance of a clinical expert system. *Journal of the American Medical Informatics Association*, 1(6):428– 438.
- Gardner, R.M., Monis, S., Oehler, P. (1986). Monitoring direct blood pressure: Algorithm enhancements. *IEEE Computers in Cardiology*, 13:607.
- Gardner, R.M., Shabot, M.M. (2001). Patient-monitoring systems. In E. H. Shortliffe & L. E. Perreault (eds.), *Medical Informatics* (2nd ed), pp. 443– 485. New York: Springer Verlag.
- Gardner, R.M., Sittig, D.F., Clemmer, T.P. (1995). Computers in the intensive care unit: A match meant to be! In Shoemaker W.C. (ed.), *Textbook of Critical Care*. (3rd ed.), pp.1757–1770. Philadelphia, PA: W.B. Saunders.
- Garg, A.X., Adhikari, N.K.J., McDonald, H., Rosas-Arellano M.P., Devereaux, P.J., Beyene, J., Sam, J., Haynes, R.B. (2005). Effects of computerized clinical decision support systems on practitioner performance and patient outcomes: A systematic review. *JAMA* 293(10):1223–1238.
- Garibaldi, R.A. (1998). Editorial: Computers and the quality of care: A clinician's perspective. *New England Journal of Medicine*, 338(4):259–260.
- Gazmararian, J., Baker, D., et al. (1999). Health literacy among Medicare enrollees in a managed care organization. *Journal of the American Medical Association*, 281:545–551.
- Gee, J.C., Reivich, M., Bajcsy, R. (1993). Elastically deforming 3D atlas to match anatomical brain images. *J. Computer Assisted Tomography*, 17(2), 225–236.
- Geissbuhler, A., Miller R.A. (1996). A new approach to the implementation of direct care-provider order entry. *Proceedings of the AMIA Annual Fall Symposium*, pp. 689–693.
- Geissbuhler, A.J., Miller, R.A. (1997). Desiderata for product labeling of medical expert systems. *International Journal of Medical Informatics*, 47(3):153–163.
- Gelfand, M. (1995). Prediction of function in DNA sequence analysis. *Journal of Computational Biology*, 2(1):87–115.
- The Gene Ontology Consortium (2003). Gene Ontology: tool for the unification of biology. *Nature Genet*, 25: 25–29.
- George, J.S., Aine, C.J., Mosher, J.C., Schmidt, D.M., Ranken, D.M., Schlitz, H.A., Wood, C.C., Lewine, J.D., Sanders, J.A., Belliveau, J.W. (1995). Mapping function in human brain with magnetoencephalography, anatomical magnetic resonance imaging, and functional magnetic resonance imaging. *Journal of Clinical Neurophysiology*, 12(5):406– 431.
- Gerstein, M., Edwards, A., Arrowsmith, C.H., Montelione, G.T. (2003). Structural genomics: Current progress. *Science*. 298(5595):948–950.
- Gibson, K., Scheraga, H. (1967). Minimization of polypeptide energy. I. Preliminary structures of bovine pancreatic ribonuclease S-peptide. *Proceedings of the National Academy of Sciences*, 58(2):420– 427.
- Giger M., MacMahon H. (1996). Image processing and computer-aided diagnosis. In Greenes, R.A. & Bauman, R.A. (eds.) *Imaging and information management: computer systems for*

- a changing health care environment. *The Radiology Clinics of North America*, 34(3):565–596.
- Gillan, D.J., Schvaneveldt, R.W. (1999). Applying cognitive psychology: Bridging the gulf between basic research and cognitive artifacts. In F. T. Durso, R.S. Nickerson (eds.), *Handbook of Applied Cognition*, pp. 3–31. New York: Wiley.
- Gilman, A.G., Simon, M.I., Bourne, H.R., Harris, B.A., Long, R., Ross, E.M., Stull, J.T., Taussig, R., Bourne, H.R., Arkin, A.P., Cobb, M.H., Cyster, J.G., Devreotes, P.N., Ferrell, J.E., Fruman, D., Gold, M., Weiss, A., Stull, J.T., Berridge, M.J., Cantley, L.C., Catterall, W.A., Coughlin, S.R., Olson, E.N., Smith, T.F., Brugge, J.S., Botstein, D., Dixon, J.E., Hunter, T., Lefkowitz, R.J., Pawson, A.J., Sternberg, P.W., Varmus, H., Subramaniam, S., Sinkovits, R.S., Li, J., Mock, D., Ning, Y., Saunders, B., Sternweis, P.C., Hilgemann, D., Scheuermann, R.H., DeCamp, D., Hsueh, R., Lin, K.M., Ni, Y., Seaman, W.E., Simpson, P.C., O'Connell, T.D., Roach, T., Simon, M.I., Choi, S., Eversole-Cire, P., Fraser, I., Mumby, M.C., Zhao, Y., Brekken, D., Shu, H., Meyer, T., Chandry, G., Heo, W.D., Liou, J., O'Rourke, N., Verghese, M., Mumby, S.M., Han, H., Brown, H.A., Forrester, J.S., Ivanova, P., Milne, S.B., Casey, P.J., Harden, T.K., Arkin, A.P., Doyle, J., Gray, M.L., Meyer, T., Michnick, S., Schmidt, M.A., Toner, M., Tsien, R.Y., Natarajan, M., Ranganathan, R., Sambrano, G.R. (2003). Overview of the Alliance for Cellular Signaling. *Nature*. 420(6916):703–6.
- Ginsburg, P. (1982). *Containing Medical Care Costs Through Market Forces*. Washington, D.C.: Congressional Budget Office.
- Ginzton, L.E., Laks, M.M. (1984). Computer aided ECG interpretation. *M.D. Computing*, 1(3):36–44.
- Giuse, D.A., Mickish, A. Increasing the availability of the computerized patient record. *Proc AMIA Annu Fall Symp*. 1996, pp. 633–7.
- Glowniak, J.W., Bushway, M.K. (1994). Computer networks as a medical resource: Accessing and using the Internet. *Journal of the American Medical Association*, 271(24):1934–1940.
- Gold, M.R., Siegel, J.E., Russell, L.B., Weinstein, M.C. (eds.) (1996). *Cost Effectiveness in Health and Medicine*. New York: Oxford University Press.
- Goldberg, M.A. (1996). Teleradiology and telemedicine. In Greenes, R.A. & Bauman, R.A. (eds.) *Imaging and information management: computer systems for a changing health care environment*. *The Radiology Clinics of North America*, 34(3):647–665.
- Goldstein, B., McNames, J., McDonald, B.A., et al. (2003). Physiological data acquisition system and database for the study of disease dynamics in the intensive care unit. *Crit Car Med*, 31(2):433–441
- Goldstein, M.K., Hoffman, B.B., Coleman, R.W., Musen, M.A., Tu, S.W., Advani, A., Shankar, R.D., O'Connor, M. (2000). Implementing clinical practice guidelines while taking account of evidence: ATHENA, an easily modifiable decision-support system for management of hypertension in primary care. *Proceedings of the Annual AMIA Fall Symposium*, pp. 300-304, Hanley & Belfus, Philadelphia.
- Goldstein, M.K., Hoffman, B.B., Coleman, R.W., Musen, M.A., Tu, S.W., Shankar, R.D., O'Connor, M., Martins, S., Advani, A., Musen, M.A. (2002). Patient safety in guideline-based decision support for hypertension management: ATHENA DSS. *Journal of the American Medical Informatics Association* 9(6 Suppl): S11–16.
- Gonzales, R., Bartlett, J., et al. (2001). Principles of appropriate antibiotic use for treatment of acute respiratory infections in adults: background, specific aims, and methods. *Annals of Internal Medicine*, 134:479–486.
- Goodman, K.W. (1996). Ethics, genomics and information retrieval. *Computers in Biology and Medicine*, 26(3):223–229.
- Goodman, K.W. (ed.) (1998a). *Ethics, Computing, and Medicine: Informatics and the Transformation of Health Care*. Cambridge and New York: Cambridge University Press.

- Goodman, K.W. (1998b). Bioethics and health informatics: An introduction. In Goodman K.W. (ed.), *Ethics, Computing, and Medicine: Informatics and the Transformation of Health Care*, pp.1-31. Cambridge and New York: Cambridge University Press.
- Goodman, K.W. (1998c). Outcomes, futility, and health policy research. In Goodman K.W. (ed.), *Ethics, Computing, and Medicine: Informatics and the Transformation of Health Care*, pp. 116-138. Cambridge: Cambridge University Press.
- Goodwin, J.O., Edwards, B.S. (1975). Developing a computer program to assist the nursing process: Phase I-From systems analysis to an expandable program. *Nursing Research*, 24(4):299-305.
- Gordon, M. (1982). Historical perspective: The National Conference Group for Classification of Nursing Diagnoses. *Proceedings of the Classification of Nursing Diagnoses: Proceedings of the Third and Fourth National Conferences*.
- Gorman, P.N. (1995). Information needs of physicians. *Journal of the American Society for Information Science*, 46:729-736.
- Gorman, P.N., Ash, J., Wykoff, L. (1994). Can primary care physicians' questions be answered using the medical literature? *Bulletin of the Medical Library Association*, 82(2):140-146.
- Gorman, P.N., Helfand, M. (1995). Information seeking in primary care: how physicians choose which clinical question to pursue and which to leave unanswered. *Medical Decision Making*, 15(2):113-119.
- Gould, M.K., Kushner, W.G., Rydzak, C.E., Maclean, C.C., Demas, A.N., Shigemitsu, H., Chan, J.K., Owens, D.K. (2003). Test performance of positron emission tomography and computed tomography for mediastinal staging in patients with non-small cell lung cancer: A meta analysis. *Annals of Internal Medicine* 139:879-892.
- Graves, J.R., Corcoran, S. (1989). The study of nursing informatics. *Image: Journal of Nursing Scholarship*, 21:227-231.
- Gray, J.E., Safran, C., Davis, R.B., Pompilio-Weitzner, G., Stewart, J.E., Zaccagnini, L., Pursley, D. (2000). Baby CareLink: using the internet and telemedicine to improve care for high-risk infants. *Pediatrics* 106,1318-1324.
- Greenes, R.A. (1982). OBUS: A microcomputer system for measurement, calculation, reporting, and retrieval of obstetrical ultrasound examinations. *Radiology*, 144:879-883.
- Greenes, R.A. (1989). The radiologist as clinical activist: A time to focus outward. *Proceedings of the First International Conference on Image Management and Communication in Patient Care: Implementation and Impact (IMAC 89)*, Washington, D.C., pp. 136-140.
- Greenes, R.A., Barnett, G.O., Klein, S.W., Robbins, A., Prior, R.E. (1970). Recording, retrieval, and review of medical data by physician-computer interaction. *New England Journal of Medicine*, 282(6):307-315.
- Greenes, R.A., Bauman, R.A., Robboy, S.J., Wieder, J.F., Mercier, B.A., Altshuler, B.S. (1978). Immediate pathologic confirmation of radiologic interpretation by computer feedback. *Radiology*, 127(2):381-383.
- Greenes, R.A., Bauman, R.A. (1996). Imaging and information management: Computer systems for a changing health care environment. *The Radiology Clinics of North America*, 34(3):463-697.
- Greenes, R.A., Brinkley, J.F. (2001). Radiology Systems. In E.H. Shortliffe & L.E. Perreault (eds.), *Medical Informatics* (2nd ed.), pp. 485-538. New York: Springer Verlag.
- Greenes, R.A., Deibel, S.R. (1996). Constructing workstation applications: Component integration strategies for a changing health-care system. In Van Bommel J.H., McCray A.T. (eds.), *IMIA Yearbook of Medical Informatics '96*, pp.76-86. Rotterdam, The Netherlands: IMIA.
- Greenes, R.A., Shortliffe, E.H. (1990). Medical informatics: An emerging academic discipline and institutional priority. *Journal of the American Medical Association*, 263(8):1114-1120.
- Greenlick, M.R. (1992). Educating physicians for population-based clinical practice. *Journal of the American Medical Association*, 267(12):1645-1648.

- Greeno, J.G., Simon, H.A. (1988). Problem solving and reasoning. In R.C. Atkinson & R.J. Herrnstein (eds.), *Stevens' Handbook of Experimental Psychology* (2nd ed., Vol. 1: Perception and Motivation), pp. 589–672. Oxford, England: John Wiley & Sons.
- Gribskov, M., Devereux, J. (1991). *Sequence Analysis Primer*. New York: Stockton Press.
- Griffith, H.M., Robinson, K.R. (1992). Survey of the degree to which critical care nurses are performing current procedural terminology-coded services. *American Journal of Critical Care*, 1(2):91–98.
- Grigsby, J., Sanders, J.H. (1998). Telemedicine: Where it is and where it's going. *Annals of Internal Medicine*, 129(2):123–127.
- Grimm, R.H., Shimoni, K., Harlan, W.R., Estes, E.H.J. (1975). Evaluation of patient-care protocol use by various providers. *New England Journal of Medicine*, 282(10):507–511.
- Grimshaw, J.M. Russel, I.T. (1993). Effect of clinical guidelines on medical practice: A systematic review of rigorous evaluations. *Lancet*, 342:1317–1322.
- Grisham, R., Kittredge R. (eds.) (1986), *Analyzing Language in Restricted Domains: Sublanguage Description and Processing*. Hillsdale, New Jersey: Erlbaum Associates.
- Grobe, S.J. (1996). The nursing intervention lexicon and taxonomy: Implications for representing nursing care data in automated records. *Holistic Nursing Practice*, 11(1):48–63.
- Gross, M.S., Lohman, P. (1997). The technology and tactics of physician integration. *Journal of the Healthcare Information and Management Systems Society*, 11(2):23–41.
- Grosz, B., Joshi, A., Weinstein, S. (1995). Centering: A framework for modeling the local coherence of discourse. *Computational Linguistics*; 2(21):203–225.
- Guo, Q.M.. (2003). DNA microarray and cancer. *Current Opinion in Oncology*. 15(1):36–43.
- Gupta, L., Ward, J.E., Hayward, R.S. (1997). Clinical practice guidelines in general practice: A national survey of recall, attitudes and impact. *Med J Aust* 166(2):69–72.
- Gusfield, D. (1997). *Algorithms on Strings, Trees, and Sequences: Computer Science and Computational Biology*. Cambridge, England: Cambridge University Press.
- Gustafson, D.H., Hawkins, R.P., Boberg, E.W., McTavish, F., Owens, B., Wise, M., Berhe, H., Pingree, S. (2002). CHESS: 10 years of research and development in consumer health informatics for broad populations, including the underserved. *International Journal of Medical Informatics*. 65(3):169–77.
- Gustafson, D.H., Taylor, J.O., Thompson, S., Chesney, P. (1993). Assessing the needs of breast cancer patients and their families. *Quality Management in Health Care*, 2(1):6–17.
- Guyatt, G. Rennie, D. et al. (2001). *Users' Guide to the Medical Literature: Essentials of Evidence-Based Clinical Practice*. Chicago. American Medical Association.
- Hagen, P.T., Turner, D., Daniels, L., Joyce, D. (1998). Very large-scale distributed scanning solution for automated entry of patient information. *TEPR Proceedings (Toward an Electronic Patient Record)*, One:228–32.
- Hahn, U.; Romacker, M.; Schulz, S. (1999) Discourse structures in medical reports – watch out! The generation of referentially coherent and valid text knowledge bases in the medSynDiKATe system.: *International Journal of Medical Informatics*, 53(1):1–28.
- Halamka, J.D., Safran, C. (1998). CareWeb: A web-based medical record for an integrated health-care delivery system. *Proceedings of Medinfo 1998*; pt 1:36–39.
- Hamilton, D., Macdonald, B., King, C., Jenkins, D., Parlett, M. (eds.) (1977). *Beyond the Numbers Game*. Berkeley, CA: McCutchan Publishers.
- Hammond, W.E., Stead, W.W., Straube, M.J., Jelovsek, F.R. (1980). Functional characteristics of a computerized medical record. *Methods of Information in Medicine*, 19(3):157–162.
- Hanlon, W.B., Fene, E.F., Davi, S.D., Downs, J.W. (1996). Project BRAHMS: PACS implementation at Brigham and Women's Hospital. *Proceedings of the SICAR96*, Denver, CO, pp. 489–490.

- Hansen, L.K., Nielsen, F.A., Toft, P., Liptrot, M.G., Goutte, C., Strother, S.C., Lange, N., Gade, A., Rottenberg, D.A., & Paulson, O.B. (1999). Lyngby-modeler's Matlab toolbox for spatio-temporal analysis of functional neuroimages. *Neuroimage*, 9(6), S241.
- Haralick, R.M. (1988). *Mathematical Morphology*: Seattle: University of Washington.
- Haralick, R.M., Shapiro, L.G. (1992). *Computer and Robot Vision*. Reading, MA: Addison-Wesley.
- Hardiker, N.R., Hoy, D., Casey, A. Standards for nursing terminology. *Journal of the American Medical Informatics Association*, 7:6,523–528.
- Harless, W.G., Drennon, G.G., Marxer, J.J., Root, J.A., Miller, G.E. (1971). CASE: A computer-aided simulation of the clinical encounter. *Journal of Medical Education*, 46(5):443–448.
- Harless, W.G., Zier, M.A., Duncan, R.C. (1986). Interactive videodisc case studies for medical education. *Proceedings of the 10th Annual Symposium on Computer Applications in Medical Care*, Washington, DC, pp. 183–187.
- Harnad, S. (1998). On-line journals and financial firewalls. *Nature*, 395:127–128.
- Harris, J.R., Caldwell, B., Cahill, C. (1998). Measuring the public's health in an era of accountability: Lessons from HEDIS (Health Plan Employer Data and Information Set). *American Journal of Preventive Medicine*, 14(3 suppl):9–13.
- Harris, MA, Clark, J, Ireland, A, et al. for the Gene Ontology Consortium (2004). The Gene Ontology (GO) database and informatics resource. *Nucleic Acids Res.* 32(Database issue):D258-6.
- Harris, Z. (1991), *A Theory of Language and Information: A Mathematical Approach*, Oxford University Press, New York.
- Harris, Z, Gottfried, M, Ryckmann, T, Mattick, Jr P, Daladier, A, Harris, TN, Harris, S. (1989). *The Form of Information in Science: Analysis of an Immunology Sublanguage*. Boston, MA: Reidel Dordrecht Studies in the Philosophy of Science.
- Harter, S. (1992). Psychological relevance and information science. *Journal of the American Society for Information Science*, 43: 602–615.
- Hayes-Roth, F., Waterman, D., Lenat, D. (eds.) (1983). *Building Expert Systems*. Reading, MA: Addison-Wesley.
- Haynes, R. (2001). Of studies, syntheses, synopses, and systems: The “4S” evolution of services for finding current best evidence. *ACP Journal Club*, 134:A11–A13.
- Haynes, R., Devereaux, P., et al. (2002). Clinical expertise in the era of evidence-based medicine and patient choice. *ACP Journal Club*, 136:A11.
- Haynes, R., McKibbin, K., et al. (1985). Computer searching of the medical literature: An evaluation of MEDLINE searching systems. *Annals of Internal Medicine*, 103:812–816.
- Haynes, R.B., McKibbin, K.A., Walker, C.J., Ryan, N., Fitzgerald, D., Ramsden, M.F. (1990). Online access to MEDLINE in clinical settings. *Annals of Internal Medicine*, 112(1):78–84.
- Haynes, R., Walker, C., et al. (1994). Performance of 27 MEDLINE systems tested by searches with clinical questions. *Journal of the American Medical Informatics Association*, 1:285–295.
- Haynes, R.B., Wilczynski, N., McKibbin, K.A., Walker, C.J., Sinclair, J.C. (1994). Developing optimal search strategies for detecting clinically sound studies in MEDLINE. *Journal of the American Medical Informatics Association*, 1(6):447–458.
- Health Care Financial Management Association (1992). *Implementation Manual for the 835 Health Care Claim Payment/Advice*: The Health Care Financial Management Association.
- Health Care Financial Management Association (1993). *Implementation Manual for the 834 Benefit Enrollment and Maintenance*. : The Health Care Financial Management Association.
- Health Care Financing Administration (1980). *The International Classification of Diseases 9th Revision, Clinical Modification, ICD-9-CM*. (PHS 80-1260.) Washington, D.C.: U.S. Department of Health and Human Services.
- Health Care Financing Review (1996). *Medicare and Medicaid Statistical Supplement*. Baltimore: U.S. Department of Health and Human Services.

- Health Devices (anon) (2003). Next-generation pulse oximetry. *Health Devices*, 32(2):49–103
- Health Insurance Association of America (HIAA) (1983). *Source Book of Health Insurance Data 1982–1983*. Washington, D.C.: HIAA.
- Health Level 7 (2003). *Arden Syntax*. (Accessed 2005 at: <http://www.hl7.org/Special/committees/Arden/arden.htm>)
- Health Level Seven (HL7) (2004). *Technical Committees and Special Interest Groups*. <http://www.hl7.org>.
- Hearst, M., Karadi, C. (1997). Cat-a-Cone: An interactive interface for specifying searches and viewing retrieval results using a large category hierarchy. *Proceedings of the 20th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval*, Philadelphia, PA. ACM Press, pp. 246–255.
- Heath, C., Luff, P. (2000). *Technology in Action*. New York: Cambridge University Press.
- Heathfield, H.A., Wyatt, J.C. (1993). Philosophies for the design and development of clinical decision-support systems. *Methods of Information in Medicine*, 32(1):1–8.
- Heathfield H.A., Wyatt J.C. (1995). The road to professionalism in medical informatics: A proposal for debate. *Methods of Information in Medicine*, 34(5):426–433.
- Heckerman, D., Horvitz, E. (1986). The myth of modularity in rule-based systems for reasoning with uncertainty. In Lemmer J., Kanal L. (eds.), *Uncertainty in Artificial Intelligence 2*. Amsterdam, Netherlands: North Holland.
- Heckerman, D., Horvitz, E., Nathwani, B. (1989). Update on the Pathfinder project. *Proceedings of the Thirteenth Annual Symposium on Computer Applications in Medical Care*, Washington, DC, pp. 203–207.
- Heckerman D., Nathwani B. (1992). An evaluation of the diagnostic accuracy of Pathfinder. *Computers and Biomedical Research*, 25:56–74.
- Heiss, W.D., Phelps, M.E. (eds.) (1983). *Positron Emission Tomography of the Brain*. Berlin; New York: Springer-Verlag.
- Helfand, M., & Redfern, C. (1998). Screening for thyroid disease. *Annals of Internal Medicine*, 129(2):144–158.
- Hellmich, M., Abrams, K.R., Sutton, A.J. (1999). Bayesian approaches to meta-analysis of ROC curves. *Medical Decision Making* 19:252–264.
- Henchley, A. (2003). *Understanding Version 3: A Primer on the HL7 Version 3 Communication Standard*. Munich, Germany: Alexander Moench Publishing Co.
- Henderson, M. (2003). *HL7 Messaging*. Silver Spring, Maryland OTEch Inc.
- Henderson, S. Crapo, R.O., Wallace, C.J., East, T.D., Morris, A.H., Gardner, R.M. (1991). Performance of computerized protocols for the management of arterial oxygenation in an intensive care unit. *International Journal of Clinical Monitoring and Computing*, 8(4):271–280.
- Henikoff, S, Henikoff, JG. (1992). *Amino acid substitution matrices from protein blocks*. *Proceedings of the National Academy of the Sciences*. 89(22):10915–9.
- Henley, R.R., Wiederhold, G. (1975). *An Analysis of Automated Ambulatory Medical Record Systems*. (AAMRS Study Group, Technical Report 13(1).): Laboratory of Medical Information Science, University of California, San Francisco.
- Hennessy, J.L., Patterson, D.A. (1994). *Computer Architecture, A Quantitative Approach*. (2nd ed.). San Francisco: Morgan Kaufmann.
- Henry (Bakken), S.B., Holzemer, W.L., Randell, C., Hsieh, S.F., Miller, T.J. (1997). Comparison of nursing interventions classification and current procedural terminology codes for categorizing nursing activities. *Image: Journal of Nursing Scholarship*, 29(2):133–138.
- Henry (Bakken), S.B., Holzemer, W.L., Reilly, C.A., Campbell, K.E. (1994). Terms used by nurses to describe patient problems: Can SNOMED III represent nursing concepts in the patient record? *Journal of the American Medical Informatics Association*, 1(1):61–74.

- Henry (Bakken), S.B., Holzemer, W.L., Tallberg, M., Grobe, S. (1995). Informatics: infrastructure for quality assessment and improvement in nursing. *Proceedings of the 5th International Nursing Informatics Symposium (NI94) Post-Conference*, Austin, TX.
- Henry (Bakken), S.B., Mead, C.N. (1997). Nursing classification systems: Necessary but not sufficient for representing “what nurses do” for inclusion in computer-based patient record systems. *Journal of the American Medical Informatics Association*, 4(3):222–232.
- Hersh, W.R. (1991). Evaluation of Meta-1 for a concept-based approach to the automated indexing and retrieval of bibliographic and full-text databases. *Medical Decision Making*, 11 (4 Suppl):S120–S124.
- Hersh, W.R. (1994). Relevance and retrieval evaluation: perspectives from medicine. *Journal of the American Society for Information Science*, 45:201–206.
- Hersh, W.R. (1996). *Information Retrieval: A Health Care Perspective*. New York: Springer-Verlag.
- Hersh, W.R. (1999). “A world of knowledge at your fingertips”: The promise, reality, and future directions of on-line information retrieval. *Academic Medicine*, 74:240–243.
- Hersh, W.R. (2001). Interactivity at the Text Retrieval Conference (TREC). *Information Processing and Management*, 37: 365–366.
- Hersh, W.R. (2003). *Information Retrieval, A Health and Biomedical Perspective (Second Edition)*, New York: Springer-Verlag.
- Hersh, W.R., Brown, K.E., Donohoe, L.C., Campbell, E.M., Horacek, A.E. (1996). CliniWeb: managing clinical information on the World Wide Web. *Journal of the American Medical Informatics Association*, 3:273–280.
- Hersh, W.R., Crabtree, M., et al. (2002). Factors associated with success for searching MEDLINE and applying evidence to answer clinical questions. *Journal of the American Medical Informatics Association*, 9:283–293.
- Hersh, W.R., Elliot, D., et al. (1994). Towards new measures of information retrieval evaluation. *Proceedings of the 18th Annual Symposium on Computer Applications in Medical Care*, Washington, DC. Hanley & Belfus, pp. 895–899.
- Hersh, W.R., Elliot, D.L., Hickam, D.H., Wolf, S.L., Molnar, A., Leichtenstein, C. (1995). Towards new measures of information retrieval evaluation. *Proceedings of the 18th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval*, Seattle, WA, .
- Hersh, W.R., Hickam, D. (1994). Use of a multi-application computer workstation in a clinical setting. *Bulletin of the Medical Library Association*, 82(4):382–389.
- Hersh, W.R., Hickam, D. (1998). How well do physicians use electronic information retrieval systems? A framework for investigation and review of the literature. *Journal of the American Medical Association*, 280: 1347–1352.
- Hersh, W.R., Pentecost, J., Hickam, D. (1996). A task-oriented approach to information retrieval evaluation. *Journal of the American Society for Information Science*, 47:50–56.
- Hersh, W.R. and Rindfleisch, T.C. (2000). Electronic publishing of scholarly communication in the biomedical sciences. *Journal of the American Medical Informatics Association*, 7:324–325.
- Hersh, W.R., Turpin, A., et al. (2000). Do batch and user evaluations give the same results? *Proceedings of the 23rd Annual International ACM SIGIR Conference on Research and Development in Information Retrieval*, Athens, Greece. ACM Press, pp. 17–24.
- Hickam, D.H., Shortliffe, E.H., Bischoff, M.B., Scott, A.C., Jacobs, C.D. (1985). The treatment advice of a computer-based cancer chemotherapy protocol advisor. *Annals of Internal Medicine*, 103(6 Pt 1):928–936.
- Hickam, D.H., Sox, H.C., Sox, C.H. (1985). Systematic bias in recording the history in patients with chest pain. *Journal of Chronic Diseases*, 38:91.
- Hilgard, E.R., Bower, G.H. (1975). *Theories of Learning* (4th ed.). Englewood Cliffs, N.J.: Prentice-Hall.

- Hillestad, R., Bigelow, J., Bower, A., Girosi, F., Meili, R., Scoville, R., Taylor, R. (2005). Can electronic medical record systems transform health care? Potential health benefits, savings, and costs. *Health Affairs* 24:1103–1117.
- Hillman, B.J. (2002). Current clinical trials of the American College of Radiology Imaging Network. *Radiology* 224(3):636–637.
- Hinshaw, K.P., Brinkley, J.F. (1997). Using 3-D shape models to guide segmentation of MR brain images. *Proceedings of the 1997 AMIA Annual Fall Symposium*, Nashville, TN, pp. 469–478.
- Hinshaw, K.P., Poliakov, A.V., Martin, R.F., Moore, E.B., Shapiro, L.G., & Brinkley, J.F. (2002). Shape-based cortical surface segmentation for visualization brain mapping. *Neuroimage*, 16(2), 295–316.
- Hobbs, J.R., Appelt, D.E., Bear, J., Israel, D., Kameyama, M., Stickel, M. et al. (1996). FASTUS: A cascaded finite-state transducer for extracting information from natural-language text. In *Finite State Devices for Natural Language Processing*, Cambridge, MA: MIT Press.
- Hodge, M.H. (1990). History of the TDS medical information system. In B.I. Blum & K. Duncan (ed.), *A History of Medical Informatics*, pp.328–344. New York: ACM Press.
- Hoey, J. (1998). When the physician is the vector. *CMAJ* 159(1):45–46.
- Hoffer, E.P., Barnett, G.O. (1986). Computer-aided instruction in medicine: 16 years of MGH experience. In Salamon R., B. Blum, & M. Jorgensen, (ed.), *MEDINFO 86*. Amsterdam: Elsevier North-Holland.
- Hoffman, C., Rice, D., Sung, H.Y. (1996). Persons with chronic conditions: Their prevalence and costs, *JAMA*, 276,1473–1479.
- Hoffman, R.R. (ed.) (1992). *The Psychology of Expertise: Cognitive Research and Empirical AI*. Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.
- Hoffman, R.R., Schadbolt, N.R., Burton, A.M., Klein, G. (1995). Eliciting knowledge from experts: A methodological analysis. *Organizational Behavior & Human Decision Processes*, 62(2),129–158.
- Hohne, K., Bomans, M., Pommert, A., Riemer, M., Schiers, C., Tiede, U., & Wiebecke, G. (1990). 3-D visualization of tomographic volume data using the generalized voxel model. *The Visual Computer*, 6(1), 28–36.
- Hohne, K.H., Bomans, M., Riemer, M., Schubert, R., Tiede, U., Lierse, W. (1992). A volume-based anatomical atlas. *IEEE Computer Graphics and Applications*, 72–78.
- Hohne, K.H., Pflesser, B., Riemer, M., Schiemann, T., Schubert, R., Tiede, U. (1995). A new representation of knowledge concerning human anatomy and function. *Nature Medicine*, 1(6):506–510.
- Honeyman-Buck, J. (2003). PACS adoption. *Semin Roentgenol.* 38(3):256–269.
- Hopf, HW. (2003). Molecular diagnostics of injury and repair responses in critical illness: What is the future of “monitoring” in the intensive care unit? *Crit Care Med*; 31(8)[Suppl.]:S518–523
- Horii, S.C. (1996). Image acquisition: Sites, technologies and approaches. In Greenes, R.A. & Bauman, R.A. (eds.) *Imaging and information management: computer systems for a changing health care environment. The Radiology Clinics of North America*, 34(3):469–494.
- Horne, P, Saarlans, K, Hinman, A (2000). Costs of immunization registries. Experience from the All Kids Count II Projects. *Am J Prev Med*, 18:262–267.
- Horsky, J., Kaufman, D.R., Oppenheim, M.I., Patel, V.L. (2003). A framework for analyzing the cognitive complexity of computer-assisted clinical ordering. *Journal of Biomedical Informatics*, 36(1-2),4 –22.
- Horsky, J., Kaufman, D.R., Patel, V.L. (2003). The cognitive complexity of a provider order entry interface *Proceedings of the AMIA Annual Fall Symposium*, Washington, DC, pp. 294 –298.
- House, E.R. (1980). *Evaluating with Validity*. Beverly Hills, CA: Sage Publications.
- Hoy, J.D., Hyslop, A.Q. (1995). Care planning as a strategy to manage variation in practice: From care planning to integrated person-based record. *Journal of the American Medical Informatics Association*, 2(4):260–266.

- Hripcsak, G., Austin, J.H., Alderson, P.O., Friedman, C. (2002). Use of natural language processing to translate clinical information from a database of 889,921 chest radiographic reports. *Radiology*, 224(1):157–163.
- Hripcsak, G., Cimino, J.J., Sengupta, S. (1999). WebCIS: Large scale deployment of a Web-based clinical information system. *Proceedings of the Annual AMIA Symposium*, pp. 804–808.
- Hripcsak, G., Ludemann, P., Pryor, T.A., Wigertz, O.B., Clayton, P.D. (1994). Rationale for the Arden syntax. *Computers and Biomedical Research*, 27:291–324.
- Hripcsak, G., Wilcox, A. (2002). Reference standards, judges, and comparison subjects: roles for experts in evaluating system performance. *J Am Med Inform Assoc*; 9(1):1–15.
- Hsu, H.L. (1996). *Interactivity of Human-Computer Interaction and Personal Characteristics in a Hypermedia Learning Environment*. Unpublished doctoral dissertation, Stanford University.
- Huang, H.K. (2003). Enterprise PACS and image distribution. *Comput Med Imaging Graph*, 27 (2-3):241–53
- Hucka, M., Finney, A., Sauro, H.M., et al. (2003). The systems biology markup language (SBML): A medium for representation and exchange of biochemical network models. *Bioinformatics*, 19(4):524–31.
- Hudson, L. (1985). Monitoring of critically ill patients. Conference summary. *Respiratory Care*, 30:628.
- Huff, S.M, Rocha, R.A., McDonald, C.J., DeMoor, G.J., Fiers, T., Bidgood, W.D. Jr., Forrey, A.W., Francis, W.G., Tracy, W.R., Leavelle, D., Stalling, F., Griffin, B., Maloney, P., Leland, D., Charles, L., Hutchins, K., Baenziger, J. (1998). Development of the Logical Observation Identifier Names and Codes (LOINC) vocabulary. *J Am Med Inform Assoc* 5(3):276–292.
- Human Brain Project. (2003). *Home page*. (Accessed 2005 at: <http://www.nimh.nih.gov/neuroinformatics/index.cfm>)
- Humphreys, B.L. (2000). Electronic health record meets digital library: A new environment for achieving an old goal. *Journal of the American Medical Informatics Association*, 7: 444 – 452.
- Humphreys, B.L. (ed.) (1990). *UMLS Knowledge Sources – First Experimental Edition Documentation*. Bethesda, MD: National Library of Medicine.
- Humphreys, B.L., Lindberg, D.A. (1993). The UMLS project: making the conceptual connection between users and the information they need. *Bulletin of the Medical Library Association*, 81(2):170–177.
- Humphreys, B.L., Lindberg, D.A., Schoolman, H.M., Barnett, G.O. (1998). The Unified Medical Language System: An informatics research collaboration. *J Am Med Inform Assoc*. 5(1):1–11.
- Hunt, L.T., Dayhoff, M.O. (1974). Table of abnormal human globins. *Annual of the New York Academy of Science*, 241:722–735.
- Hunt, D.L., Haynes, R.B., Hanna, S.E., Smith, K. (1998). Effects of computer-based clinical decision support systems on physician performance and patient outcomes: A systematic review. *JAMA*; 280:1339–1346.
- Hunter, L. (1993). *Artificial Intelligence and Molecular Biology*. Menlo Park: AAAI Press/MIT Press.
- Hurdal, M.K., Stephenson, K., Bowers, P., Sumners, D.W., Rottenberg, D.A. (2000). Coordinate systems for conformal cerebellar flat maps. *Neuroimage*, 11(5), S467.
- Hussein, R., Engelmann, U., Schroeter, A., Meinzer, H.P. (2004). DICOM structured reporting: Part 2. Problems and challenges in implementation for PACS workstations. *Radiographics*, 24(3):897–909.
- Hutchins, E. (1995). *Cognition in the Wild*. Cambridge, Mass: MIT Press.
- IAIMS (1996). *Proceedings of the 1996 IAIMS Symposium*. Nashville, TN: Vanderbilt University.
- International Anatomical Nomenclature Committee. (1989). *Nomina Anatomica* (6th ed.). Edinburgh: Churchill Livingstone.
- Institute of Medicine (1985). *Assessing Medical Technologies*. Washington, D.C.: National Academy Press.

- Institute of Medicine (1988). *The Future of Public Health*. Washington, DC: National Academy Press.
- Institute of Medicine (1991). *The Computer-Based Patient Record: An Essential Technology for Patient Care*. Washington, DC: National Academy Press.
- Institute of Medicine (1996). *Healthy Communities: New Partnerships for the Future of Public Health*. Washington, DC: National Academy Press.
- Institute of Medicine (1997a). *Improving Health in the Community: A Role for Performance Monitoring*. Washington, DC: National Academy Press.
- Institute of Medicine (1997b). *Managing Managed Care: Quality Improvement in Behavioral Health*. Washington, DC: National Academy Press.
- Institute of Medicine (1997c). *The Computer-Based Patient Record: An Essential Technology for Health Care*. (2nd ed.). Washington, D.C.: National Academy Press.
- Institute of Medicine (2000a). *To Err Is Human: Building a Safer Health Care System*. Washington, DC: National Academy Press.
- Institute of Medicine (2000b). *Calling the Shots — Immunization Finance Policies and Practices*. Washington, DC: National Academy Press.
- Institute of Medicine (2001). *Crossing the Quality Chasm: A New Health System for the Twenty-First Century*. Washington: National Academies Press.
- Institute of Medicine (2002). *Priority Areas for National Action: Transforming Health Care Quality*. Washington DC: National Academies Press.
- Institute of Medicine (2003). *Patient Safety: Achieving a New Standard for Care*. Washington, DC: National Academies Press.
- International Standards Organization (1987). *Information processing systems—Concepts and terminology for the conceptual schema and the information base*. (ISO TR 9007:1987.): International Standards Organization.
- International Standards Organization. (2003). *Integration of a Reference Terminology Model for Nursing* (ISO 18104:2003). International Standards Organization.
- Interstudy (1995). *The Interstudy Competitive Edge, Part II: Industry Report*. Excelsior, Minn.
- Issel-Tarver, L., Christie, K.R., Dolinski, K., Andrada, R., Balakrishnan, R., Ball, C.A., Binkley, G., Dong, S., Dwight, S.S., Fisk, D.G., Harris, M., Schroeder, M., Sethuraman, A., Tse, K., Weng, S., Botstein, D., Cherry, J.M. (2001). *Saccharomyces genome database*. *Methods Enzymol*; 350:329–46.
- Ivers, M.T., Timson, G.F. (1985). The applicability of the VA integrated clinical CORE information system to the needs of other health care providers. *MUG Quarterly*, 14:19–21.
- Jacky, J. (1989). Programmed for disaster. *The Sciences*, 29(5):22–27.
- Jadad, A. (1999). Promoting partnerships: Challenges for the Internet age. *British Medical Journal*, 319:761–764.
- Jain, R. (1991). *The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation, and Modeling*. New York: John Wiley & Sons, Inc.
- Jakobovits, R.M., Modayur, B., Brinkley, J.F. (1996). A Web-based manager for brain mapping data. *Proceedings of the 1996 AMIA Annual Fall Symposium*, Washington, DC, pp. 309–313.
- Jakobovits, R.M., Brinkley, J.F., Rosse, C., Weinberger, E. (2001). Enabling clinicians, researchers, and educators to build custom web-based biomedical information systems. *Proc AMIA Annual Fall Symposium*; pp. 279–283.
- Jakobovits, R.M., Rosse, C., Brinkley, J.F. (2002). An open source toolkit for building biomedical web applications. *J Am Med Info. Ass.*;9(6):557–590.
- Jewett, A.I., Huang, C.C., Ferrin, T.E. (2003). MINRMS: An efficient algorithm for determining protein structure similarity using root-mean-squared-distance. *Bioinformatics*. 19(5):625–34.
- John, B.E. (2003). Information processing and skilled behavior. In J. M. Carroll (ed.), *HCI Models, Theories and Frameworks: Toward a Multidisciplinary Science*. San Francisco, CA: Morgan Kaufmann.

- Johnson, K.A., Becker, J.A. (2001). *The Whole Brain Atlas*. Harvard University. (Accessed 2005 at: <http://www.med.harvard.edu/AANLIB/home.html>)
- Johnson, P. (1983). What kind of expert should a system be? *Journal of Medicine and Philosophy*, 8:77–97.
- Johnson, P.D., Tu, S.W., Booth, N., Sugden, B., Purves, I.N. (2000). Using scenarios in chronic disease management guidelines for primary care. *Proceedings of the AMIA Annual Symposium*, Los Angeles, CA, Hanley & Belfus, Philadelphia.
- Johnson, S.B. (2000). Natural language processing in biomedicine. In: Bronzino JD. *The Handbook of Biomedical Engineering*. Boca Raton, FL: CRC Press, pp. 188–196.
- Johnson, S.B., Friedman, C., Cimino, J.J., Clark, T., Hripcsak, G., Clayton, P.D. (1991). Conceptual data model for a central patient database. *Proceedings of the Fifteenth Symposium on Computer Applications in Medical Care*. Washington, D.C., pp. 381–385.
- Johnston, D., Pan, E., Walker, J., Bates, D.W., Middleton, B. (2003). *The Value of Computerized Provider Order Entry in Ambulatory Settings*. Boston: Center for Information Technology Leadership, Partners HealthCare.
- Johnston, M.C., Langton, K.B., Haynes, R.B., Mathieu, A. (1994). Effects of computer-based clinical decision support systems on clinician performance and patient outcome. A critical appraisal of research. *Annals of Internal Medicine*, 120(2):135–142.
- Jolesz, F.A. (1997). 1996 RSNA Eugene P. Pendergrass New Horizons Lecture. Image-guided procedures and the operating room of the future. *Radiology*, 204(3):601–612.
- Jollis, J.G., Ancukiewicz, M., DeLong, E.R., Pryor, D.B., Muhlbaier, L.H., Mark, D.B. (1993). Discordance of databases designed for claims payment versus clinical information systems. Implications for outcomes research. *Annals of Internal Medicine*, 119(8):844–850.
- Jurafsky, D, Martin, JH. (2000a). *Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition*. New York: Prentice Hall.
- Jystrup R.A., Gross M.J. (1966). Cost of information handling in hospitals. *Health Services Research*, 1(3):235–271.
- Kahle, B. (1997). Preserving the Internet. *Scientific American*, 276(3):82–83.
- Kahn, M.G. (1994). Clinical databases and critical care research. *Critical Care Clinics*, 10(1):37–51.
- Kaiser Family Foundation and Health Research and Educational Trust (2005). *Employer Health Benefits 2005 Annual Survey*. Menlo Park, CA.
- Kalet, I.J., Austin-Seymour, M.M. (1997). The use of medical images in planning and delivery of radiation therapy. *Journal of the American Medical Informatics Association*, 4(5):327–339.
- Kalinski, T., Hofmann, H., Franke, D.S., Roessner, A. (2002). Digital imaging and electronic patient records in pathology using an integrated department information system with PACS. *Pathol Res Pract*, 198(10):679–84.
- Kane, B. Sands, D.Z. (1998). Guidelines for the clinical use of electronic mail with patients. *J Am Med Inform Assoc* 5,104–111.
- Kaplan, B. (1997). Addressing organizational issues into the evaluation of medical systems. *Journal of the American Medical Informatics Association*, 4(2):94–101.
- Kaplan, B., Duchon, D. (1988). Combining qualitative and quantitative methods in information systems research: A case study. *MIS Quarterly*, 4:571–586.
- Karat, C.M. (1994). A business case approach to usability cost justification. In R. G. Bias & D.J. Mayhew (eds.), *Cost Justifying Usability*, pp. 45-70. New York: Academic Press.
- Karplus, M., Weaver, D.L. (1976). Protein-folding dynamics. *Nature*, 260(5550):404–406.
- Kass, B. (2001). Reducing and preventing adverse drug events to decrease hospital costs. *Research in Action, Issue 1*. AHRQ Publication Number 01-0020. (Accessed 2005 at: <http://www.ahrq.gov/qual/aderial/aderia.htm>)

- Kass, M., Witkin, A., Terzopoulos, D. (1987). Snakes: Active contour models. *International Journal of Computer Vision*, 1(4):321–331.
- Kassirer, J.P., Gorry, G.A. (1978). Clinical problem solving: A behavioral analysis. *Annals of Internal Medicine*, 89(2):245–255.
- Kastor, J.A.. (2001). *Mergers of Teaching Hospitals in Boston, New York, and Northern California*. Ann Arbor: University of Michigan Press.
- Kaufmann, A, Meltzer, M, Schmid, G. (1997). The economic impact of a bioterrorist attack: Are prevention and post-attack intervention programs justifiable? *Emerg Infect Dis* 3(2):83–94.
- Kaufman, D.R., Patel, V.L., Hilliman, C., Morin, P.C., Pevzner, J., Weinstock, R., et al. (2003). Usability in the real world: Assessing medical information technologies in the patient's home. *Journal of Biomedical Informatics*. 36(1-2), 45–60.
- Kaufman, D.R., Patel, V.L., Magder, S. (1996). The explanatory role of spontaneously generated analogies in reasoning about physiological concepts. *International Journal of Science Education*, 18(3),369–386.
- Kaushal, R., Shojania, K.G., Bates, D.W. (2003). Effects of computerized physician order entry and clinical decision support systems on medication safety: A systematic review. *Archives of Internal Medicine*, 163(12):1409–16.
- Keen, P.G.W. (1981). Information systems and organizational change. *Communications of the ACM*, 24:24.
- Kennedy, D. (2001). *Internet Brain Segmentation Repository*. Massachusetts General Hospital. (Accessed 2005 at: <http://neuro-www.mgh.harvard.edu/cma/ibsr>)
- Kennelly, R.J., Gardner, R.M. (1997). Perspectives on development of IEEE 1073: The Medical Information Bus (MIB) standard. *International Journal of Clinical Monitoring and Computing*, 14(3):143–149.
- Kenny, N.P. (1997). Does good science make good medicine? Incorporating evidence into practice is complicated by the fact that clinical practice is as much art as science. *CMAJ* 157(1):33–36.
- Kent, W.J. (2003). BLAT – the BLAST-like alignment tool. *Genome Research*. 12(4):656–64.
- Keston, V., Enthoven, A.C. (1996). Total hip replacement: A history of innovations to improve quality while reducing costs. *Stanford University Working Paper Number 1411*: October 29, 1996.
- Keves, B. (1997). *Naked to the Bone: Medical Imaging in the Twentieth Century*. New Brunswick, NJ: Rutgers University Press.
- Khorasani, R., Hanlon, W.B., Fener, E.F., Lester, J.M., Dreyer, K., Seltzer, S.E., Holman, B.L. (1997). Exploiting the Internet and the world wide web for rapid and inexpensive distribution of digital images and radiology reports. Unpublished technical report, Brigham and Women's Hospital.
- Khorasani, R., Lester, J.M., Davis, S.D., Hanlon, W.B., Fener, E.F., Seltzer, S.E., Adams, D.F., Holman, B.L. (1998). Web-based digital radiology teaching file: Facilitating case input at time of interpretation. *AJR American Journal of Roentgenology*, 170(5):1165–1167.
- Kikinis, R., Shenton, M.E., Iosifescu, D.V., McCarley, R.W., Saiviroonporn, P., Hokama, H.H., Robatino, A., Metcalf, D., Wible, C.G., Portas, C.M., Donnino, R., Jolesz, F. (1996). A digital brain atlas for surgical planning, model-driven segmentation, and teaching. *IEEE Trans. Visualization and Computer Graphics*, 2(3), 232–241.
- Kim, D., Constantinou, P.S., Glasgow, E. (1995). *Clinical Anatomy: Interactive Lab Practical*. St. Louis: Mosby-Year Book. CD-ROM., .
- Kimborg, D.Y., Aguirre, G.K. (2002). *A Flexible Architecture for Neuroimaging Data Analysis and Presentation*. (Accessed 2005 at: <http://www.nimh.nih.gov/neuroinformatics/kimberg.cfm>)
- King, W., Proffitt, J., Morrison, L., Piper, J., Lane, D., Seelig, S. (2000). The role of fluorescence in situ hybridization technologies in molecular diagnostics and disease management. *Mol Diagn*, 5(4),309–319.

- Kingsland, L.C., Harbourt, A.M., Syed, E.J., Schuyler, P.L. (1993). Coach: Applying UMLS knowledge sources in an expert searcher environment. *Bulletin of the Medical Library Association*, 81(2):178–183.
- Kintsch, W. (1988). The role of knowledge in discourse comprehension: A construction-integration model. *Psychological Review*, 95(2), 163–182.
- Kirby, M., Miller, N. (1986). MEDLINE searching on Colleague: Reasons for failure or success of untrained users. *Medical Reference Services Quarterly*, 5:17–34.
- Kirkpatrick, D.L. (1994). *Evaluating Training Programs*. San Francisco, CA: Berrett-Koehler Publishers.
- Kittredge, R. J. Lehrberger (eds.) (1982). *Sublanguage: Studies of Language in Restricted Semantic Domains*, New York: De Gruyter.
- Kjems, U., Strother, S.C., Anderson, J.R., Law, I., Hansen, L.K. (1999). Enhancing the multivariate signal of ¹⁵O water PET studies with a new nonlinear neuroanatomical registration algorithm. *IEEE Trans. Med. Imaging*, 18, 301–319.
- Kleinmuntz, B. (1968). *Formal Representation of Human Judgement*. New York: Wiley.
- Kleinmuntz, D.N., Schkade, D.A. (1993). Information displays in decision making. *Psychological Science*, 4, 221–227.
- Knaus, W.A., Draper, E.A., Wagner, D.P., Zimmerman, J.E. (1986). An evaluation of outcome from intensive care in major medical centers. *Annals of Internal Medicine*, 104(3):410–418.
- Knaus, W.A., Wagner, D.P., Lynn, J. (1991). Short-term mortality predictions for critically ill hospitalized adults: Science and ethics. *Science*, 254(5030):389–394.
- Knight, E., Glynn, R., et al. (2000). Failure of evidence-based medicine in the treatment of hypertension in older patients. *Journal of General Internal Medicine*, 15:702–709.
- Koedinger, K.R., Anderson, J.R. (1992). Abstract planning and perceptual chunks. *Cognitive Science*, 14(4), 511–550.
- Kohn, L.T., Corrigan, J.M., Donaldson, M.S. (eds) (1999). *To Err is Human: Building A Safer Health System*, Washington, DC: National Academy Press.
- Kolodner, R.M., Douglas, J.V. (eds) (1997). *Computerizing Large Integrated Health Networks: The VA Success*. New York: Springer.
- Komaroff, A. (1979). The variability and inaccuracy of medical data. *Proceedings of the IEEE*, 67:1196.
- Komaroff, A., Black, W., Flatley, M. (1974). Protocols for physician assistants: Management of diabetes and hypertension. *New England Journal of Medicine*, 290:370–312.
- Koo, D., O'Carroll, P.W., LaVenture, M. (2001). Public health 101 for informaticians. *Journal of the American Medical Informatics Association* 8(6):585–97.
- Kosara, R., Miksch, S. (2002). Visualization methods for data analysis and planning in medical applications. *Int J Med Inf*, 68(1-3), 141–153.
- Koski, E.M., Makivirta, A., Sukuvaara, T., Kari, A. (1995). Clinicians' opinions on alarm limits and urgency of therapeutic responses. *Int J Clin Monit Comput* 12(2):85–88
- Koslow, S.H., Huerta, M.F. (1997). *Neuroinformatics: An Overview of the Human Brain Project*. Mahwah, NJ: Lawrence Erlbaum.
- KPMG Peat Marwick (1996). Health Benefits in 1996. *KPMG Survey of Employer Sponsored Health Benefits*.
- Kuhn, I.M., Wiederhold, G., Rodnick, J.E., Ramsey-Klee, D.M., Benett, S., Beck, D.D. (1984). Automated ambulatory medical record systems in the U.S. In B. Blum (ed.), *Information Systems for Patient Care*, pp.199-217. New York: Springer-Verlag.
- Kuhn, T. (1962). *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press.
- Kulikowski, C.A. (1997). Medical imaging informatics: Challenges of definition and integration. *Journal of the American Medical Informatics Association*, 4(3):252–253.

- Kulikowski, C.A., Jaffe, C.C. (1997). Focus on Imaging Informatics. *Journal of the American Medical Informatics Association*, 4(3).
- Kuperman, G., Gardner, R., Pryor, T.A. (1991). *HELP: A Dynamic Hospital Information System*. New York: Springer-Verlag.
- Kuperman, G.J., Gibson, R.F. (2003). Computer physician order entry: benefits, costs, issues. *Ann Intern Med*. 139(1):31–39.
- Kupiers, B., Kassirer, J. (1984). Causal reasoning in medicine: Analysis of a protocol. *Cognitive Science*, 8:363–385.
- Kurtzke, J.F. (1979). ICD-9: A regression. *American Journal of Epidemiology*, 108(4):383–393.
- Kushniruk, A.W., Kaufman, D.R., Patel, V.L., Levesque, Y., Lottin, P. (1996). Assessment of a computerized patient record system: A cognitive approach to evaluating medical technology. *MD Computing*, 13(5), 406–415.
- Lagoze, C., VandeSompel, H. (2001). The Open Archives Initiative: Building a low-barrier interoperability framework. *Proceedings of the First ACM/IEEE-CS Joint Conference on Digital Libraries*, Roanoke, VA.: ACM Press. 54–62.
- Lancaster, J.L., Woldorff, M.G., Parsons, L.M., Liotti, M., Freitas, C.S., Rainey, L., Kochunov, P.V., Nickerson, D., Mikiten, S.A., Fox, P.T. (2000). Automated Talairach atlas labels for functional brain mapping. *Hum Brain Mapp*, 10(3), 120–131.
- Lander, E.S., Linton, L.M., Birren, B., and colleagues (2001). Initial sequencing and analysis of the human genome. *Nature*. 409(6822):860–921.
- Lange, L.L. (1996). Representation of everyday clinical nursing language in UMLS and SNOMED. *Proceedings of the 1996 AMIA Annual Fall Symposium*, Washington, D.C., pp. 140–144.
- Lantridge, R. (1974). Interactive three-dimensional computer graphics in molecular biology. *Federal Proceedings*, 33(12):2332–2335.
- Lanzola, G., Quaglini, S., Stefanelli, M. (1995). Knowledge-acquisition tools for medical knowledge-based systems. *Methods of Information in Medicine*, 34(1-2):25–39.
- Larkin, J.H., McDermott, J., Simon, D.P., Simon, H.A. (1980). Expert and novice performance in solving physics problems. *Science*, 208,1335–1342.
- Larkin, J.H., Simon, H.A. (1987). Why a diagram is (sometimes) worth ten thousand words. *Cognitive Science*, 11(1), 65–99.
- Lashkari, D.A., DeRisi, J.L., McCusker, J.H., Namath, A.F., Gentile, C., Hwang, S.Y., Brown, P.O., Davis, R.W. (1997). Yeast microarrays for genome wide parallel genetic and gene expression analysis. *Proc Natl Acad Sci*. 94(24):13057–1362.
- Lassila, O., Hendler, J., et al. (2001). The Semantic Web. *Scientific American*, 284(5):34–43.
- Lawrence, S. (2001). Online or invisible? *Nature*, 411: 521.
- Lawrence, S., Giles, C., et al. (1999). Digital libraries and autonomous citation indexing. *IEEE Computer*, 32: 67–71.
- Leape, L.L. & Berwick, D.M. (2005). Five years after “To Err is Human”: What have we learned? *JAMA* 239(19):2384–2390.
- Leatherman, S., Berwick, D., Iles, D., Lewin, L.S., Davidoff, F., Nolan, T., Bisognano, N. (2003). The business case for quality: Case studies and an analysis. *Health Affairs*, 22(2):17–30.
- Le Bihan, D., Mangin, J.F., Poupon, C., Clark, C.A., Pappata, S., Molko, N., Chabriat, H. (2001). Diffusion tensor imaging: concepts and applications. *J. Magnetic Resonance Imaging*, 13(4),534–546.
- Lederberg, J. (1978). Digital communications and the conduct of science: The new literacy. *Proceedings of the IEEE*, 66(11):1314–1319.
- Ledley, R., Lusted L. (1959). Reasoning foundations of medical diagnosis. *Science*, 130:9–21.
- Lee, C.C., Jack, C.R.J., Riederer, S.J. (1996). Use of functional magnetic resonance imaging. *Neurosurgery Clinics of North America*, 7(4):665–683.

- Lee, D.H. (2003). Magnetic resonance angiography. *Adv Neurol*, 92:43–52.
- Leeming, B.W.A., Simon, M. (1982). CLIP: A 1982 update. *Proceedings of the 7th Conference on Computer Applications in Radiology*, Boston, MA, pp. 273–289.
- Lehr, J.L., Lodwick, G.S., Nicholson, B.F., Birznieks, F.B. (1973). Experience with MARS (Missouri Automated Radiology System). *Radiology*, 106(2):289–294.
- Leiner, F., Haux, R. (1996). Systematic planning of clinical documentation. *Methods of Information in Medicine*, 35:25–34.
- Leitch, D. (1989). Who should have their cholesterol measured? What experts in the UK suggest. *British Medical Journal*, 298:1615–1616.
- Lenert, L.A., Michelson, D., Flowers, C., Bergen, M.R. (1995). IMPACT: An object-oriented graphical environment for construction of multimedia patient interviewing software. *Proceedings of the Annual Symposium of Computer Applications in Medical Care*, Washington, DC, pp. 319–323.
- Lenhart, A., Horrigan, J., et al. (2003). *The Ever-Shifting Internet Population: A New Look at Internet Access and the Digital Divide*. Pew Internet & American Life Project. (Accessed 2005 at: <http://www.pewinternet.org/reports/toc.asp?Report=88>)
- Lesgold, A., Rubinson, H., Feltovich, P., Glaser, R., Klopfer, D., Wang, Y. (1988). Expertise in a complex skill: Diagnosing x-ray pictures. In M. T. H. Chi & R. Glaser (eds.), *The Nature of Expertise*, pp. 311–342. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Lesgold, A.M. (1984). Acquiring expertise. In J. R. Anderson & S. M. Kosslyn (eds.), *Tutorials in Learning and Memory: Essays in Honor of Gordon Bower*, pp. 31–60. San Francisco, CA: W.H. Freeman.
- Lesk, M. (1997). *Practical Digital Libraries: Books, Bytes, & Bucks*. San Francisco. Morgan Kaufmann.
- Levit, K.R. et al. (2003). Trends in U.S. health care spending, *Health Affairs*, 22(1): 154–64.
- Levit, K.R., Lazenby, H.C., Braden, B.R., Cowan, C.A., McDonnell, P.A., Sivarajan, L., Stiller, J.M., Won, D.K., Donham, C.S., Long, A.M., Stewart, M.W. (1996). Data view: National health expenditures, 1995. *Health Care Financing Review*, 18:175–214.
- Levitt, M. (1983). Molecular dynamics of native protein. I. Computer simulation of trajectories. *Journal of Molecular Biology*, 168(3):595–617.
- Leymann, F., Roller, D. (2000). *Production Workflow: Concepts and Techniques*; New York: Prentice-Hall.
- Liberman, L., Menell, J.H. (2002). Breast imaging reporting and data system (BI-RADS). *Radiol Clin North Am.* 40(3):409–430.
- Libicki, M.C. (1995). *Information Technology Standards: Quest for the Common Byte*: Digital Press.
- Lichtenbelt, B., Crane, R., Naqvi, S. (1998). *Introduction to Volume Rendering*. Upper Saddle River, N.J.: Prentice Hall.
- Lin, L., Isla, R., Doniz, K., Harkness, H., Vicente, K.J., Doyle, D. J. (1998). Applying human factors to the design of medical equipment: Patient-controlled analgesia. *Journal of Clinical Monitoring & Computing*, 14(4),253–263.
- Lin, L., Vicente, K.J., Doyle, D.J. (2001). Patient safety, potential adverse drug events, and medical device design: a human factors engineering approach. *Journal of Biomedical Informatics.*, 34(4),274–284.
- Lincoln, Y.S., Guba, E.G. (1985). *Naturalistic Inquiry*. Beverly Hills, CA: Sage Publications.
- Lindberg, D.A.B. (1965). Operation of a hospital computer system. *Journal of the American Veterinary Medical Association*, 147(12):1541–1544.
- Lindberg, D.A.B., Humphreys, B.L., McCray, A.T. (1993). The Unified Medical Language System. *Methods of Information in Medicine*, 32(4):281–291.
- Lipton, E., Johnson, K (2001): The Anthrax Trail; Tracking Bioterror's Tangled Course. *New York Times*, Section A, p. 1, 12/26/2001.

- Lorensen, W.E., Cline, H.E. (1987). Marching cubes: A high resolution 3-D surface construction algorithm. *ACM Computer Graphics*, 21(4):163–169.
- Lorenzi, N.M., Riley, R.T., Blyth, A.J., Southon, G., Dixon, B.J. (1997). Antecedents of the people and organizational aspects of medical informatics. *Journal of the American Medical Informatics Association*, 4(2):79–93.
- Lou, S.L., Huang, H.K., Arenson, R.L. (1996). Workstation design: Image manipulation, image set handling, and display issues. In Greenes, R.A. & Bauman, R.A. (eds.) *Imaging and information management: computer systems for a changing health care environment. The Radiology Clinics of North America*, 34(3):525–544.
- Lowe, H.J., Barnett, G.O. (1994). Understanding and using the medical subject headings (MeSH) vocabulary to perform literature searches. *Journal of the American Medical Association*, 271(14):1103–1108.
- Lusignan, S.D., Stephens, P.N., Adal, N., Majeed, A. (2002) Does feedback improve the quality of computerized medical records in primary care. *Journal of American Medical Informatics Association*, 9,395– 401.
- Lussier, Y, Shagina, L, Friedman, C. (2001). Automating SNOMED coding using medical language understanding: A feasibility study. *Proceedings of the AMIA Annual Symposium*, pp. 418– 422. Phila: Hanley&Belfus.
- Lyon Jr., H.C., Healy, J.C., Bell, J.R., O'Donnell, J.F., Shultz, E.K., Moore-West, M., Wigton, R.S., Hirai, F., Beck, J.R. (1992). PlanAlyzer: An interactive computer-assisted program to teach clinical problem solving in diagnosing anemia and coronary artery disease. *Academic Medicine*, 67(12):821–828.
- Maas, M.L., Johnson, M., Moorhead, S. (1996). Classifying nursing-sensitive patient outcomes. *Image: Journal of Nursing Scholarship*, 28(4):295–301.
- Macklin, R. (1992). Privacy and control of genetic information. In Annas G.J., Elias S. (eds.), *Gene Mapping: Using Law and Ethics as Guides*. New York: Oxford University Press.
- Mahon, BE, Rosenman, MB, Kleiman, MB. (2001). Maternal and infant use of erythromycin and other macrolide antibiotics as risk factors for infantile hypertrophic pyloric stenosis. *J Pediat*, 139(3):380–384.
- Major, K., Shabot, M.M., Cunneen, S. (2002). Wireless clinical alerts and patient outcomes in the surgical intensive care unit. *Am Surg*. 68(12):1057–60.
- Malcolm, S., Goodship, J. (eds.) (2001). *Genotype to Phenotype* (2nd Edition). BIOS Scientific Publishers Ltd.
- Malet, G., Munoz, F., et al. (1999). A model for enhancing Internet medical document retrieval with “medical core metadata”. *Journal of the American Medical Informatics Association*, 6:183–208.
- Maloney Jr., J. (1968). The trouble with patient monitoring. *Annals of Surgery*, 168(4):605–619.
- Managed Care Trends Digest (2000). *Managed Care Digest Series 2000*,. Parsippany, NJ: Aventis Pharmaceuticals, Inc.
- Manning, C.D., Schütze, H. (1999). *Foundations of Statistical Natural Language Processing*. Cambridge: MIT Press.
- Mant, J., Hicks, N. (1995). Detecting differences in quality of care: The sensitivity of measures of process and outcome in treating acute myocardial infarction. *British Medical Journal*, 311(7008):793–796.
- Margulies, S.I., Wheeler, P.S. (1972). Development of an automated reporting system. *Proceedings of the Conference on Computer Applications in Radiology*, Columbia, MO, pp. 423– 440.
- Maroto, M., Reshef, R., Munsterberg, A.E., Koester, S., Goulding, M., Lassar, A.B. (1997). Ectopic Pax-3 activates MyoD and Myf-5 expression in embryonic mesoderm and neural tissue. *Cell*, 89:139– 48.
- Marrone, T.J., Briggs, J.M., McCammon, J.A. (1997). Structure-based drug design: Computational advances. *Annual Review of Pharmacology and Toxicology*, 37:71–90.

- Marshall, E. (1996). Hot property: biologists who compute [news]. *Science*, 272(5269):1730–1732.
- Martin, K.S., Scheet, N.J. (1992). *The Omaha System: Applications for Community Health Nursing*. Philadelphia: WB Saunders.
- Martin, K.S., Scheet, N.J. (eds.) (1995). *The Omaha System: Nursing diagnoses, Interventions, and Client Outcomes*. Washington, D.C.: American Nurses Publishing.
- Martin, R.F., Bowden, D.M. (2001). *Primate Brain Maps: Structure of the Macaque Brain*. New York: Elsevier Science.
- Martin, R.F., Mejino, J.L.V., Bowden, D.M., Brinkley, J.F., Rosse, C. (2001). Foundational model of neuroanatomy: Implications for the Human Brain Project, *Proc AMIA Annu Fall Symp*, pp. 438–442. Washington, DC.
- Martin, R.F., Poliakov, A.V., Mulligan, K.A., Corina, D.P., Ojemann, G.A., Brinkley, J.F. (2000). Multi-patient mapping of language sites on 3-D brain models. *Neuroimage* (Human Brain Mapping Annual Meeting, June 12–16), 11(5),S534.
- Massoud, T.F., Gambhir, S.S. (2003). Molecular imaging in living subjects: seeing fundamental biological processes in a new light. *Genes and Development*, 17,545–580.
- Masys, D.R. (1992). An evaluation of the source selection elements of the prototype UMLS information sources map. *Proceedings of the 16th Annual Symposium on Computer Applications in Medical Care*, Baltimore, MD, pp. 295–298.
- Masys, D.R. (2001). Knowledge Management: Keeping Up with the Growing Knowledge. *Speech given at the IOM Annual Meeting 2001*. (Accessed 2005 at: <http://www.iom.edu/subpage.asp?id=7774>)
- Mayes, R.T., Draper, S.W., McGregor, A.M., Oatley, K. (1988). Information flow in a user interface: The effect of experience of and context on the recall of MacWrite screens. In D. M. Jones & R. Winder (eds.), *People and Computers IV*, pp. 257–289. Cambridge, England: Cambridge University Press.
- Mazziotta, J., Toga, A., Evans, A., Fox, P., et al. (2001). A four-dimensional probabilistic atlas of the human brain. *J Am Med Inform Ass*, 8(5), 401–430.
- McAlister, F.A., Laupacis, A., Teo, K.K., Hamilton, P.G., Montague, T.J. (1997). A survey of clinician attitudes and management practices in hypertension. *J Hum Hypertens*, 11(7), 413–419.
- McAlister, F.A., Teo, K.K., Lewanczuk, R.Z., Wells, G., Montague, T.J. (1997). Contemporary practice patterns on the management of newly diagnosed hypertension. *Canadian Medical Association Journal*, 157(1), 23–30.
- McCloskey, J.C., Bulechek, G.M. (1996). *Nursing Interventions Classification*. (2nd ed.). St. Louis: C.V. Mosby.
- McCormick, K.A., Lang, N., Zielstorff, R., Milholland, D.K., Saba, V., Jacox, A. (1994). Toward standard classification schemes for nursing language: Recommendations of the American Nurses Association Steering Committee on Databases to Support Clinical Nursing Practice. *Journal of the American Medical Informatics Association*, 1(6):421–427.
- McCray, A., Gallagher, M. (2001). Principles for digital library development. *Communications of the ACM*, 44:49–54.
- McCray, A.T., Miller, R.A. (1998). Focus on the Unified Medical Language System. *Journal of the American Medical Informatics Association*, 5(1):1–138.
- McDaniel, A.M. (1997). Developing and testing a prototype patient care database. *Computers in Nursing*, 15(3):129–136.
- McDonald, C.J. (1973). Computer applications to ambulatory care, *Proceedings of the IEEE Conference on Systems, Man, and Cybernetics*. Boston, MA.
- McDonald, C.J. (1976). Protocol-based computer reminders, the quality of care and the non-perfectibility of man. *New England Journal of Medicine*, 295(24):1351–1355.
- McDonald, C.J. (1984). The search for national standards for medical data exchange. *MD Computing*, 1(1):3–4.

- McDonald, C.J. (ed.) (1987). *Tutorials (M.D. Computing: Benchmark Papers)*. New York: Springer-Verlag.
- McDonald, C.J. (1988). Computer-stored medical record systems. *M.D. Computing*, 5(5):1–62.
- McDonald, C.J. (1997). The barriers to electronic medical record systems and how to overcome them. *Journal of the American Medical Informatics Association*, 4(3):213–221.
- McDonald, C.J., Bhargava, B., Jeris, D.W. (1975). A clinical information system (CIS) for ambulatory care. *Proc AFIPS Natl Comput Conf*, Anaheim, California.
- McDonald, C.J., Dexter, P., Schadow, G., Chueh, H.G., Abernathy, G., Hook, J., Blevins, L., Overhage, J.M., Berman, J.J. (2005). SPIN Query tools for de-identified research on a humongous database. *Proceedings AMIA Annu Symp*, pp. 515–519.
- McDonald, C.J., Huff, S.M., Suico, J.G., Hill, G., Leavelle, D., Aller, R., Forrey, A., Mercer, K., DeMoor, G., Hook, J., Williams, W., Case, J., Maloney, P. (2003). LOINC, a universal standard for identifying laboratory observations: A 5-year update. *Clinical Chemistry*, 49(4):624–633.
- McDonald, C.J., Hui, S.L., Smith, D.M., Tierney, W.M., Cohen, S.J., Weinberger, M., McCabe, G.P. (1984). Reminders to physicians from an introspective computer medical record. A two year randomized trial. *Annals of Internal Medicine*, 100(1):130–138.
- McDonald, C.J., Overhage, J.M., Dexter, P., Takesue, B.Y., Dwyer, D.M. (1997). A framework for capturing clinical data sets from computerized sources. *Annals of Internal Medicine*, 127(8):675–682.
- McDonald, C.J., Overhage, J.M., Tierney, W.M., et al. (1999). The Regenstrief Medical Record System: A quarter century experience. *Int J Med Inf*. 54(3):225–53.
- McDonald, C.J., Overhage, J.M., Barnes, M., Schadow, G., Blevins, L., Dexter, P.R., Mamlin, B., and the INPC management committee (2005). The Indiana network for patient care: A working local health information infrastructure. *Health Aff (Millwood)*. 24(5):1214–1220.
- McDonald, C.J., Tierney, W.M. (1986a). Research uses of computer-stored practice records in general medicine. *Journal of General Internal Medicine*, 1(4 supplement):S19–S24.
- McDonald, C.J., Tierney, W.M. (1986b). The medical gopher: A microcomputer system to help find, organize and decide about patient data. *The Western Journal of Medicine*, 145(6):823–829.
- McDonald, C.J., Tierney, W.M., Overhage, J.M., Martin, D.K., Wilson, G.A. (1992). The Regenstrief Medical Record System: 20 years of experience in hospitals, clinics, and neighborhood health centers. *MD Computing*, 9(4):206–217.
- McDonald, C.J., Schadow, G., Barnes, M., Dexter, P., Overhage, J.M., Mamlin, B., McCoy, J.M. (2003). Open Source software in medical informatics: Why, how and what. *Int J Med Inform*, 69:175–184.
- McDonald, C.J., Wiederhold, G., Simborg, D., Hammond, W.E., Jelovsek, F., Schneider, K. (1984). A discussion of the draft proposal for data exchange standards for clinical laboratory results. *Proceedings of the 8th Annual Symposium on Computer Applications in Medical Care*, pp. 406–413.
- MacDonald, D. (1993). *Register: McConnel Brain Imaging Center*, Montreal Neurological Institute.
- MacDonald, D., Kabani, N., Avis, D., Evans, A. C. (2000). Automated 3-D extraction of inner and outer surfaces of cerebral cortex from MRI. *Neuroimage*, 12(3),340–356.
- McFarland, G.K., McFarlane, E.A. (1993). *Nursing Diangosis & Intervention: Planning for Patient Care*. (2nd ed.). St. Louis: Mosby.
- McGlynn, E.A., Asch, S.M., Adams, J. et al (2003): The quality of health care delivered to adults in the United States. *NEJM* 348:2635–2645.
- McGrath, J.C., Wagner, W.H., Shabot, M.M. (1996). When is ICU care warranted after carotid endarterectomy? *The American Surgeon*, 62(10):811–814.
- McIntosh, N. (2002). Intensive care monitoring: Past, present, future. *Clin Med*, 2(4):349–355

- McKibbin, K., Haynes, R., et al. (1990). How good are clinical MEDLINE searches? A comparative study of clinical end-user and librarian searches. *Computers and Biomedical Research*, 23(6):583–593.
- McKinin, E.J., Sievert, M.E., Johnson, E.D., Mitchell, J.A. (1991). The Medline/full-text research project. *Journal of the American Society for Information Science*, 42:297–307.
- McKnight, L., Wilcox, AB, Hripcsak, G. (2002). The effect of sample size and disease prevalence on supervised machine learning of narrative data. *Proceedings of the AMIA Annual Symp*, pp. 519–522.
- McLaughlin, P.J., Dayhoff, M.D. (1970). Eukaryotes versus prokaryotes: An estimate of evolutionary distance. *Science*, 168(938):1469–1471.
- McNeer, J.F., Wallace, A.G., Wagner, G.S., Starmer, C.F., Rosati, R.A. (1975). The course of acute myocardial infarction: Feasibility of early discharge of the uncomplicated patient. *Circulation*, 51:410–413.
- McPhee, S.J., Bird, J.A., Fordham, D., Rodnick, J.E., Osborn, E.H. (1991). Promoting cancer prevention activities by primary care physicians: results of a randomized, controlled trial. *Journal of the American Medical Association*, 266(4):538–544.
- Medicare Board of Trustees (1996). *1996 Annual Report of the Board of Trustees of the Federal Hospital Insurance Trust Fund and of the Federal Supplementary Medical Insurance Trust Fund*. Washington, DC.
- Meek, J. (2001). Science world in revolt at power of the journal owners. *The Guardian*.
- Mehta, T.S., Raza, S., Baum, J.K. (2000). Use of Doppler ultrasound in the evaluation of breast carcinoma. *Semin Ultrasound CT MR*, 21(4):297–307.
- Meigs, J., Barry, M., Oesterling, J., Jacobsen, S. (1996). Interpreting results of prostate-specific antigen testing for early detection of prostate cancer. *Journal of General Internal Medicine*, 11(9):505–512.
- Mejino, J.L.V., Noy, N.F., Musen, M.A., Brinkley, J.F., Rosse, C. (2001). Representation of structural relationships in the foundational model of anatomy, *Proceedings of the AMIA Fall Symposium*, p. 973. Washington, DC.
- Melton III, L.J. (1996). History of the Rochester Epidemiology Project. *Mayo Clin Proc*; 71: 266–274.
- Michaelis, J., Wellek, S., Willems, J.L. (1990). Reference standards for software evaluation. *Methods of Information in Medicine*, 29(4):289–297.
- Michel, A., Zorb, L., Dudeck, J. (1996). Designing a low-cost bedside workstation for intensive care units. *Proceedings of the AMIA Annual Fall Symposium*, Washington, DC, pp. 777–781.
- Miettinen, O.S. (1998). Evidence in medicine: Invited commentary. *CMAJ* 158(2):215–221.
- Miksch, S., Shahar, Y., Johnson, P. (1997). Asbru: A task-specific, intention-based, and time-oriented language for representing skeletal plans. *Proceedings of the Seventh Workshop on Knowledge Engineering Methods and Languages (KEML-97)* (Milton Keynes, UK).
- Miles, W.D (1982). *A History of the National Library of Medicine: The Nation's Treasury of Medical Knowledge*. Bethesda, MD: U.S. Department of Health and Human Services.
- Millenson, M. (1997) *Demanding Medical Evidence: Doctors and Accountability in the Information Age*, Chicago: University of Chicago Press.
- Miller, E. (1998). An introduction to the Resource Description Framework. *D-Lib Magazine*.
- Miller, G.A., Galanter, E., Pribram, K.H. (1986). *Plans and the Structure of Behavior*. New York: Adams-Bannister-Cox.
- Miller, N., Lacroix, E., et al. (2000). MEDLINEplus: Building and maintaining the National Library of Medicine's consumer health Web service. *Bulletin of the Medical Library Association*, 88:11–17.
- Miller, P.L. (1986). *Expert Critiquing Systems: Practice-Based Medical Consultation by Computer*. New York: Springer-Verlag.

- Miller, P.L. (1988). *Selected Topics in Medical Artificial Intelligence*. New York: Springer-Verlag.
- Miller, P.L., Frawley SJ, Sayward FG (2001). Exploring the utility of demographic data and vaccination history data in the deduplication of immunization registry patient records. *J Biomed Inform*, 34(1):37–50.
- Miller, R.A., Masarie, F. (1990). The demise of the Greek oracle model for medical diagnosis systems. *Methods of Information in Medicine*, 29:1–2.
- Miller, R.A., Pople Jr., H., Meyers, J. (1982). INTERNIST-1: An experimental computer-based diagnostic consultant for general internal medicine. *New England Journal of Medicine*, 307:468–476.
- Miller, R., Schaffner, K., Meisel, A. (1985). Ethical and legal issues related to the use of computer programs in clinical medicine. *Annals of Internal Medicine*, 102(4):529–537.
- Miller, R.A. (1989). Legal issues related to medical decision support systems. *International Journal of Clinical Monitoring and Computing*, 6:75–80.
- Miller, R.A. (1990). Why the standard view is standard: people, not machines, understand patients' problems. *Journal of Medicine and Philosophy*, 15(6):581–591.
- Miller, R.A., Gardner, R.M. (1997a). Summary recommendations for responsible monitoring and regulation of clinical software systems. *Annals of Internal Medicine*, 127(9):842–845.
- Miller, R.A., Gardner, R.M. (1997b). Recommendations for responsible monitoring and regulation of clinical software systems. *Journal of the American Medical Informatics Association*, 4(6):442–457.
- Miller, R.A., Gieszczykiewicz F.M., Vries J.K., Cooper G.F. (1992). CHARTLINE: Providing bibliographic references relevant to patient charts using the UMLS Metathesaurus knowledge sources. *Proceedings of the 16th Annual Symposium on Computer Applications in Medical Care*, Baltimore, MD, pp. 86–90.
- Miller, R.A., Goodman, K.W. (1998). Ethical challenges in the use of decision-support software in clinical practice. In Goodman K.W. (ed.), *Ethics, Computing, and Medicine: Informatics and the Transformation of Health Care*. Cambridge: Cambridge University Press.
- Miller, R.A., McNeil, M.A., Challinor, S.M., Masarie Jr., F.E., Myers, J.D. (1986). The INTERNIST-1/Quick Medical Reference project: Status report. *Western Journal of Medicine*, 145(6):816–822.
- Modayur, B., Portero, J., Ojemann, G., Maravilla, K., Brinkley, J. (1997). Visualization-based mapping of language function in the brain. *Neuroimage*, 6(4):245–258.
- Mohr, D.N., Offord, K.P., Owen, R.A., Melton, L.J. (1986). Asymptomatic microhematuria and urologic disease. A population-based study. *Journal of the American Medical Association*, 256(2):224–229.
- Morris, A.H. (2003). Treatment algorithms and protocolized care. *Curr Opin Crit Care* 9:236–240
- Morris, A.H. (2001). Rational use of computerized protocols in the intensive care unit. *Crit Care*, 5(5):249–254
- Mortensen, R.A., Nielsen, G.H. (1996). *International Classification of Nursing Practice (Version 0.2)*. Geneva, Switzerland: International Council of Nursing.
- Moses, L.E., Littenberg, B., Shapiro, D. (1993). Combining independent studies of a diagnostic test into a summary ROC curve: Data-analytic approaches and some additional considerations. *Statistics in Medicine*, 12(4):1293–1316.
- Muller, H., Michoux, N., Bandon, D., Geissbuhler, A. (2004). A review of content-based image retrieval systems in medical applications: Clinical benefits and future directions. *Int J Med Inform*. 73(1):1–23.
- Mulrow, C.D. (1987). The medical review article: State of the science. *Annals of Internal Medicine*, 106:485–488.
- Mulrow, C., Cook, D., et al. (1997). Systematic reviews: Critical links in the great chain of evidence. *Annals of Internal Medicine*, 126: 389–391.

- Munnecke, T., Kuhn, I. (1989). Large-scale portability of hospital information system software within the Veterans Administration. In H. Orthner and B. Blum (ed.), *Implementing Health Care Information Systems*. New York: Springer-Verlag.
- Murphy, P. (1994). Reading ability of parents compared with reading level of pediatric patient education materials. *Pediatrics*, 93: 460–468.
- Musen M.A. (1993). An overview of knowledge acquisition. In David J.M., Krivine J.P., Simmons R. (eds.), *Second Generation Expert Systems*, pp.415-438. Berlin: Springer-Verlag.
- Musen, M.A. (1997). Modeling for decision support. In van Bommel, J., Musen, M. (eds.), *Handbook of Medical Informatics*, pp.431–448. Heidelberg: Springer-Verlag.
- Musen, M.A.. (1998). Domain ontologies in software engineering: Use of PROTÉGÉ with the EON architecture. *Methods of Information in Medicine*, 37(4-5):540–550.
- Musen, M.A., Carlson, R.W., Fagan, L.M., Deresinski S.C. (1992). T-HELPER: Automated support for community-based clinical research. *Proceedings of the 16th Annual Symposium on Computer Applications in Medical Care*, Baltimore, MD, pp. 719–723.
- Musen, M.A., Fagan, L.M., Combs, D.M., Shortliffe, E.H. (1987). Use of a domain model to drive an interactive knowledge-editing tool. *International Journal of Man-Machine Studies*, 26(1):105–121.
- Musen, M.A., Gennari, J.H., Eriksson, H., Tu, S.W., Puerta, A.R. (1995). PROTÉGÉ-II: Computer support for development of intelligent systems from libraries of components. *Proceedings of the MEDINFO 1995*, Vancouver, British Columbia, pp. 766–770.
- Musen, M.A., Tu, S.W., Das, A.K., Shahar, Y. (1996). EON: A component-based approach to automation of protocol-directed therapy. *Journal of the American Medical Informatics Association*, 3(6):367–388.
- Mutalik, P.G., Deshpande, A., Nadkarni, P.M. (2001). Use of general-purpose negation detection to augment concept indexing of medical documents: A quantitative study using the UMLS. *J Am Med Inform Assoc*; 8(6):598–609.
- Mynatt, B., Leventhal, L., et al. (1992). Hypertext or book: Which is better for answering questions? *Proceedings of Computer-Human Interface 92*, pp.19–25.
- Nadkarni, P, Chen, R, Brandt, C. (2001). UMLS concept indexing for production databases: A feasibility study. *J Am Med Inform Assoc*; 8(1):80–91.
- Napoli, M., Nanni, M., Cimarra, S., Crisafulli, L., Campioni, P., Marano, P. (2003). Picture archiving and communication in radiology. *Rays*, 28(1):73–81.
- National Committee for Quality Assurance (1997). *HEDIS 3.0*. Washington, DC: National Committee for Quality Assurance.
- National Committee on Vital and Health Statistics (2000). NCVHS Report to the Secretary on Uniform Standards for Patient Medical Record Information. *NCVHS Reports and Recommendations*. (Accessed 2005 at: <http://www.ncvhs.hhs.gov/hipaa000706.pdf>)
- National Committee on Vital and Health Statistics (2001). Information for Health: A Strategy for Building the National Health Information Infrastructure. *NCVHS Reports and Recommendations*. (Accessed 2005 at: <http://www.ncvhs.hhs.gov/nhiilayo.pdf>)
- National Council for Prescription Drug Programs (1994). *Data Dictionary*.
- National Equipment Manufacturers Association (NEMA) (2004). *DICOM 3.0 Specification*. <http://www.nema.org/prod/med/dicom.cfm>.
- National League for Nursing (1987). *Guidelines for Basic Computer Education in Nursing*. New York: National League for Nursing.
- National Library of Medicine. (1999, updated annually). *Medical Subject Headings -Annotated Alphabetic List*. Bethesda, MD: U.S. Department of Health and Human Services, Public Health Service.

- National Priority Expert Panel on Nursing Informatics (1993). *Nursing Informatics: Enhancing Patient Care*. Bethesda, MD: U.S. Department of Health and Human Services, U.S. Public Health Service, National Institutes of Health.
- National Research Council (1997). *For the Record: Protecting Electronic Health Information*. Washington, D.C.: National Academy Press.
- National Research Council (2001). *Networking Health: Prescriptions for the Internet*. Washington, DC: National Academy Press.
- National Vaccine Advisory Committee (1999). *Development of Community- and State-Based Immunization Registries*. (Accessed 2005 at: <http://www.cdc.gov/nip/registry/nvac.htm>)
- Nease Jr, R.F., Kneeland, T., O'Connor, G.T., Sumner, W., Lumpkins, C., Shaw, L., Pryor, D., Sox, H.C. (1995). Variation in patient utilities for the outcomes of the management of chronic stable angina. Implications for clinical practice guidelines. *Journal of the American Medical Association*, 273(15):1185–1190.
- Nease Jr, R.F., Owens, D.K. (1994). A method for estimating the cost-effectiveness of incorporating patient preferences into practice guidelines. *Medical Decision Making*, 14(4):382–92.
- Nease Jr., R.F., Owens, D.K. (1997). Use of influence diagrams to structure medical decisions. *Medical Decision Making*, 17(13):263–275.
- Nease Jr., R. F., Tsai, R., Hynes, L.H., Littenberg, B. (1996). Automated utility assessment of global health. *Quality of Life Research*, 5(1):175–182.
- Needleman, S.B., Wunsch, C.D. (1970). A general method applicable to the search for similarities in the amino acid sequence of two proteins. *Journal of Molecular Biology*, 48(3):443–453.
- Neisser, U. (1967). *Cognitive Psychology*. New York,: Appleton-Century-Crofts.
- Nelson, S.J., Brown, S.H., Erlbaum, M.S., Olson, N., Powell, T., Carlsen, B., Carter, J., Tuttle, M.S., Hole, W.T.(2002) A semantic normal form for clinical drugs in the UMLS: Early experience with the VANDF. *Proceedings of the AMIA Fall Symposium*; pp 557–561.
- Newell, A. (1990). *Unified Theories of Cognition*. Cambridge, Mass.: Harvard University Press.
- Newell, A., Simon, H.A. (1972). *Human Problem Solving*. Englewood Cliffs, N.J.: Prentice-Hall.
- Newhouse, J. (1993) *Free for All? Lessons from the Rand Health Insurance Experiment*, Cambridge, MA: Harvard University Press.
- New York Academy of Medicine (1961). *Standard Nomenclature of Diseases and Operations*. (5th ed.). New York: McGraw-Hill.
- Nguyen, J.H., Shahar, Y., Tu, S.W., Das, A.K., Musen, M.A. (1997). A temporal database mediator for protocol-based decision support. *Proceedings of the AMIA Annual Fall Symposium*, Nashville, TN, pp. 298–302.
- NHS Centre for Coding and Classification (1994a). *Read Codes, Version 3*. (April ed.). London: NHS Management Executive, Department of Health.
- NHS Centre for Coding and Classification (1994b). *Read Codes and the Terms Projects: A Brief Guide*. (April ed.). Leicestershire, Great Britain: NHS Management Executive, Department of Health.
- Nielsen, G.H., Mortensen, R.A. (1996). The architecture for an International Classification of Nursing Practice (ICNP). *International Nursing Review*, 43(6):175–182.
- Nielsen, J. (1993). *Usability Engineering*. Boston: Academic Press.
- Nielsen, J. (1994). Heuristic evaluation. In J. Nielsen & R. L. Mack (eds.), *Usability Inspection Methods*, pp. 25–62. New York: Wiley & Sons, Inc.
- Norman, D.A. (1986). Cognitive engineering. In D. A. Norman & S. W. Draper (eds.), *User Centered System Design: New Perspectives on Human-Computer Interaction*, pp. 31–61. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Norman, D.A. (1988). *The Psychology of Everyday Things*. New York: Basic Books.

- Norman, D.A. (1993). *Things That Make Us Smart: Defending Human Attributes in the Age of the Machine*. Reading, Mass.: Addison-Wesley Pub. Co.
- Norman, F. (1996). Organizing medical networked information: OMNI. *Medical Informatics*, 23: 43–51.
- O'Carroll, P.W., Friede, A., Noji, E.K., Lillebridge, S.R., Fries, D.J., Atchison, C.G. (1995). The rapid implementation of a statewide emergency health information system during the 1993 Iowa flood. *American Journal of Public Health*, 85(4):564–567.
- O'Carroll, P.W., Yasnoff, W.A., Ward, M.E., Ripp, L.H., Martin, E.L. (eds.) (2003). *Public Health Informatics and Information Systems*. New York: Springer-Verlag.
- O'Connell, E.M., Teich, J.M., Pedraza, L.A., Thomas, D. (1996). A comprehensive inpatient discharge system. *Proceedings of the AMIA Annual Fall Symposium*, Washington, D.C., pp. 699-703.
- O'Donnell-Maloney, M.J., Little, D.P. (1996). Microfabrication and array technologies for DNA sequencing and diagnostics. *Genetic Analysis*, 13(6):151–157.
- Office of Technology Assessment (OTA) (1980). *The Implications of Cost-Effectiveness Analysis of Medical Technology*. Washington D.C.: Congress of the United States, U.S. Government Printing Office.
- Ohno-Machado, L., Gennari, J.H., Murphy, S.N., et al. (1998). The guideline interchange format: A model for representing guidelines. *Journal of the American Medical Informatics Association*, 5:357–72.
- Ohta, T., Tateisi, Y., Mima, H., Tsujii, J. (2002). GENIA Corpus: An annotated research abstract corpus in molecular biology domain. *Proceedings of the Human Language Technology Conference (HLT 2002)*, pp. 73–77.
- Ojemann, G., Ojemann, J., Lettich, E., Berger, M. (1989). Cortical language localization in left, dominant hemisphere: an electrical stimulation mapping investigation in 117 patients. *J. Neurosurgery*, 71, 316–326.
- Oldendorf, W.H., Oldendorf Jr., W.H. (1991). *MRI Primer*. New York: Raven Press.
- Oniki, T.A., Clemmer, T.P., Pryor, T.A. (2003). The effect of computer-generated reminders on charting deficiencies in the ICU. *Journal of the American Medical Informatics Association*, 10:177–187
- Ono, M.S., Kubik, S., Abernathy, C.D. (1990). *Atlas of the Cerebral Sulci*. New York: Thieme Medical Publishers.
- Organization for Human Brain Mapping. (2001). *Proceedings of the Annual Conference on Human Brain Mapping*. Brighton, United Kingdom.
- Orthner, H.F., Blum, B.I. (eds.) (1989). *Implementing Health Care Information Systems*. New York: Springer-Verlag.
- Osheroff, J. (ed.) (1995). *Computers in Clinical Practice. Managing Patients, Information, and Communication*. Philadelphia, PA: American College of Physicians.
- O'Sullivan, J., Franco, C., Fuchs, B., Lyke, B., Price, R., Swendiman, K. (1997). *Medicare Provisions in the Balanced Budget Act of 1997*. Congressional Research Service Report for Congress BBA 97, P.L. 105–33.
- Overhage, J.M. (ed.) (1998). *Proceedings of the Fourth Annual Nicholas E. Davies CPR Recognition Symposium*. Schaumburg, IL: Computer-based Patient Record Institute.
- Overhage, J.M. (2002). Personal Communication.
- Overhage, J.M., Dexter, P.R., Perkins, S.M., Cordell, W.H., McGoff, J., McGrath, R., McDonald, C.J. (2002). A randomized, controlled trial of clinical information shared from another institution. *Ann Emerg Med*; 39(1):14–23.
- Overhage, J.M., Suico, J., McDonald, C.J. (2001). Electronic laboratory reporting: barriers, solutions and findings. *J Public Health Manag Prac*; 7(6):60–6.
- Owens, D., Harris, R., Scott, P., Nease Jr., R.F. (1995). Screening surgeons for HIV infection: A cost-effectiveness analysis. *Annals of Internal Medicine*, 122(9):641–652.

- Owens, D.K. (1998a). Patient preferences and the development of practice guidelines. *Spine*, 23(9):1073–1079.
- Owens D.K. (1998b). Interpretation of cost-effectiveness analyses. *Journal of General Internal Medicine*, 13(10):716–717.
- Owens, D.K., Holodniy, M., Garber, A.M., Scott, J., Sonnad, S., Moses, L., Kinoshian, B., Schwartz, J.S. (1996). The polymerase chain reaction for the diagnosis of HIV infection in adults: A meta-analysis with recommendations for clinical practice and study design. *Annals of Internal Medicine*, 124(9):803–15.
- Owens, D.K., Holodniy, M., McDonald, T.W., Scott, J., Sonnad, S. (1996). A meta-analytic evaluation of the polymerase chain reaction (PCR) for diagnosis of human immunodeficiency virus (HIV) infection in infants. *Journal of the American Medical Association*, 275(17):1342–1348.
- Owens, D.K., Nease Jr., R.F. (1993). Development of outcome-based practice guidelines: A method for structuring problems and synthesizing evidence. *Joint Commission Journal on Quality Improvement*, 19(7):248–263.
- Owens, D.K., Nease Jr., R.F. (1997). A normative analytic framework for development of practice guidelines for specific clinical populations. *Medical Decision Making*, 17(4):409–426.
- Owens, D.K., Sanders, G.D., Harris, R.A., McDonald, K.M., Heidenreich, P.A., Dembitzer, A.D., Hlatky, M.A. (1997). Cost-effectiveness of implantable cardioverter defibrillators relative to amiodarone for prevention of sudden cardiac death. *Annals of Internal Medicine*, 126(1):1–12.
- Owens, D.K., Shachter, R.D., Nease Jr., R.F. (1997). Representation and analysis of medical decision problems with influence diagrams. *Medical Decision Making*, 17(3):241–262.
- Ozbolt, J.F., Schultz II, S., Swain, M.A., Abraham, I.I. (1985). A proposed expert system for nursing practice: A springboard to nursing science. *Journal of Medical Systems*, 9(1–2):57–68.
- Ozbolt, J.G. (1996). From minimum data to maximum impact: Using clinical data to strengthen patient care. *Advanced Practice Nursing Quarterly*, 1(4):62–69.
- Ozbolt, J.G., Fruchnicht, J.N., Hayden, J.R. (1994). Toward data standards for clinical nursing information. *Journal of the American Medical Informatics Association*, 1(2):175–185.
- Ozbolt, J.G., Russo, M., Stultz, M.P. (1995). Validity and reliability of standard terms and codes for patient care data. *Proceedings of the 19th Symposium on Computer Applications in Medical Care*, New Orleans, pp. 37–41.
- Ozbolt, J. (2000). Terminology standards for nursing: Collaboration at the Summit. *Journal of the American Medical Informatics Association*, 7:6, 517–522.
- Ozbolt, J. (2003). Reference terminology for therapeutic goals: A new approach. *Proceedings of the AMIA Fall Symposium*, pp. 504–08.
- Ozbolt, J., Brennan G., Hatcher I. (2001). PathworX: An informatics tool for quality improvement. *Proceedings of the AMIA Fall Symposium*, pp 518–22.
- Ozdas, A., Speroff, T., Waitman, L.R., Ozbolt, J., Butler, J., Miller, R.A. (2006). Integrating “best of care” protocols into clinicians’ workflow via care provider order entry: Impact of quality of care indicators for acute myocardial infarction. *J Amer Med Informatics Assoc*, 13(2) [in press].
- Pabst, M.K., Scherubel, J.C., Minnick, A.F. (1996). The impact of computerized documentation on nurses’ use of time. *Computers in Nursing*, 14(1):25–30.
- Paddock, S.W. (1994). To boldly glow: Applications of laser scanning confocal microscopy in developmental biology. *Bioessays*, 16(5):357–365.
- Palda, V.A., Detsky, A.S. (1997). Perioperative assessment and management of risk from coronary artery disease. *Annals of Internal Medicine*, 127(4):313–328.
- Palmer, S. (1978). Fundamental aspects of cognitive representation. In E. Rosh & B. B. Lloyd (eds.), *Cognition and Categorization*. Hillsdale, NJ: Lawrence Erlbaum Associates.

- Paskin, N. (1999). DOI: Current status and outlook. *D-Lib Magazine*, 5. (Accessed 2005 at: <http://www.dlib.org/dlib/may99/05paskin.html>)
- Patel, V.L. (1998). Individual to collaborative cognition: A paradigm shift? *Artif Intell Med*, 12(2), 93–96.
- Patel, V.L., Allen, V.G., Arocha, J.F., Shortliffe, E.H. (1998). Representing clinical guidelines in GLIF: Individual and collaborative expertise. *Journal of the American Medical Informatics Association*, 5(5),467– 483.
- Patel, V.L., Arocha, J.F. (1995). Cognitive models of clinical reasoning and conceptual representation. *Methods of Information in Medicine*, 34(1–2),47–56.
- Patel, V.L., Arocha, J.F., Diermeier, M., How, J., Mottur-Pilson, C. (2001). Cognitive psychological studies of representation and use of clinical practice guidelines. *International Journal of Medical Informatics*, 63(3), 147–167.
- Patel, V.L., Arocha, J.F., Diermeier, M., Greenes, R.A., Shortliffe, E.H. (2001). Methods of cognitive analysis to support the design and evaluation of biomedical systems: The case of clinical practice guidelines. *Journal of Biomedical Informatics*, 34(1):52–66.
- Patel, V.L., Arocha, J.F., Kaufman, D.R. (1994). Diagnostic reasoning and medical expertise. In D. L. Medin (ed.), *The Psychology of Learning and Motivation: Advances in Research and Theory* (Vol. 31), pp. 187–252. San Diego, CA: Academic Press, Inc.
- Patel, V.L., Arocha, J.F., Kaufman, D.R. (2001). A primer on aspects of cognition for medical informatics. *Journal of the American Medical Informatics Association*, 8(4),324–343.
- Patel, V.L., Branch, T, Arocha, J.F. (2002). Errors in interpreting quantities as procedures: The case of pharmaceutical labels. *International Journal of Medical Informatics*, 65(3),193–211.
- Patel, V.L. Frederiksen, C.H. (1984). Cognitive processes in comprehension and knowledge acquisition by medical students and physicians. In H.G. Schmidt and M.C. de Volder (eds.), *Tutorials in Problem-Based Learning*, pp. 143–157. Assen, Holland: van Gorcum.
- Patel, V.L., Groen, G.J. (1986). Knowledge-based solution strategies in medical reasoning. *Cognitive Science*, 10:91–116.
- Patel, V.L., Groen, G.J. (1991). The general and specific nature of medical expertise: A critical look. In K. A. Ericsson & J. Smith (eds.), *Toward a General Theory of Expertise: Prospects and Limits*, pp. 93–125. New York, NY: Cambridge University Press.
- Patel, V.L., Groen, G.J., Arocha, J.F. (1990). Medical expertise as a function of task difficulty. *Memory & Cognition*, 18(4), 394 – 406.
- Patel, V.L., Groen, G.J., Frederiksen, C.H. (1986). Differences between students and physicians in memory for clinical cases. *Medical Education*, 20,3–9.
- Patel, V.L., Kaufman, D. R. (1998). Medical informatics and the science of cognition. *JAMIA*, 5(6),493–502.
- Patel, V.L., Kaufman, D.R., Arocha, J.F. (2000). Conceptual change in the biomedical and health sciences domain. In R. Glaser (ed.), *Advances in Instructional Psychology: Educational Design and Cognitive Science* (5th ed., Vol. 5), pp. 329–392. Mahwah, NJ: Lawrence Erlbaum Associates.
- Patel, V.L., Kaufman, D.R., Arocha, J.F. (2002). Emerging paradigms of cognition in medical decision-making. *Journal of Biomedical Informatics*, 35,52–75.
- Patel, V.L., Kaufman, D.R., Magder, S.A. (1996). The acquisition of medical expertise in complex dynamic environments. In K.A. Ericsson (ed.), *The Road to Excellence: The Acquisition of Expert Performance in the Arts and Sciences, Sports, and Games*, pp. 127–165. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Patel, V.L., Kushniruk, A.W., Yang, S., Yale, J.F. (2000). Impact of a computer-based patient record system on data collection, knowledge organization, and reasoning. *Journal of the American Medical Informatics Association*. 7(6), 569–585.

- Patel, V.L., Ramoni, M.F. (1997). Cognitive models of directional inference in expert medical reasoning. In Feltovich, P.J., Ford, K.M., Hoffman, R.R. (eds.). *Expertise in Context*, pp. 67–99. Cambridge, MA: The MIT Press.
- Patten, S.F., Lee, J.S., Nelson, A.C. (1996). NeoPath, Inc. NeoPath AutoPap 300 Automatic Pap Screener System. *Acta Cytologica*, 40(1):45–52.
- Pauker, S.G., Gorry, G.A., Kassirer, J.P., Schwartz, W.B. (1976). Towards the simulation of clinical cognition. Taking a present illness by computer. *American Journal of Medicine*, 60(7):981–996.
- Pauker, S.G., Kassirer, J.P. (1980). The threshold approach to clinical decision making. *New England Journal of Medicine*, 302(20):1109–1117.
- Pauker, S.G., Kassirer, J.P. (1981). Clinical decision analysis by computer. *Archives of Internal Medicine*, 141(13):1831–1837.
- Biondich, P.G., Anand, V., Downs, S.M., McDonald, C.J. (2003). Using adaptive turnaround documents to electronically acquire structured data in clinical settings. Proceedings of the AMIA Annual Symposium, pp. 86–90.
- Paxinos, G., Watson, C. (1986). *The Rat Brain in Stereotaxic Coordinates*. San Diego: Academic Press.
- Payne, S.H. (2003). User's mental models: The very idea. In J. M. Carroll (ed.), *HCI Models, Theories and Frameworks*, pp. 135–156. San Francisco, CA: Morgan Kaufmann Publishers.
- Peabody, G. (1922). The physician and the laboratory. *Boston Medical Surgery Journal*, 187:324.
- Peleg, M., Boxwala, A., Bernstam, E., Tu, S.W., Greenes, R.A., Shortliffe, E.H. (2001). Sharable representation of clinical guidelines in GLIF: Relationship to the Arden syntax. *Journal of Biomedical Informatics*, 34:170–181.
- Peleg, M., Boxwala, A.A., Omolola, O., Zeng, Q., Tu, S.W., Lacson, R., Bernstam, E., Ash, N., Mork, P., Ohno-Machado, L., Shortliffe, E.H., Greenes, R.A. (2000). GLIF3: The evolution of a guideline representation format. *Proceedings of the AMIA Annual Symposium*, pp. 645–649. Philadelphia: Hanley & Belfus.
- Peleg, M., Boxwala, A.A., Tu, S., Zeng, Q., Ogunyemi, O., Wang, D., Patel, V.L., Greenes, R.A., Shortliffe, E.H. (2004). The InterMed approach to sharable computer-interpretable guidelines: A review. *Journal of the American Medical Informatics Association*, 11:1–10.
- Perkins, D.N., Schwartz, S., Simmons, R. (1990). A view from programming. In M. Smith (ed.), *Toward a Unified Theory of Problem Solving: Views from Content Domains*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Perkins, G., Renken, C., Martone, M.E., Young, S.J., Ellisman, M., Frey, T. (1997). Electron tomography of neuronal mitochondria: Three-dimensional structure and organization of cristae and membrane contacts. *J. Structural Biology*, 119(3):260–272.
- Peleg, M., Tu, S., Bury, J., Ciccarese, P., Fox, J., Greenes, R.A., Hall, R., Johnson, P.D., Jones, N., Kumar, A., Miksch, S., Quaglini, S., Seyfang, A., Shortliffe, E.H., Stefanelli, M. (2003). Comparing computer-interpretable guideline models: A case-study approach. *J Am Med Inform Asso*, 10(1):52–68
- Perreault, L.E., Metzger, J.B. (1999). A pragmatic framework for understanding clinical decision support. *Healthcare Information Management*, 13(2):5–21.
- Perry, M. (2003). Distributed cognition. In J. M. Carroll (ed.), *HCI Models, Theories, and Frameworks : Toward a Multidisciplinary Science*. San Francisco, Calif.: Morgan Kaufmann.
- Peterson, W., Birdsall, T. (1953). *The Theory of Signal Detectability*. (Technical Report No. 13.): Electronic Defense Group, University of Michigan, Ann Arbor.
- Piemme, T.E. (1988). Computer-assisted learning and evaluation in medicine. *Journal of the American Medical Association*, 260(3):367–372.
- Pigoski, T.M. (1997). *Practical Software Maintenance: Best Practices for Managing Your Software Investment*, IEEE Computer Society Press.

- Pincirolì, F. (1995). Virtual Reality for Medicine. *Computers in Biology and Medicine*, 25(2):81–83.
- Polson, P.G., Lewis, C.H., Rieman, J., Wharton, C. (1992). Cognitive walkthroughs: A method for theory-based evaluation of user interfaces. *International Journal of Man-Machine Studies*, 36(5),741–773.
- Ponte, J., Croft, W. (1998). A language modeling approach to information retrieval. *Proceedings of the 21st Annual International ACM SIGIR Conference on Research and Development in Information Retrieval*, Melbourne, Australia. ACM Press, pp. 275–281.
- Poon, E.G., Kuperman, G.J., Fiskio, J., Bates, D.W. (2002). Real-time notification of laboratory data requested by users through alphanumeric pagers. *JAMIA*; 9(3):217–222.
- Pople, H. (1982). Heuristic methods for imposing structure on ill-structured problems: The structuring of medical diagnosis. In Szolovits P. (ed.), *Artificial Intelligence in Medicine*. Boulder, CO: Westview Press.
- Potchen, E. J. (2000). Prospects for progress in diagnostic imaging. *J. Internal Medicine*, 247(4), 411–424.
- Pouratian, N., Sheth, S.A., Martin, N.A., Toga, A.W. (2003). Shedding light on brain mapping: Advances in human optical imaging. *Trends in Neurosciences*, 26(5):277–282.
- Pratt, W., Hearst, M., et al. (1999). A knowledge-based approach to organizing retrieved documents. *Proceedings of the 16th National Conference on Artificial Intelligence*, pp 80–85. Orlando, FL.: AAAI.
- President's Information Technology Advisory Committee (2001). *Transforming Health Care Through Information Technology. (President's Information Technology Advisory Committee: Panel on Transforming Health Care)..* (Accessed 2005 at: <http://www.itrd.gov/pubs/pitac/pitac-hc-9feb01.pdf>)
- Prothero, J.S., Prothero, J.W. (1982). Three-dimensional reconstruction from serial sections: I. A portable microcomputer-based software package in Fortran. *Computers and Biomedical Research*, 15:598–604.
- Prothero, J.S., Prothero, J.W. (1986). Three-dimensional reconstruction from serial sections IV. The reassembly problem. *Computers and Biomedical Research*, 19(4):361–373.
- Pruitt, K.D., Maglott, D.R.. (2001). RefSeq and LocusLink: NCBI gene-centered resources. *Nucleic Acids Res*;29(1):137–140.
- Pryor, T.A. (1988). The HELP medical record system. *MD Computing*, 5(5):22–33.
- Pryor, T.A., Gardner, R.M., Clayton, P.D., Warner, H.R. (1983). The HELP system. *Journal of Medical Informatics* 7(2):87–102.
- Public Health Service (1991). *Healthy People 2000: National Health Promotion and Disease Prevention Objectives: Full Report, with Commentary*. (DHHS publication no. (PHS)91–50212.): Washington, DC: U.S. Department of Health and Human Services, Public Health Service.
- Pyper, C., Amery, J., Watson, M., Crook, C., Thomas, B. (2002). Patients' access to their online electronic health records. *J Telemed Telecare*. 8(Suppl 2):103–5.
- Quaglini, S., Stefaneli, M., Lanzola, G., Caporusso, V., Panzarasa, S. (2001). Flexible guideline-based patient careflow systems. *Artificial Intelligence in Medicine* 22:65–80
- Quarterman, J.S. (1990). *The Matrix: Computer Networks and Conferencing Systems Worldwide*: Digital Press.
- Raiffa, H. (1970). *Decision Analysis: Introductory Lectures on Choices Under Uncertainty*. Reading, MA: Addison-Wesley.
- Ransohoff, D.F., Feinstein, A.R. (1978). Problems of spectrum and bias in evaluating the efficacy of diagnostic tests. *New England Journal of Medicine*, 299(17):926–930.
- Read, J.D. (1990). Computerizing medical language. In DeGlanville H., Roberts J. (eds.), *Current Perspectives in Health Computing HC90. British Journal of Health Care Computing*, pp.203–208.
- Read, J.D., Benson, T.J. (1986). Comprehensive coding. *British Journal of Health Care Computing*, pp.:22–25.

- Rector, A.L., Glowinski, A.J., Nowlan, W.A., Rossi-Mori, A. (1995). Medical-concept models and medical records: an approach based on GALEN and PEN & PAD. *Journal of the American Medical Informatics Association*, 2(1):19–35.
- Rector, A.L., Nowlan, W.A., Glowinski, A. (1993). Goals for concept representation in the GALEN project. *Proceedings of the 17th Annual Symposium on Computer Applications in Medical Care*, pp. 414 – 418. New York: McGraw Hill.
- Redman, P., Kelly, J., et al. (1997). Common ground: The HealthWeb project as a model for Internet collaboration. *Bulletin of the Medical Library Association*, 85: 325–330.
- Reddy, M.C., Pratt, W., Dourish, P., Shabot, M. (2002). Asking questions: Information needs in a surgical intensive care unit. *Proc AMIA Symp.* pp. 647–651.
- Reggia, J., Turhim, S. (eds.) (1985). *Computer-Assisted Medical Decision Making*. New York: Springer-Verlag.
- Reich, V., Rosenthal, D. (2001). LOCKSS: A permanent Web publishing and access system. *D-Lib Magazine*, 7. (Accessed 2005 at: <http://www.dlib.org/dlib/june01/reich/06reich.html>)
- Reiser, S. (1991). The clinical record in medicine. Part 1: Learning from cases. *Annals of Internal Medicine*, 114(10):902–907.
- Reiser, S.J., Anbar, M. (eds.) (1984). *The Machine at the Bedside: Strategies for Using Technology in Patient Care*. Cambridge, MA: Cambridge University Press.
- Richardson, J.S. (1981). The anatomy and taxonomy of protein structure. *Advances in Protein Chemistry*, 34:167–339.
- Rimoldi, H.J.A. (1961). The test of diagnostic skills. *Journal of Medical Education*, 36:73–79.
- Ringold, D.J., et al., (2000). ASHP national survey of pharmacy practice in acute care settings: Dispensing and administration – 1999,” *Am J Health Syst Pharm*, 57(19):1759–75.
- Ritchie, C.J., Edwards, W.S., Cyr, D.R., Kim, Y. (1996). Three-dimensional ultrasonic angiography using power-mode Doppler. *Ultrasound in Medicine and Biology*, 22(3):277–286.
- Robb, R.A. (2000). *Biomedical Imaging, Visualization, and Analysis*. New York: Wiley-Liss.
- Robbins, A.H., Vincent, M.E., Shaffer, K., Maietta, R., Srinivasan, M.K. (1988). Radiology reports: Assessment of a 5,000-word speech recognizer. *Radiology*, 167(3):853–855.
- Robertson, S., Walker, S. (1994). Some simple effective approximations to the 2-Poisson model for probabilistic weighted retrieval. *Proceedings of the 17th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval*, pp. 232–241. Dublin, Ireland. Springer-Verlag.
- Roethlisberger, F.J., Dickson, W.J. (1939). *Management and the Worker*. Cambridge, MA: Harvard University Press.
- Rogers, W.A. (ed.). (2002). *Human Factors Interventions for the Health Care of Older Adults*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Rogers, Y. (2004). New theoretical approaches for HCI. *Annual Review of Information Science and Technology*, 38:87–143.
- Rose, M.T. (1989). *The Open Book: A Practical Perspective on OSI*. New Jersey: Prentice Hall.
- Rosen, G. (1993). *History of Public Health*. Baltimore, MD: Johns Hopkins University Press.
- Rosen, G.D., Williams, A.G., Capra, J.A., Connolly, M.T., Cruz, B., Lu, L., Airey, D.C., Kulkarni, K., Williams, R.W. (2000). The Mouse Brain Library @ www.mbl.org, *Int. Mouse Genome Conference*, 14:166.
- Ross, B., Bluml, S. (2001). Magnetic resonance spectroscopy of the human brain. *Anatomical Record (New Anat.)*, 265(2),54–84.
- Rosse, C. (2000). Terminologia Anatomica: Considered from the perspective of next-generation knowledge sources. *Clinical Anatomy*, 14:120–133.
- Rosse, C., Mejino, J.L.V. (2003). A reference ontology for bioinformatics: The Foundational Model of Anatomy. *Journal of Bioinformatics*, 36(6),478–500.

- Rosse, C., Mejino, J.L., Jakobovits, R.M., Modayur, B.R., Brinkley, J.F. (1997). Motivation and organizational principles for anatomical knowledge representation: The digital anatomist symbolic knowledge base. *Journal of the American Medical Informatics Association*, 5(1):17–40.
- Rosse, C., Shapiro, L.G., Brinkley, J.F. (1998). The Digital Anatomist foundational model: principles for defining and structuring its concept domain, *Proceedings of the AMIA Fall Symposium*, pp. 820–824. Orlando, Florida.
- Rossi, P.H., Freeman, H.E. (1989). *Evaluation: A Systematic Approach*. (4th ed.). Newbury Park, CA: Sage Publications.
- Roth, E.M., Patterson, E.S., Mumaw, R.J. (2002). Cognitive engineering: Issues in user-centered system design. In J. J. Marciniak (ed.), *Encyclopedia of Software Engineering*, 2nd edition, pp. 163–179. New York: John Wiley & Sons.
- Rothenberg, J. (1999). *Ensuring the Longevity of Digital Information*. RAND Corporation. (Accessed 2005 at: <http://www.clir.org/pubs/archives/ensuring.pdf>)
- Rothschild, M.A., Wett, H.A., Fisher, P.R., Weltin, G.G., Miller, P.L. (1990). Exploring subjective vs. objective issues in the validation of computer-based critiquing advice. *Computer Methods and Programs in Biomedicine*, 31(1):11–18.
- Rothwell, D.G., Côté, R.A., Cordeau, J.P., Boisvert, M.A. (1993). Developing a standard data structure for medical language: The SNOMED proposal. *Proceedings of the 17th Annual Symposium for Computer Applications in Medical Care*, Washington, DC, pp. 695–699.
- Rothwell, D.J., Côté, R.A. (1996). Managing information with SNOMED: Understanding the model. *Proceedings of the AMIA Annual Fall Symposium*, Washington, DC, pp. 80–83.
- Rotman, B.L., Sullivan, A.N., McDonald, T.W., Brown, B.W., DeSmedt, P., Goodnature, D., Higgins, M.C., Suermondt, H.J., Young, C., Owens, D.K. (1996). A randomized controlled trial of a computer-based physician workstation in an outpatient setting: Implementation barriers to outcome evaluation. *Journal of the American Medical Association*, 3(5):340–348.
- Rowen, L., Mahairas, G., Hood, I. (1997). Sequencing the human genome. *Science*, 278(5338):605–607.
- Rubin, RD (2003). The community health information movement: Where it's been, where it's going. In O'Carroll, P.W., Yasnoff, W.A., Ward, M.E., Ripp, L.H., Martin, E.L. (eds.), *Public Health Informatics and Information Systems*. New York: Springer-Verlag, p. 605.
- Ruland, C.M. (2002). Handheld technology to improve patient care. *Journal of the American Medical Informatics Association*, 9:192–200.
- Saba, V.K. (1992). The classification of home health care nursing: Diagnoses and interventions. *Caring Magazine*, 11(3):50–56.
- Saba, V.K. (1994). *Home Health Care Classification of Nursing Diagnoses and Interventions*. Washington, DC: Georgetown University.
- Saba, V.K. (1995). Home Health Care Classifications (HHCCs): Nursing diagnoses and nursing interventions, In *Nursing Data Systems: The Emerging Framework*, pp.61–103. Washington, D.C.: American Nurses Publishing.
- Saba, V.K., McCormick, K. (1996). *Essentials of Computers for Nurses*. New York: McGraw-Hill.
- Sackett, D.L., Richardson, W.S., Rosenberg, W.M., Haynes, R.B. (eds.) (1997). *Evidence-Based Medicine: How to Practice and Teach EBM*. New York: Churchill Livingstone.
- Sackett, D.L., Richardson, W.S., Rosenberg, W., Haynes, R.B. (2000) *Evidence-Based Medicine: How to Practice and Teach EBM (Second Edition)*, New York: Churchill Livingstone..
- Safran, C, Using routinely collected data for clinical research. *Stat Med*; 10:559–564.
- Safran, C., Porter, D., Lightfoot, J., Rury, C.D., Underhill, L.H., Bleich, H.L., Slack, W.V. (1989). ClinQuery: A system for online searching of data in a teaching hospital. *Annals of Internal Medicine*, 111(9):751–6.

- Safran, C., Rind, D.M., Davis, R.B., Ives, D., Sands, D.Z., Currier, J., Slack, W.V., Makadon, H.J., Cotton, D.J. (1995). Guidelines for management of HIV infection with computer-based patient's record. *Lancet*, 346(8971):341–346.
- Safran, C., Rury, C., Rind, D.M., Taylor, W.C. (1991). A computer-based outpatient medical record for a teaching hospital. *MD Computing*, 8(5):291–299.
- Safran, C., Slack, W.V., Bleich, H.L. (1989). Role of computing in patient care in two hospitals. *MD Computing*, 6(3):141–148.
- Sager, N., Friedman, C., Lyman, M.S. (1987). *Medical Language Processing: Computer Management of Narrative Data*. New York: Addison-Wesley.
- Sailors, R.M., East, T.D. (1997). Role of computers in monitoring. In Tobin M.J. (ed.), *Principals and Practice of Intensive Care Monitoring*, pp.1329–1354. New York: McGraw-Hill.
- Salomon, G., Perkins, D.N., Globerson, T. (1991). Partners in cognition: Extending human intelligence with intelligent technologies. *Educational Researcher*, 20(3):2–9.
- Salpeter, S.R., Sanders, G.D., Salpeter, E.E., Owens, D.K. (1997). Monitored isoniazid prophylaxis for low-risk tuberculin reactors older than 35 years of age: A risk-benefit and cost-effectiveness analysis. *Annals of Internal Medicine*, 127(12):1051–1061.
- Salton, G. (1983). *Introduction to Modern Information Retrieval*. New York: McGraw-Hill.
- Salton, G. (1991). Developments in automatic text retrieval. *Science*, 253:974–980.
- Salton, G., Buckley, C. (1990). Improving retrieval performance by relevance feedback. *Journal of the American Society for Information Science*, 41:288–97.
- Salton, G., Fox, E., et al. (1983). Extended Boolean information retrieval. *Communications of the ACM*, 26:1022–1036.
- Salton, G., Lesk, M. (1965). The SMART automatic document retrieval system: An illustration. *Communications of the ACM*, 8: 391–398.
- Salzberg, S., Searls, D., Kasif, S. (eds.) (1998). *Computational Methods in Molecular Biology*. New York: Elsevier Science.
- Sanders, G.D., Hagerty, C.G., Sonnenberg, F.A., Hlatky, M.A., Owens, D.K. (1999). Distributed dynamic decision support using a web-based interface for prevention of sudden cardiac death. *Medical Decision Making*, 19(2):157–66.
- Sanders, D.L., Miller, R.A. (2001). The effects on clinician ordering patterns of a computerized decision support system for neuroradiology imaging studies. *Proceedings of the AMIA Annual Fall Symposium*, pp. 583–587.
- Sandor, S., Leahy, R. (1997). Surface-based labeling of cortical anatomy using a deformable atlas. *IEEE Trans. Med. Imaging*, 16(1), 41–54.
- Sanford, M.K., Hazelwood, S.E., Bridges, A.J., Cutts 3rd, J.H., Mitchell, J.A., Reid, J.C., Sharp, G. (1996). Effectiveness of computer-assisted interactive videodisc instruction in teaching rheumatology to physical and occupational therapy students. *Journal of Allied Health*, 25(2):141–148.
- Saracevic, T. (1991). Individual differences in organizing, searching, and retrieving information. *Proceedings of the 54th Annual Meeting of the American Society for Information Science*, Washington, D.C.
- Sarkar, I.N., Starren, J. (2002). Desiderata for personal electronic communications in clinical systems. *J Am Med Inform Assoc* 9:209–216.
- Sartorius, N. (1976). I. Methodologic problems of common terminology, measurement, and classification. II. Modifications and new approaches to taxonomy in long-term care: Advantages and limitations of the ICD. *Medical Care*, 14(4 Suppl):109–15.
- Scaife, M., Rogers, Y. (1996). External cognition: How do graphical representations work? *International Journal of Human-Computer Studies*, 45(2),185–213.
- Schaltenbrand, G., Warren, W. (1977). *Atlas for Stereotaxy of the Human Brain*. Stuttgart: Thieme.

- Scherrer, J.R., Baud, R.H., Hochstrasser, D., Ratib, O. (1990). DIOGENE: An integrated hospital information system in Geneva. *MD Computing*, 7(2):81–89.
- Scherrer, J.R., Lovis, C., Borst, F. (1995). DIOGENE 2: A distributed hospital information system with an emphasis on its medical information content. In J.H. van Bommel and A.T. McCray (ed.), *Yearbook of Medical Informatics*, pp.86–97. Stuttgart: Schattauer.
- Schmidt, H.G., Boshuizen, H.P. (1993). On the origin of intermediate effects in clinical case recall. *Memory & Cognition*, 21(3):338–351.
- Schneiderman, B. (1992). *Designing the User Interface: Strategies for Effective Human-Computer Interaction*. Don Mills, ON: Addison-Wesley Publishing Company.
- Schreiber, A.T., Akkermans, J., Anjewierden, A., De Hoog, R., Shadbolt, N., Van De Velde, W., Wielinga, B. (2000). *Knowledge Engineering and Management: The Common KADS Methodology*. Cambridge, MA: The MIT Press.
- Schreiber, G., Wielinga, B., Breuker, J. (eds.) (1993). *KADS: A Principled Approach to Knowledge-Based System Development*. London: Academic Press.
- Schulz, K.F., Chalmers, I., Hayes, R.J., Altman, D.G. (1995). Empirical evidence of bias: Dimensions of methodological quality associated with estimates of treatment effects in controlled trials. *Journal of the American Medical Association*, 273(5):408–412.
- Schulze-Kremer, S. (1994). *Advances in Molecular Bioinformatics*. Washington, D.C.: IOS Press.
- Schultz, E.B., Price, C., Brown, P.J.B. (1997). Symbolic anatomic knowledge representation in the Read Codes Version 3: Structure and application. *J. Am. Med. Inform. Assoc.*, 4:38–48.
- Schwartz, R.J., Weiss, K.M., Buchanan, A.V. (1985). Error control in medical data. *MD Computing*, 2(2):19–25.
- Schwartz, W.B. (1970). Medicine and the computer: The promise and problems of change. *New England Journal of Medicine*, 283(23):1257–1264.
- Science (1997). Special issue on bioinformatics. *Science*, 278(Oct. 24):541–768.
- Scriven, M. (1973). Goal free evaluation. In House E.R. (ed.), *School Evaluation*. Berkeley, CA: McCutchan Publishers.
- Seiver, A. (2000). Critical care computing: Past, present, future. *Crit Care Clin*, 17(4):601–621.
- Selden, C., Humphreys, B.L., Friede, A., Geisslerova, Z. (1996). *Public Health Informatics, January 1980 through December 1995: 471 Selected Citations*. Bethesda, MD: National Institutes of Health, National Library of Medicine, pp. 1–21.
- Senior Medical Review (1987). Urinary tract infection. *Senior Medical Review*.
- Sensor Systems Inc. (2001). *MedEx*. (Accessed 2005 at: <http://medx.sensor.com/products/medx/index.html>)
- Setubal, J., Medianis, J. (1997). *Introduction to Computational Molecular Biology*. Boston: PWS Publishing Company.
- Severinghaus, J.W., Astrup, P.B. (1986). History of blood gas analysis IV. Oximetry. *Journal of Clinical Monitoring*, 2(4):270–288.
- Sewell, W., Teitelbaum, S. (1986). Observations of end-user online searching behavior over eleven years. *Journal of the American Society for Information Science*, 37(4):234–245.
- Shabot, M.M. (1982). Documented bedside computation of cardiorespiratory variables with an inexpensive programmable calculator. In DeAngelis J. (ed.), *Debates and Controversies in the Management of High Risk Patients*, pp.153–163. San Diego, CA: Beach International.
- Shabot, M.M. (1989). Standardized acquisition of bedside data: The IEEE P1073 medical information bus. *International Journal of Clinical Monitoring and Computing*, 6(4):197–204.
- Shabot, M.M. (1995). Computers in the intensive care unit: Was Pogo correct? *Journal of Intensive Care Medicine*, 10:211–212.
- Shabot, M.M. (1997a). Automated clinical pathways for surgical services. *Surgical Services Management*, June:19–23.

- Shabot, M.M. (1997b). The HP CareVue clinical information system. *International Journal of Clinical Monitoring and Computing*, 14(3):177–184.
- Shabot, M.M., Gardner, R.M. (eds.) (1994). *Decision Support Systems in Critical Care*. Boston: Springer-Verlag.
- Shabot, M.M., Leyerle, B.J., LoBue, M. (1987). Automatic extraction of intensity-intervention scores from a computerized surgical intensive care unit flowsheet. *American Journal of Surgery*, 154(1):72–78.
- Shabot, M.M., LoBoe, M. (1995). Real-time wireless decision support alerts on a palmtop PDA. *Proceedings of the 19th Annual Symposium on Computer Applications in Medical Care*, New Orleans, LA, pp. 174–177.
- Shabot, M.M., Shoemaker, W.C., State, D. (1977). Rapid bedside computation of cardiorespiratory variables with a programmable calculator. *Critical Care Medicine*, 5(2):105–111.
- Shabot, MM. (2003). Closing address: Breaking free of the past: Innovation and technology in patient care. *Nurs Outlook*, 51(3):S37–38
- Shahar, Y. (1997). A framework for knowledge-based temporal abstractions. *Artificial Intelligence*, 90:79–133.
- Shahar, Y., Miksch, S., Johnson, P.D. (1988). The Asgaard Project: A task-specific framework for the application and critiquing of time-oriented clinical guidelines. *Artificial Intelligence in Medicine*, 14:29–51.
- Shahar, Y., Musen, M.A. (1996). Knowledge-based temporal abstractions in clinical domains. *Artificial Intelligence in Medicine*, 8(3):267–298.
- Shan, M.C., Davis, J.W. (1996). Business process flow management and its application in the telecommunications management network. *HP-Journal*, October 1996.
- Shapiro, L.G., Stockman, G.C. (2001). *Computer Vision*. Upper Saddle River, N.J.: Prentice Hall.
- Shaughnessy, A., Slawson, D., et al. (1994). Becoming an information master: A guidebook to the medical information jungle. *Journal of Family Practice*, 39: 489–499.
- Shea, S., DuMouchel, W., Bahamonde, L. (1996). A meta-analysis of 16 randomized controlled trials to evaluate computer-based clinical reminder systems for preventive care in the ambulatory setting. *Journal of the American Medical Informatics Association*, 3(6):399–409.
- Shea, S., Starren, J., Weinstock, R.S., Knudson, P.E., Teresi, J., Holmes, D., et al. (2002). Columbia University's Informatics for Diabetes Education and Telemedicine (IDEATel) project: Rationale and design. *J Am Med Inform Assoc*, 9(1),49–62.
- Sheppard, L.C., Kouchoukos, N.T., Kurtts, M.A., Kirklin, J.W. (1968). Automated treatment of critically ill patients following operation. *Annals of Surgery*, 168(4):596–604.
- Shlaer, S., Mellor, S.J. (1992). *Object Life Cycles, Modeling the World in States*: New York: Prentice-Hall.
- Shortell, S.M., Gillies, R.R., Anderson, D.A. (2000). *Remaking Health Care In America: The Evolution of Organized Delivery Systems* (2nd ed.). San Francisco. Jossey-Bass Publishers.
- Shortliffe, E.H. (1976). *Computer-Based Medical Consultations: MYCIN*. New York: Elsevier/North Holland.
- Shortliffe, E.H. (1984). Coming to terms with the computer. In Reiser S., Anbar M. (eds.), *The Machine at the Bedside: Strategies for Using Technology in Patient Care*, pp.235–239. Cambridge, MA: Cambridge University Press.
- Shortliffe, E.H. (1986). Medical expert systems: Knowledge tools for physicians. *The Western Journal of Medicine*, 145:830–839.
- Shortliffe, E.H. (1989). Testing reality: The introduction of decision-support technologies for physicians. *Methods of Information in Medicine*, 28:1–5.
- Shortliffe, E.H. (1993). Doctors, patients, and computers: Will information technology dehumanize healthcare delivery? *Proceedings of the American Philosophical Society*, 137(3):390–398.

- Shortliffe, E.H. (1994). Dehumanization of patient care: Are computers the problem or the solution. *Journal of the American Medical Informatics Association*, 1(1):76–78.
- Shortliffe, E.H. (1995a). Medical informatics meets medical education. *Journal of the American Medical Association*, 273(13):1061–1065.
- Shortliffe, E.H. (1995b). Medical informatics training at Stanford University School of Medicine. In van Bommel J.H., McCray A.T. (eds.), *IMIA Yearbook of Medical Informatics*. (Vol. 1995), pp.105–110. Stuttgart, Germany: Schattauer Publishing Company.
- Shortliffe, E.H. (1998a). Health care and the Next Generation Internet (editorial). *Annals of Internal Medicine*, 129(2):138–140.
- Shortliffe, E.H. (1998b). The Next Generation Internet and health care: A civics lesson for the informatics community. *Proceedings of the AMIA Annual Fall Symposium*, Orlando, FL, pp. 8–14.
- Shortliffe, E.H. (1998c). The evolution of health-care records in the era of the Internet, *Proceedings of Medinfo 98*. Seoul, Korea: Amsterdam: IOS Press.
- Shortliffe, E.H. (2000). Networking health: Learning from others, taking the lead. *Health Affairs* 19(6):9–22.
- Shortliffe, E.H., Blois, M.S. (2000). The Computer meets medicine and biology: Emergence of a discipline. In E. H. Shortliffe & L. E. Perreault (eds.), *Medical Informatics: Computer Applications in Health Care and Biomedicine* (2nd ed.), pp. 3–40. New York: Springer Verlag.
- Shortliffe, E.H., Buchanan, B.G., Feigenbaum, E. (1979). Knowledge engineering for medical decision making; A review of computer-based clinical decision aids. *Proceedings of the IEEE*, 67:1207–1224.
- Shortliffe, E.H., Johnson, S.B. (2002). Medical informatics training and research at Columbia University. In *IMIA Yearbook of Medical Informatics* (R. Haux and A.T. McCray, eds), pp 173–180. Stuttgart, Germany: Schattauer Publishing Company.
- Shortliffe, E.H., Sondik, E. (2004). The informatics infrastructure: Anticipating its role in cancer surveillance. *Proceedings of the C-Change Summit on Cancer Surveillance and Information: The Next Decade*, Phoenix, Arizona.
- Shubin, H., Weil, M.H. (1966). Efficient monitoring with a digital computer of cardiovascular function in seriously ill patients. *Annals of Internal Medicine*, 65(3):453–460.
- Siegel, E., Cummings, M., Woodsmall, R. (1990). Bibliographic Retrieval Systems. In E. Shortliffe & L. Perreault (ed.), *Medical Informatics: Computer Applications in Health Care* (1st ed), pp.434–465. Reading, MA: Addison-Wesley.
- Siegel, E.L., Protopapas, Z., Reiner, B.I., Pomerantz, S.M. (1997). Patterns of utilization of computer workstations in a filmless environment and implications for current and future picture archiving and communication systems. *Journal of Digital Imaging*, 10(3 Suppl 1):41–43.
- Silberg, W.M., Lundberg, G.D., Musacchio, R.A. (1997). Assessing, controlling, and assuring the quality of medical information on the Internet: Caveat lector et viewer — let the reader and viewer beware. *Journal of the American Medical Association*, 277(15):1244–1245.
- Simborg, D.W. (1984). Networking and medical information systems. *Journal of Medical Systems*, 8(1–2):43–47.
- Simborg, D.W., Chadwick, M., Whiting-O’Keefe, Q.E., Tolchin, S.G., Kahn, S.A., Bergan, E.S. (1983). Local area networks and the hospital. *Computers and Biomedical Research*, 16(3):247–259.
- Simmons, D.A. (1980). *A Classification Scheme for Client Problems in Community Health Nursing: Nurse Planning Information Series*. (Volume 14, Pub No.[HRP] 501501). Springfield, VA: National Technical Information Service.
- Simon, D.P., Simon, H. A. (1978). Individual differences in solving physics problems. In R. Siegler (ed.), *Children’s Thinking: What Develops?* Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.
- Singer, S.J. (1991). Problems in gaining access to hospital information. *Health Affairs*, 10(2):148–151.

- Singer, S.J., Hunt, K., Gabel, J., Liston, D., Enthoven, A.C. (1997). New research shows how to save money on employee health benefits. *Managing Employee Health Benefits*, 5(4):1–9.
- Singhal, A., Buckley, C., et al. (1996). Pivoted document length normalization. *Proceedings of the 19th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval*, Zurich, Switzerland. ACM Press, pp. 21–29.
- Sinha, U., Bui, A., Taira, R., Dionisio, J., Morioka, C., Johnson, D., Kangarloo, H. (2002). A review of medical imaging informatics. *Ann N Y Acad Sci*, 980:168–97
- Sittig, D. (1987). Computerized management of patient care in a complex, controlled clinical trial in the intensive care unit. *Proceedings of the 11th Annual Symposium on Computer Applications in Medical Care*, Washington, D.C., pp. 225–232.
- Slack, W.V., Bleich, H.L. (1999). The CCC system in two teaching hospitals: A progress report. *Int J Med Inf*, 54(3):183–96.
- Sloboda, J. (1991). Musical expertise. In K. A. Ericsson & J. Smith (eds.), *Toward a General Theory of Expertise: Prospects and Limits*, pp. 153–171. New York: Cambridge University Press.
- Smith, D. (1994). *Biocomputing: Informatics and Genome Projects*. New York: Academic Press.
- Smith, L. (1985). Medicine as an art. In Wyngaarden J., Smith L. (eds.), *Cecil Textbook of Medicine*. Philadelphia: W. B. Saunders.
- Smith, L.D. (1986). *Behaviorism and Logical Positivism : A Reassessment of the Alliance*. Stanford, Calif.: Stanford University Press.
- Smith, R. (1992). Using a mock trial to make a difficult clinical decision. *British Medical Journal*, 305(6864):1284–1287.
- Smith, T., Waterman, M. (1981). Identification of common molecular subsequences. *Journal of Molecular Biology*, 147(1):195–197.
- Snow, V., Lascher, S., & Mottur-Pilson, C. (2000). Pharmacologic treatment of acute major depression and dysthymia. *Annals of Internal Medicine*, 132(9):738–742.
- Sollins, K. and Masinter, L. (1994). *Functional Requirements for Uniform Resource Names*. Internet Engineering Task Force. (Accessed 2005 at: <http://www.w3.org/Addressing/rfc1737.txt>)
- Somers, A.R. (1971). *The Kaiser Permanente Medical Care Program*, New York: Commonwealth Fund.
- Sonnenberg, F.A., Beck, J.R. (1993). Markov models in medical decision making: A practical guide. *Medical Decision Making*, 13(4):322–338.
- Soto, G.E., Young, S.J., Martone, M.E., Deerinck, T.J., Lamont, S.L., Carragher, B.O., Hamma, K., Ellisman, M.H. (1994). Serial section electron tomography: A method for three-dimensional reconstruction of large structures. *Neuroimage*, 1:230–243.
- Southon, F.C., Sauer, C., Dampney, C.N. (1997). Information technology in complex health services: Organizational impediments to successful technology transfer and diffusion. *Journal of the American Medical Informatics Association*, 4(2):112–124.
- Sowa, J.F. (1983). *Conceptual Structures: Information Processes in Mind and Machine*. Reading, MA: Addison-Wesley.
- Sowa, J.F. (2000). *Knowledge Representation: Logical, Philosophical, and Computational Foundations*. Pacific Grove: Brooks/Cole.
- Sox, H.C. (1986). Probability theory in the use of diagnostic tests. An introduction to critical study of the literature. *Annals of Internal Medicine*, 104(1):60–66.
- Sox, H.C. (1987). Probability theory in the use of diagnostic tests: Application to critical study of the literature. In Sox H.C. (ed.), *Common Diagnostic Tests: Use and Interpretation*, pp.1–17. Philadelphia: American College of Physicians.
- Sox, H.C., Blatt, M.A., Higgins, M.C., Marton, K.I. (1988). *Medical Decision Making*. Boston, MA: Butterworth Publisher.

- Spackman, K.A. (2000) SNOMED RT and SNOMEDCT. Promise of an international clinical terminology. *MD Comput*, 17(6):29.
- Spackman, K.A., Campbell, K.E., Cote, R.A. (1997). SNOMED RT: A reference terminology for health care. *Proc AMIA Annu Fall Symp*, pp. 640–644. Philadelphia: Hanley and Belfus.
- Spee, J.H., de Vos, W.M., Kuipers, O.P. (1993). Efficient random mutagenesis method with adjustable mutation frequency by use of PCR and dITP. *Nucleic Acids Research*, 21(3):777–778.
- Spellman, P.T., Miller, M., Stewart, J., et al. (2002). Design and implementation of microarray gene expression markup language (MAGE-ML). *Genome Biol*, 23;3(9):RESEARCH0046. Epub 2002 Aug 23.
- Spitzer, V., Ackerman, M., et al. (1996). The visible human male: A technical report. *Journal of the American Medical Informatics Association*, 3: 118–130.
- Spitzer, V.M., Whitlock, D.G. (1998). The Visible Human Dataset: The anatomical platform for human simulation. *Anat Rec*, 253(2),49–57.
- Srinivasan, P. (1996). Query expansion and MEDLINE. *Information Processing and Management*, 32: 431–444.
- Stallings, W. (1987a). *The Open Systems Interconnection (OSI) Model and OSI-Related Standards*. (Vol. 1). New York: Macmillan.
- Stallings, W. (1987b). *Handbook of Computer-Communications Standards*. New York: Macmillan Publishing Company.
- Stallings, W. (1997). *Data and Computer Communications*. New Jersey: Prentice Hall.
- Starr P. (1982). *The Social Transformation of American Medicine*. New York: Basic Books.
- Starr, P. (1983). *Social Transformation of American Medicine*. Basic Books.
- Starren, J., Hripcsak, G., Sengupta, S., Abbruscato, C.R., Knudson, P., Weinstock, R.S., Shea, S. (2002). Columbia University's Informatics for Diabetes Education and Telemedicine (IDEATel) project: Technical implementation. *J Am Med Inform Assoc*, 9, 25–36.
- Starren J., Johnson, S.B. (2000). An object-oriented taxonomy of medical data presentations. *J American Medical Informatics Association*; 7(1):1–20.
- Stavri, P. (2001). Personal health information seeking: a qualitative review. *Proceedings of Medinfo 2001*. London, England. IOS Press, pp. 1484–1488.
- Stead, W.W. (1997a). Building infrastructure for integrated health systems: Proceedings of the 1996 IAIMS Symposium. *Journal of the American Medical Informatics Association*, 4(2 Suppl):S1–76.
- Stead, W.W. (1997b). The evolution of the IAIMS: Lessons for the next decade. *Journal of the American Medical Informatics Association*, 4(2 Suppl):S4–9.
- Stead, W.W., Borden, R., Bourne, J., Giuse, D., Giuse, N., Harris, T.R., Miller, R.A., Olsen, A.J. (1996). The Vanderbilt University fast track to IAIMS: Transition from planning to implementation. *Journal of the American Medical Informatics Association*, 3(5):308–317.
- Stead, W.W., Hammond, W.E. (1988). Computer-based medical records: The centerpiece of TMR. *MD Computing*, 5(5):48–62.
- Steedman, D. (1990). *Abstract Syntax Notation One: The Tutorial and Reference*. Great Britain: Technology Appraisals Ltd.
- Steen, E.B. (ed.) (1996). *Proceedings of the Second Annual Nicholas E. Davies CPR Recognition Symposium*. Schaumburg, IL: Computer-Based Patient Record Institute.
- Sternberg, R.J., Horvarth, J.A. (1999). *Tacit Knowledge in Professional Practice. Researcher and Practitioner Perspectives*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Stensaas, S.S., Millhouse, O.E. (2001). *Atlases of the Brain*. University of Utah. (Accessed 2005 at: http://medstat.med.utah.edu/kw/brain_atlas/)
- Stewart, B.K., Lange, S.G., Hoath, J.I., Tarczy-Hornuch, P. (1997). DICOM image integration into a Web-browsable electronic medical record, *RSNA 1997 Scientific Program Supplement to Radiology*, p.205.

- Stringer, W.A. (1997). MRA image production and display. *Clinical Neuroscience*, 4(3):110–116.
- Strong, D.M., Lee, Y.W., Wang, R.T. (1997). 10 potholes in the road to information quality. *IEEE Computer*, 31:38–46.
- Stryer, L. (1995). *Biochemistry*. New York: WH Freeman.
- Subramaniam, B., Hennessey, J.G., Rubin, M.A., Beach, L.S., Reiss, A.L. (1997). Software and methods for quantitative imaging in neuroscience: The Kennedy Krieger Institute Human Brain Project. In S. H. Koslow & M. F. Huerta (eds.), *Neuroinformatics: An Overview of the Human Brain Project*, pp. 335–360. Mahwah, New Jersey: Lawrence Erlbaum.
- Suchman, L. (1987). *Plans and Situated Actions: The Problem of Human/Machine Communication*. Cambridge: Cambridge University Press.
- Sumner, W., Nease Jr., R.F., Littenberg, B. (1991). U-titer: A utility assessment tool. *Proceedings of the 15th Annual Symposium on Computer Applications in Medical Care*, Washington, DC, pp. 701–5.
- Sundheim, B. (1991). *Proceedings of the Third Message Understanding Conference (MUC-3)*. San Mateo, CA: Morgan Kaufmann.
- Sundheim, B. (1992). *Proceedings of the Fourth Message Understanding Conference (MUC-4)*. San Mateo, CA: Morgan Kaufmann.
- Sundheim, B. (1994). *Proceedings of the Fifth Message Understanding Conference (MUC-5)*. San Mateo, CA.: Morgan Kaufmann.
- Sundheim, B. (1996). *Proceedings of the Sixth Message Understanding Conference (MUC-6)*. San Mateo, CA.: Morgan Kaufmann.
- Sundsten, J.W., Conley, D.M., Ratiu, P., Mulligan, K.A., Rosse, C. (2000). *Digital Anatomist web-based interactive atlases*. (Accessed 2005 at: <http://www9.biostr.washington.edu/da.html>)
- Sussman, S.Y. (2001). *Handbook of Program Development for Health Behavior Research & Practice*. Thousand Oaks, Calif.: Sage.
- Swanson, D. (1988). Historical note: Information retrieval and the future of an illusion. *Journal of the American Society for Information Science*, 39: 92–98.
- Swanson, L.W. (1992). *Brain Maps: Structure of the Rat Brain*. Amsterdam; New York: Elsevier.
- Swanson, L.W. (1999). *Brain Maps: Structure of the Rat Brain* (2nd ed.). Amsterdam; New York: Elsevier Science.
- Sweeney, L. (1996). Replacing personally-identifying information in medical records: The SCRUB system. *Proceedings of the AMIA Annual Fall Symposium*, Washington, DC, pp. 333–337.
- Swets, J.A. (1973). The relative operating characteristic in psychology. *Science*, 182:990.
- Szolovits, P. (ed.) (1982). *Artificial Intelligence in Medicine*. Boulder, CO: Westview Press.
- Szolovits, P., Pauker, S.G. (1979). Computers and clinical decision making: Whether, how much, and for whom? *Proceedings of the IEEE*, 67:1224–1226.
- Tagare, H.D., Jaffe, C.C., Duncan, J. (1997). Medical image databases: A content-based retrieval approach. *Journal of the American Medical Informatics Association*, 4(3):184–198.
- Tagare, H.D., Vos, F.M., Jaffe, C.C., Duncan, J.S. (1995). Arrangement: a spatial relation between parts for evaluating similarity of tomographic section. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 17(9):880–893.
- Talairach, J., Tournoux, P. (1988). *Co-Planar Stereotaxic Atlas of the Human Brain*. New York: Thieme Medical Publishers.
- Tanenbaum, A.S. (1987). *Computer Networks*. (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.
- Tanenbaum, A.S. (1996). *Computer Networks*. (3rd ed.). Englewood Cliffs, NJ: Prentice-Hall.
- Tang, P.C. (2003). *Key Capabilities of an Electronic Health Record System* (Letter Report). Committee on Data Standards for Patient Safety. Board on Health Care Services, Institute of Medicine.
- Tang, P.C., Annevelink, J., Suermondt, H.J., Young, C.Y. (1994). Semantic integration in a physician's workstation. *International Journal of Bio-Medical Computing*, 35(1):47–60.

- Tang, P.C., Fafchamps, D., Shortliffe, E.H. (1994). Traditional medical records as a source of clinical data in the outpatient setting. *Proceedings of the 18th Annual Symposium on Computer Applications in Medical Care*, Washington, DC, pp. 575–579.
- Tang, P.C., Marquardt, W.C., Boggs, B., et al. (1999). NetReach: Building a clinical infrastructure for the enterprise. In Overhage JM (ed.) *Fourth Annual Proceedings of the Davies CPR Recognition Symposium*, pp. 25–68. Chicago: McGraw-Hill.
- Tang, P.C., McDonald, C J. (2001). Computer-Based Patient-Record Systems. In E.H. Shortliffe & L.E. Perreault (eds.), *Medical Informatics* (2nd ed.), pp. 327–358. New York: Springer Verlag.
- Tang, P., Newcomb, C., et al. (1997). Meeting the information needs of patients: Results from a patient focus group. *Proceedings of the 1997 AMIA Annual Fall Symposium*, Nashville, TN. Hanley & Belfus, pp. 672–676.
- Tang, P.C., Patel, V.L. (1993). Major issues in user interface design for health professional workstations: Summary and recommendations. *International Journal of Bio-Medical Computing*, 34(104):139–148.
- Tarczy-Hornuch, P., Kwan-Gett, T.S., Fouche, L., Hoath, J., Fuller, S., Ibrahim, K.N., Ketchell, D.S., LoGerfo, J.P., Goldberg, H. (1997). Meeting clinician information needs by integrating access to the medical record and knowledge sources via the Web. *Proceedings of the 1997 AMIA Annual Fall Symposium*, Nashville, TN, pp. 809–813.
- Tatro, D., Briggs, R., Chavez-Pardo, R., Hannigan, J., Moore, T., Cohen, S. (1975). Online drug interaction surveillance. *American Journal of Hospital Pharmacy*, 32:417.
- Taylor, H., Leitman, R. (2001). *The Increasing Impact of eHealth on Physician Behavior*. Harris Interactive. (Accessed 2005 at: http://www.harrisinteractive.com/news/newsletters/healthnews/HI_HealthCareNews2001Vol1_iss31.pdf)
- Teach, R.L., Shortliffe, E.H. (1981). An analysis of physician attitudes regarding computer-based clinical consultation systems. *Computers and Biomedical Research*, 14(6):542–558.
- Teich, J.M. (ed.) (1997). *Proceedings of the Third Annual Nicholas E. Davies CPR Recognition Symposium*. Schaumburg, IL: Computer-based Patient Record Institute.
- Teich, J.M., Glaser, J.P., Beckley, R.F. (1996). Toward cost-effective, quality care: the Brigham Integrated Computing System. In E.B. Steen (ed.), *Proceedings of the Second Annual Nicholas E. Davies CPR Recognition Symposium*. (Vol. 2), pp.3–34. Schaumburg, IL: Computer-Based Patient Record Institute.
- Teich, JM, Glaser, JP, Beckley, RF, et al. (1999). The Brigham integrated computing system (BICS): Advanced clinical systems in an academic hospital environment. *Int J Med Inf*, 54(3):197–208.
- Teich, J.M., Kuperman, G.J., Bates, D.W. (1997). Clinical decision support: Making the transition from the hospital to the community network. *Healthcare Information Management*, 11(4):27–37.
- Teich, J.M., Merchia, P.R., Schmiz, J.L., Kuperman, G.J., Spurr, C.D., Bates, D.W. (2000). Effects of computerized physician order entry on prescribing practices. *Arch Intern Med*, 160(18):2741–2747.
- Telecommunication N. (1992). *NCPDP Telecommunication Standard Format*. (Version 3.2).
- Templeton, A.W., Dwyer, S.J., Johnson, J.A., Anderson, W.H., Hensley, K.S., Rosenthal, S.J., Lee, K.R., Preston, D.F., Batnitzky, S., Price, H.I. (1984). An on-line digital image management system. *Radiology*, 152(2):321–325.
- Terry, K. (2002). Beam it up, Doctor: Inexpensive wireless networking technology, now available on PDAs and tablet computers, can connect you with clinical and scheduling data throughout your office. *Med Econ*. 79(13):34–6.
- Thompson, P., Toga, A.W. (1996). A surface-based technique for warping three-dimensional images of the brain. *IEEE Transactions on Medical Imaging*, 15(4):402–417.
- Thompson, P.M., Mega, M.S., Toga, A.W. (2001). Disease-specific brain atlases. In J.C. Mazziotta & A. W. Toga (eds.), *Brain Mapping III: The Disorders*. New York: Academic Press.

- Thompson, P.M., Toga, A.W. (1997). Detection, visualization and animation of abnormal anatomic structure with a deformable probabilistic brain atlas based on random vector field transformations. *Med Image Anal*, 1, 271–294.
- Thompson, Tommy G. (2002). *The State Children's Health Insurance Program: A Summary Evaluation of States' Early Experience with SCHIP*. Washington, DC: Dept of Health and Human Services.
- Tibbo, H. (2001). Archival perspectives on the emerging digital library. *Communications of the ACM*, 44(5): 69–70.
- Tierney, W.M., McDonald, C.J. (1991). Practice databases and their uses in clinical research. *Stat Med*, 10(4):541–57.
- Tierney, W.M., Miller, M.E., Overhage, J.M., McDonald, C.J. (1993). Physician inpatient order writing on microcomputer workstations: Effects on resource utilization. *Journal of the American Medical Association*, 269(3):379–383.
- Todd, W., Harris, R.L., Schwarz, E., Bradnam, K., Lawson, D., Chen, W., Blasier, D., Kenny, E., Cunningham, F., Kishore, R., Chan, J., Muller, H.M., Petcherski, A., Thorisson, G., Day, A., Bieri, T., Rogers, A., Chen, C.K., Spieth, J., Sternberg, P., Durbin, R., Stein, L.D. (2003). WormBase: A cross-species database for comparative genomics. *Nucleic Acids Research*; 31:133–137.
- Toga, A.W. (2001a). *Brain Atlases*. (Accessed 2005 at: <http://www.loni.ucla.edu/Atlases/>)
- Toga, A.W. (2001b). *UCLA Laboratory for Neuro Imaging (LONI)*. (Accessed 2005 at: <http://www.loni.ucla.edu/>)
- Toga, A.W., Ambach, K.L., Schluender, S. (1994). High-resolution anatomy from in situ human brain. *Neuroimage*, 1(4), 334–344.
- Toga, A.W., Frackowiak, R.S.J., Mazziotta, J.C. (eds.). (2001). *Neuroimage: A Journal of Brain Function*. New York: Academic Press.
- Toga, A.W., Santori, E.M., Hazani, R., Ambach, K. (1995). A 3-D digital map of rat brain. *Brain Research Bulletin*, 38(1), 77–85.
- Toga, A.W., Thompson, P.W. (2001). Maps of the brain. *Anatomical Record (New Anat.)*, 265, 37–53.
- Tolbert, S., Pertuz, A. (1977). Study shows how computerization affects nursing activities in ICU. *Hospitals*, 51(17):79.
- Torrance, G.W., Feeny, D. (1989). Utilities and quality-adjusted life years. *International Journal of Technology Assessment in Health Care*, 5(4):559–75.
- Tsien, C.L., Fackler, J.C. (1997). Poor prognosis for existing monitors in the intensive care unit. *Critical Care Medicine*, 25(4):614–619.
- Tsui, F.C., Espino, J.U., Dato, V.M., Gesteland, P.H., Hutman, J., Wagner, M.M. (2003). Technical Description of RODS: A Real-time Public Health Surveillance System. *J Am Med Inform Assoc*, 10(5):399–408.
- Tu, S., Musen, M.A. (1996). The EON model of intervention protocols and guidelines. *Proceedings of the AMIA Annual Fall Symposium*, Washington, DC, pp. 587–591.
- Tu, S.W., Ericsson, H., Gennari, J.H., Shahar, Y., Musen, M.A. (1995). Ontology-based configuration of problem-solving methods and generation of knowledge-acquisition tools: Application of PROTÉGÉ-II to protocol-based decision support. *Artificial Intelligence in Medicine*, 7(3):257–289.
- Tu, S.W., Kemper, C.A., Lane, N.M., Carlson, R.W., Musen, M.A. (1993). A methodology for determining patients' eligibility for clinical trials. *Methods of Information in Medicine*, 32(4):317–325.
- Tunis, S.R., Hayward, R.S., Wilson, M.C., Rubin, H.R., Bass, E.B., Johnston, M., et al. (1994). Internists' attitudes about clinical practice guidelines. *Ann Intern Med*, 120(11), 956–963.
- Turing, A.M. (1950). Computing machinery and intelligence. *Mind*, 59:433–460.

- Tversky, A., Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, 185:1124–1131.
- Tysyer, D.A. (1997). Copyright law: databases. *Bitlaw*, (Accessed 2005 at: <http://www.bitlaw.com/copyright/database.html>)
- Ullman, J.D., Widom, J. (1997). *A First Course in Database Systems*. New Jersey: Prentice Hall.
- U.S. Bureau of the Census (continuously updated), Population Estimates and Population Projections, www.census.gov.
- United States General Accounting Office (1993). *Automated Medical Records: Leadership Needed to Expedite Standards Development: Report to the Chairman/Committee on Governmental Affairs*. Washington, D.C.: U.S. Senate, USGAO/IMTEC-93–17.
- van der Lei, J., Musen, M.A. (1991). A model for critiquing based on automated medical records. *Computers and Biomedical Research*, 24(4):344–378.
- van der Lei, J., Musen, M.A., van der Does, E., Man in 't Veld, A.J., van Bommel, J.H. (1991). Comparison of computer-aided and human review of general practitioners' management of hypertension. *Lancet*, 338(8781):1504–1508.
- van Heijst, G., Falasconi, S., Abu-Hanna, A., Schreiber, G., Stefanelli, M. (1995). A case study in ontology library construction. *Artificial Intelligence in Medicine*, 7(3):227–255.
- vanBommel, J.H., Musen, M.A. (1997). *Handbook of Medical Informatics*. Heidelberg/New York: Bohn Stafleu Van Loghum, Houten, and Springer-Verlag.
- van Dijk, T.A., & Kintsch, W. (1983). *Strategies of Discourse Comprehension*. New York: Academic.
- Van Essen, D.C. (2002). Windows on the brain. The emerging role of atlases and databases in neuroscience. *Curr. Op. Neurobiol.*, 12:574–579.
- Van Essen, D.C., Drury, H.A. (1997). Structural and functional analysis of human cerebral cortex using a surface-based atlas. *J. Neuroscience*, 17(18):7079–7102.
- Van Essen, D.C., Drury, H.A., Dickson, J., Harwell, J., Hanlon, D., Anderson, C.H. (2001). An integrated software suite for surface-based analysis of cerebral cortex. *J Am Med Ass*, 8(5):443–459.
- Van Essen, D.C., Drury, H.A., Joshi, S., Miller, M.I. (1998). Functional and structural mapping of human cerebral cortex: solutions are in the surfaces. *Proc. National Academy of Sciences*, 95:788–795.
- VandeSompel, H., Lagoze, C. (1999). The Santa Fe Convention of the Open Archives Initiative. *D-Lib Magazine*, 5. (Accessed 2005 at: <http://www.dlib.org/dlib/february00/vandesompel-oai/02vandesompel-oai.html>)
- Vannier, M.W., Marsh, J.W. (1996). Three-dimensional imaging, surgical planning, and image-guided therapy. In Greenes, R.A. and Bauman, R.A. (eds.) *Imaging and information management: computer systems for a changing health care environment. The Radiology Clinics of North America*, 34(3):545–563.
- Van Noorden, S. (2002). Advances in immunocytochemistry. *Folia Histochem Cytobiol*, 40(2): 121–124.
- vanRijsbergen, C. (1979). *Information Retrieval*. London. Butterworth.
- van 't Veer, L.J., Dai, H., van de Vijver, M.J., et al. (2002). *Gene expression profiling predicts clinical outcome of breast cancer. Nature*. 415(6871):484–485.
- Varmus, H. (1999). *PubMed Central: A Proposal for Electronic Publication in the Biomedical Sciences*. National Institutes of Health. (Accessed 2005 at: <http://www.nih.gov/welcome/director/ebiomed/ebi.htm>)
- Varon, J., Marik, P.E. (2002). Clinical information systems and the electronic medical record in the intensive care unit. *Curr Opin Crit Care*, 8(6):614–624
- Vetterli, M., Kovarevic, J. (1995). *Wavelets and Subband Coding*. Englewood Cliffs, NJ: Prentice Hall.

- Vicente, K.J. (1999). *Cognitive Work Analysis: Toward Safe, Productive & Healthy Computer-Based Work*. Mahwah, N.J.: Lawrence Erlbaum Associates.
- Vogel, L.H. (2003). Finding value from information technology investments: Exploring the elusive ROI in healthcare. *Journal for Health Information Management*, 17(4):20–28.
- Voorhees, E. (1998). Variations in relevance judgments and the measurement of retrieval effectiveness. *Proceedings of the 21st Annual International ACM SIGIR Conference on Research and Development in Information Retrieval*, Melbourne, Australia, pp.315–323. ACM Press.
- Voorhees, E., Harman, D. (2000). Overview of the Sixth Text REtrieval Conference (TREC). *Information Processing and Management*, 36: 3–36.
- Voorhees, E., Harman, D. (2001). Overview of TREC 2001. *Proceedings of the Text Retrieval Conference 2001*, Gaithersburg, MD, pp. 1–15.
- Vosniadou, S. (1996). *International Perspectives on the Design of Technology-Supported Learning Environments*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Wachter, S.B., Agutter, J., Syroid, N., Drews, F., Weinger, M.B., Westenskow, D. (2003). The employment of an iterative design process to develop a pulmonary graphical display. *J Am Med Inform Assoc*, 10(4):363–372.
- Wagner, M.M., Dato, V., Dowling, J.N., Allswede, M. (2003). Representative threats for research in public health surveillance. *J Biomed Informatics*, 36(3):177–88.
- Wake, M.M., Murphy, M., Affara, F.A., Lang, N.M., Clark, J., Mortensen, R. (1993). Toward an international classification for nursing practice: A literature review and survey. *International Nursing Review*, 40(3):77–80.
- Walker, J., Pan, E., Johnston, D., Adler-Milstein, J., Bates, D.W., Middleton, B. (2004). *The Value of Healthcare Information Exchange and Interoperability*. Boston, MA: Centre for Information Technology Leadership.
- Wang, A.Y., Sable, J.H., Spackman, K.A. (2002). The SNOMED clinical terms development process: Refinement and analysis of content. *Proceedings of the AMIA Annual Symp*, pp. 845–9.
- Ware, C. (2003). Design as applied perception. In J. M. Carroll (ed.), *HCI Models, Theories and Frameworks*, pp. 11–26. San Francisco, CA: Morgan Kaufmann.
- Warner, H.R. (1979). *Computer-Assisted Medical Decision-Making*. New York: Academic Press.
- Warner, H.R., Gardner, R.M., Toronto, A.F. (1968). Computer-based monitoring of cardiovascular function in postoperative patients. *Circulation*, 37(4 Suppl):II68–II74.
- Warner, H.R., Toronto, A.F., Veasy, L. (1964). Experience with Bayes' theorem for computer diagnosis of congenital heart disease. *Annals of the New York Academy of Science*, 115:2–16.
- Warren, J.J., Hoskins, L.M. (1995). NANDA's nursing diagnosis taxonomy: A nursing database, In *Nursing Data Systems: The Emerging Framework*, pp.49–59 Washington, D.C.: American Nurses Publishing.
- Watson, J., Crick, F. (1953). A structure for deoxyribose nucleic acid, *Nature*, 171:737.
- Watson, R.J. (1977). A large-scale professionally oriented medical information system: Five years later. *Journal of Medical Systems*, 1:3–16.
- Wang, A.Y., Sable, J.H., Spackman, K.A. (2002). The SNOMED clinical terms development process: Refinement and analysis of content. *Proc AMIA Annual Symposium*, pp. 845–849.
- Webster, J.G. (ed.) (1988). *Encyclopedia of Medical Devices and Instrumentation*, New York: Wiley.
- Weed, L.L. (1969). *Medical Records, Medical Education and Patient Care: The Problem-Oriented Record as a Basic Tool*. Chicago, IL: Year Book Medical Publishers.
- Weed, L.L. (1975). Problem-Oriented Medical Information System (PROMIS) Laboratory. In G.A. Giebin & L.L. Hurst (ed.), *Computer Projects in Health Care*. Ann Arbor, MI: Health Administration Press.

- Wei, L., Altman, R.B. (1998). Recognizing protein binding sites using statistical descriptions of their 3D environments. *Proceedings of the Pacific Symposium on Biocomputing '98*, Singapore, pp. 497–508.
- Weibel, S. (1996). The Dublin Core: A simple content description model for electronic resources. *ASIS Bulletin*, 24(1): 9–11.
- Weibel, W.R. (1979). *Stereological Methods*. New York: Academic Press.
- Weil, T.P. (2001) *Health Networks: Can They Be the Solution?*, Ann Arbor, Michigan, University of Michigan Press.
- Weinberg, A.D. (1973). CAI at the Ohio State University College of Medicine. *Computers in Biology and Medicine*, 3(3):299–305.
- Weiner, J., Parente, S., et al. (1995). Variation in office-based quality: A claims-based profile of care provided to Medicare patients with diabetes. *Journal of the American Medical Association*, 273:1503–1508.
- Weinfurt, P.T. (1990). Electrocardiographic monitoring: An overview. *Journal of Clinical Monitoring*, 6(2):132–138.
- Weinger, M.B., Slagle, J. (2001). Human factors research in anesthesia patient safety. *Proc AMIA Annual Fall Symp*, pp. 756–760.
- Weinstein, M.C., Fineberg, H. (1980). *Clinical Decision Analysis*. Philadelphia: W. B. Saunders.
- Weissleder, R., Mahmood, U. (2001). Molecular imaging. *Radiology*, 219,316–333.
- Wellcome Department of Cognitive Neurology. (2001). *Statistical Parametric Mapping*. (Accessed 2005 at: <http://www.fil.ion.ucl.ac.uk/spm/>)
- Weller, C.D. (1984). “Free Choice” as a restraint of trade in American health care delivery and insurance. *Iowa Law Review*, 69(5):1351–1378 and 1382–1392.
- Wennberg, J. (1998). *The Dartmouth Atlas of Health Care in the United States*. Dartmouth Medical School: American Hospital Publishing Inc.
- Wennberg, J.E., Cooper, M.M. (eds) (1999). *The Quality of Medical Care in the United States: A Report on the Medicare Program*, Chicago: American Hospital Association.
- Wennberg, J., Gittelsohn, A. (1973). Small area variations in health care delivery. *Science*, 182(117):1102–1108.
- Werley, H.H., Lang, N.M. (eds.) (1988). *Identification of the Nursing Minimum Data Set*. New York: Springer.
- Westwood, J.D., Hoffman, H.M., Stredney, D., Weghorst, S.J. (1998). *Medicine Meets Virtual Reality*. Amsterdam: IOS Press.
- White, B.Y., Frederiksen, J.R. (1990). Causal model progressions as a foundation for intelligent learning environments. In W. J. Clancey & E. Soloway (eds.), *Artificial Intelligence and Learning Environments* (Special issues of *Artificial Intelligence*), pp. 99–157.
- White House (1997). Remarks by President Clinton in Announcement on Immunization-Child Care.
- Whitely, W.P., Rennie, D., Hafner, A.W. (1994). The scientific community’s response to evidence of fraudulent publication: The Robert Slutsky case. *Journal of the American Medical Association*, 272(2):170–173.
- Whiting-O’Keefe, Q.E., Simborg, D.W., Epstein, W.V. (1980). A controlled experiment to evaluate the use of a time-oriented summary medical record. *Medical Care*, 18(8):842–852.
- Whiting-O’Keefe, Q.E., Simborg, D.W., Epstein, W.V., Warger, A. (1985). A computerized summary medical record system can provide more information than the standard medical record. *Journal of the American Medical Association*, 254(9):1185–1192.
- Widman, L.E., Tong, D.A. (1997). Requests for medical advice from patients and families to health care providers who publish on the World Wide Web. *Archives of Internal Medicine*, 15(2):209–212.

- Wiederhold, G. (1981). *Databases for Health Care*. New York: Springer-Verlag.
- Wiederhold, G., Bilello, M., Sarathy, V., Qian, X. (1996). A security mediator for health care information. *Proceedings of the AMIA Annual Fall Symposium*, Washington, DC, pp. 120–124.
- Wiederhold, G., Clayton, P.D. (1985). Processing biological data in real time. *M.D. Computing*, 2(6):16–25.
- Wilcox, A., Hripcsak, G. (1999) Classification algorithms applied to narrative reports. *Proc AMIA Annual Symposium*, pp. 455–59.
- Wildemuth, B., deBliek, R., et al. (1995). Medical students' personal knowledge, searching proficiency, and database use in problem solving. *Journal of the American Society for Information Science*, 46:590–607.
- Williams, D., Counselman, F., et al. (1996). Emergency department discharge instructions and patient literacy: a problem of disparity. *American Journal of Emergency Medicine*, 14:19–22.
- Williams, R.M., Baker, L.M., Marshall, J.G. (1992). *Information Searching*. Thorofare, NJ: Slack.
- Wilson, M.C., Hayward, R.S., Tunis, S.R., Bass, E.B., Guyatt, G. (1995). User's guides to the medical literature. VIII.: How to use clinical practice guidelines. *JAMA* 274(20):1630–1632.
- Wilson, T. (1990). *Confocal Microscopy*. San Diego: Academic Press Ltd.
- Wilson, A.L., Hill, J.J., Wilson, R.G., Nipper, K., Kwon, I.W. (1997). Computerized medication administration records decrease medication occurrences. *Pharm Pract Manag Q*, 17(1):17–29.
- Winograd, T., Flores, F. (1987). *Understanding Computers and Cognition: A New Foundation for Design*. Reading, MA: Addison-Wesley.
- Winston, P.H., Narasimhan, S. (1996). *On to Java*. Reading, MA: Addison Wesley.
- Wittenber, J., Shabot, M.M. (1990). Progress report: The medical device data language for the IEEE 1073 medical information bus. *International Journal of Clinical Monitoring and Computing*, 7(2):91–98.
- Wong, B.A., Rosse, C., & Brinkley, J.F. (1999). Semi-automatic scene generation using the Digital Anatomist Foundational Model (UW, Trans.). *Proceedings of the AMIA Annual Symposium*, pp. 637–641. Washington, D.C.
- Wong, S.T., Tjandra, D., Wang, H., Shen, W. (2003). Workflow-enabled distributed component-based information architecture for digital medical imaging enterprises. *IEEE Trans Inf Technol Biomed*. 7(3):171–183.
- Wood, E.H. (1994). MEDLINE: The options for health professionals. *Journal of the American Medical Informatics Association*, 1(5):372–380.
- Woods, R.P., Cherry, S.R., Mazziotta, J.C. (1992). Rapid automated algorithm for aligning and reslicing PET images. *J. Comp. Assisted Tomogr.*, 16:620–633.
- Woods, R.P., Mazziotta, J.C., Cherry, S.R. (1993). MRI-PET registration with automated algorithm. *J. Comp. Assisted Tomogr.*, 17:536–546.
- Woods, J.W. (ed.) (1991). *Subband Image Coding*. Boston, MA: Kluwer Academic Computer Publishers.
- Woolhandler, S., Himmelstein D.U. (1997). Costs of care and administration at for-profit and other hospitals in the United States. *New England Journal of Medicine*, 336(11):769–774.
- World Health Organization (1977). *Ninth Edition. International Classification of Diseases Index. Manual for the International Statistical Classification of Diseases*. Geneva: The World Health Organization.
- World Health Organization (1992). *International Classification of Diseases Index. Tenth Revision. Volume 1: Tabular List*. Geneva: The World Health Organization.
- Wright, P.C., Fields, R.E., Harrison, M.D. (2000). Analyzing human-computer interaction as distributed cognition: The resources model. *Human-Computer Interaction*, 15(1),1–41.
- Wyatt, J.C. (1989). Lessons learned from the field trial of ACORN, an expert system to advise on chest pain. *Proceedings of Medinfo 1989*, Singapore, pp. 111–115.

- Wyatt, J.C. (1991a). *A Method for Developing Medical Decision-Aids Applied to ACORN, a Chest Pain Advisor*. Unpublished DM thesis, Oxford University.
- Wyatt, J.C. (1991b). Use and sources of medical knowledge. *Lancet*, 338(8779):1368–1373.
- Wyatt, J.C., Altman, D.G. (1995). Prognostic models: clinically useful, or quickly forgotten? *British Medical Journal*, 311:1539–1541.
- Wyatt, J.C., Spiegelhalter, D. (1990). Evaluating medical expert systems: What to test and how? *Medical Informatics*, 15(3):205–217.
- Wyatt, J., Wyatt, S. (2003). When and how to evaluate health information systems? *Int J Med Inf*; 69: 251–9.
- Xu, J., Croft, W. (1996). Query expansion using local and global document analysis. *Proceedings of the 19th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval*, Zurich, Switzerland. ACM Press, pp. 4–11.
- Yamazaki, S, Satomura, Y. (2000). Standard method for describing an electronic patient record template: Application of XML to share domain knowledge. *Methods Inf Med*, 39(1):50–5.
- Yasnoff, W.A. (2003). Case study: An immunization data collection system for private providers. In O'Carroll, P.W., Yasnoff, W.A., Ward, M.E., Ripp, L.H., Martin, E.L. (eds.): *Public Health Informatics and Information Systems*. New York: Springer-Verlag, pp. 691–709.
- Yasnoff, W.A., Miller, P.L. (2003). Decision support and expert systems in public health. In O'Carroll, P.W., Yasnoff, W.A., Ward, M.E., Ripp, L.H., Martin, E.L. (eds.): *Public Health Informatics and Information Systems*. New York: Springer-Verlag, pp.494–512.
- Yasnoff, W.A., Humphreys, B.L., Overhage, J.M., Detmer, D.E., Brennan, P.F., Morris, R.W., Middleton, B., Bates, D.W., Fanning, J.P. (2004). A consensus action agenda for achieving the national health information infrastructure. *J Am Med Informatics Assoc* 11(4):332–338.
- Yasnoff, W.A., O'Carroll, P.W., Koo, D., Linkins, R.W., Kilbourne, E.M. (2000). Public Health Informatics: Improving and transforming public health in the information age. *Journal of Public Health Management & Practice*, 6(6):67–75.
- Young, D.W. (1980). An aid to reducing unnecessary investigations. *British Medical Journal*, 281(6225):1610–1611.
- Young, F. (1987). Validation of medical software: Present policy of the Food and Drug Administration. *Annals of Internal Medicine*, 106:628.
- Young, W.H., Gardner, R.M., East, T.D., Turner, K. (1997). Computerized ventilator charting: Artifact rejection and data reduction. *International Journal of Clinical Monitoring and Computing*, 14(3):165–176.
- Youngner, S.J. (1988). Who defines futility? *Journal of the American Medical Association*, 260(14):2094–2095.
- Yu, V.L., Buchanan, B.G., Shortliffe, E.H., Wraith, S.M., Davis, R., Scott, A.C., Cohen, S.N. (1979). Evaluating the performance of a computer-based consultant. *Computer Programs in Biomedicine*, 9(1):95–102.
- Yu, V.L., Fagan, L.M., Wraith, S.M., Clancey, W.J., Scott, A.C., Hannigan, J., Blum, R.L., Buchanan, B.G., Cohen, S.N. (1979). Antimicrobial selection by a computer. A blinded evaluation by infectious disease experts. *Journal of the American Medical Association*, 242(12):1279–1282.
- Zachary, W.W., Strong, G.W., Zaklad, A. (1984). Information systems ethnography: Integrating anthropological methods into system design to insure organizational acceptance. In Hendrick, H.W., Brown, O. (eds.), *Human Factors in Organizational Design and Management*, pp.223–227. Amsterdam: North Holland Press.
- Zhang, J. (1997a). Distributed representation as a principle for the analysis of cockpit information displays. *International Journal of Aviation Psychology*, 7(2):105–121.
- Zhang, J. (1997b). The nature of external representations in problem solving. *Cognitive Science*, 21(2):179–217.

- Zhang, J., Johnson, T.R., Patel, V.L., Paige, D.L., Kubose, T. (2003). Using usability heuristics to evaluate patient safety of medical devices. *Journal of Biomedical Informatics*, 36(1–2):23–30.
- Zhang, J., Norman, D.A. (1994). Representations in distributed cognitive tasks. *Cognitive Science*, 18:87–122.
- Zhang, J., Patel, V.L., Johnson, K.A., Malin, J. (2002). Designing human-centered distributed information systems. *IEEE Intelligent Systems*, 17(5):42–47.
- Zhang, J., Patel, V.L., Johnson, T.R. (2002). Medical error: Is the solution medical or cognitive? *Journal of the American Medical Informatics Association*, 9(6 Suppl):75–77.
- Zielstorff, R.D., Barnett, G.O., Fitzmaurice, J.B., Estey, G., Hamilton, G., Vickery, A., Welebob, E., Shahzad, C. (1996). A decision support system for prevention and treatment of pressure ulcers based on AHCPR guidelines. *Proceedings of the AMIA Annual Fall Symposium*, Washington, DC, pp. 562–566.
- Zielstorff, R.D., Hudgings, C.I., Grobe, S.J. (1993). *Next-Generation Nursing Information Systems: Essential Characteristics for Nursing Practice*. Washington, DC: American Nurses Publishing.
- Zijdenbos, A.P., Evans, A.C., Riahi, F., Sled, J., Chui, J., Kollokian, V. (1996). Automatic quantification of multiple sclerosis lesion volume using stereotactic space, *Proc. 4th Int. Conf. on Visualization in Biomedical Computing*, pp. 439–448. Hamburg.
- Zuriff, G.E. (1985). *Behaviorism: A Conceptual Reconstruction*. New York: Columbia University Press.
- Zweigenbaum, P., Courtois, P. (1998). Acquisition of lexical resources from SNOMED for medical language processing. *Proceedings of Medinfo 1998*; Pt 1:586–90.

Glossary

[Key chapters in which a term is used are indicated in square brackets.]

Abstraction: A level of medical data encoding that entails examining the recorded data and selecting an item from a terminology with which to label the data. [7]

Accountability: Security function that ensures users are responsible for their access to, and use of, information based on a documented need and right to know. [5]

Acquired immunodeficiency syndrome (AIDS): A disease of the immune system caused by a retrovirus and transmitted chiefly through blood or blood products, characterized by increased susceptibility to opportunistic infections, to certain cancers, and to neurological disorders. [3,15,21]

Active storage: In a hierarchical data storage scheme, the devices used to store data that have long-term validity and that must be accessed rapidly. [5]

Address: In a computer system, a number or symbol that identifies a particular cell of memory. [5]

Administrative services only (ASO): The practice by employers of paying their employees' medical bills directly (self-insurance), and hiring insurance companies only to process claims. [23]

Admission-discharge-transfer (ADT): The core component of a hospital information system that maintains and updates the hospital census, including bed assignments of patients. [13]

Advanced Research Projects Agency Network (ARPANET): A large wide-area network created in the 1960s by the U.S. Department of Defense Advanced Research Projects Agency (DARPA) for the free exchange of information among universities and research organizations; the precursor to today's Internet. [1,5]

Advice nurse: A health professional, typically trained in nursing, who is available by telephone to answer patients' questions and to help them to make appropriate use of health services. [23]

Aggregate content: Information from multiple sources, which can be viewed within an information retrieval system using a single interface. [19]

Alert message: A computer-generated warning that is generated when a record meets pre-specified criteria; e.g., receipt of a new laboratory test result with an abnormal value. [12]

Algorithm: A well-defined procedure or sequence of steps for solving a problem. [1]

Allocation bias: Overestimation of the effects of an intervention caused by systematic assignment of favorable subjects to the study group by investigators. [11]

Alphabetic ranking: A common ranking criterion used by information retrieval systems; for a particular field in the database, results are output based on the order of the field's first word in the alphabet. [19]

Alphanumeric: Descriptor of data that are represented as a string of letters and numeric digits, without spaces or punctuation. [19]

Ambulatory medical record system (AMRS): A clinical information system designed to support all information requirements of an outpatient clinic, including registration, appointment scheduling, billing, order entry, results reporting, and clinical documentation. [13]

American Standard Code for Information Interchange (ASCII): A 7-bit code for representing alphanumeric characters and other symbols. [5]

Analog signal: A signal that takes on a continuous range of values. [5]

Analog-to-digital conversion (ADC): Conversion of sampled values from a continuous-valued signal to a discrete-valued digital representation. [5,17]

Anchoring and adjustment: A heuristic used when estimating probability, in which a person first makes a rough approximation (the anchor) and then adjusts this estimate to account for additional information. [3]

Angiography: A technique used to increase the contrast resolution of X-ray images of the blood vessels by injection of radiopaque contrast material into the vessels. [9,18]

Antibiotic-assistant program: A computer program developed to assist physicians in ordering antibiotics for patients who have, or who are suspected of having, an infection. [17]

Applets: Small computer programs that can be embedded in an HTML document and that will execute on the user's computer when referenced. [5]

Application program: A computer program designed to accomplish a user-level task. [5]

Applications research: Systematic investigation or experimentation with the goal of applying knowledge to achieve practical ends. [1]

Arc (in an influence diagram): A diagrammatic element that appears between two chance nodes and indicates that a probabilistic dependency relationship may exist between them. [3]

Archival storage: In a hierarchical data storage scheme, the devices used to store data for long-term backup, documentary, or legal purposes. [5]

Arden Syntax: A coding scheme or language that provides a canonical means for writing rules (Medical Logic Modules), which relate specific patient situations to appropriate actions for practitioners to follow. The Arden Syntax standard is maintained by HL7. [7,20]

Art criticism approach: An evaluation approach that relies on the review and opinions of an experienced and respected critic to highlight an information resource's strengths and weaknesses. [11]

Artificial intelligence (AI): The branch of computer science concerned with endowing computers with the ability to simulate intelligent human behavior. [1,20,21]

Artificial neural network (ANN): A computer program that performs classification by taking as input a set of findings that describe a given situation, propagating calculated weights through a network of several layers of interconnected nodes, and generating as output a set of numbers, where each output corresponds to the likelihood of a particular classification that could explain the findings. [20]

Assembler: A computer program that translates assembly-language programs into machine-language instructions. [5]

Assembly language: A low-level language for writing computer programs using symbolic names and addresses within the computer's memory. [5]

Assessment bias: Overestimation (or underestimation) of the effects of an intervention caused by systematic favorable (or unfavorable) evaluations of results by the investigators. [11]

Asynchronous transfer mode (ATM): A network protocol designed for sending streams of small, fixed-length cells of information over very high-speed, dedicated connections, often digital optical circuits. [5]

ATTENDING: A standalone decision-support program that critiqued a patient-specific plan for anesthetic selection, induction, and administration after that plan had been proposed by the anesthesiologist who would be managing the case. [20]

Audit trail: A chronological record of all accesses and changes to data records, often used to promote accountability for use of, and access to, medical data. [5]

Augmented reality: A user-interface method in which a computer-generated scene is superimposed on the real world, usually by painting the scene on semi-transparent goggles that track the motion of the head. [21]

Authentication: A process for positive and unique identification of users, implemented to control system access. [5]

Authoring system: In computer-aided instruction, a specialized, high-level language used by educators to create computer-based teaching programs. [21]

Authorization: Within a system, a process for limiting user activities only to actions defined as appropriate based on the user's role. [5]

Automated indexing: The most common method of full-text indexing; words in a document are stripped of common suffixes, entered as items in the index, then assigned weights based on their ability to discriminate among documents (see **vector-space model**). [19]

Availability: In decision making, a heuristic method by which a person estimates the probability of an event based on the ease with which he can recall similar events. [3] In security systems, a function that ensures delivery of accurate and up-to-date information to authorized users when needed. [5]

Averaging out at chance nodes: The process by which each chance node of a decision tree is replaced in the tree by the expected value of the event that it represents. [3]

Backbone links: Sections of high-capacity trunk (backbone) network that interconnect regional and local networks. [5]

Backbone network: A high-speed communication network that carries major traffic between smaller networks. [1]

Background question: A question that asks for general information on a topic (see also **foreground question**). [19]

Back-projection: A method for reconstructing images, in which the measured attenuation along a path is distributed uniformly across all pixels along the path. [9]

Bandwidth: The capacity for information transmission; the number of bits that can be transmitted per unit of time. [1,5]

Baseband transmission: A data transmission technique in which bits are sent without modulation (see modem). [5]

Baseline measurement: An observation collected prior to an intervention and used for comparison with an associated study observation. [11]

Baseline rate, population: The prevalence of the condition under consideration in the population from which the subject was selected; **individual:** The frequency, rate, or degree of a condition before an intervention or other perturbation. [2]

Basic Linear Alignment and Search Technique (BLAST): An algorithm for determining optimal genetic sequence alignments based on the observations that sections of proteins are often conserved without gaps and that there are statistical analyses of the occurrence of small subsequences within larger sequences that can be used to prune the search for matching sequences in a large database. [22]

Basic research: Systematic investigation or experimentation with the goal of discovering new knowledge, often by proposing new generalizations from the results of several experiments. [1]

Basic science: The enterprise of performing basic research. [1]

Batch mode: A noninteractive mode of using a computer, in which users submit jobs for processing and receive results on completion (see time-sharing mode). [5]

Baud rate: The rate of information transfer; at lower speeds, baud rate is equal to the number of bits per second being sent. [5]

Bayes' theorem: An algebraic expression often used in clinical diagnosis for calculating posttest probability of a condition (e.g., a disease) if the pretest probability (prevalence) of the condition, as well as the sensitivity and specificity of the test, are known (also called Bayes' rule). Bayes' theorem also has broad applicability in other areas of biomedical informatics where probabilistic inference is pertinent, including the interpretation of data in bioinformatics. [3]

Bayesian diagnosis program: A computer-based system that uses Bayes' theorem to assist a user in developing and refining a differential diagnosis. [20]

Before–after study: An experiment that compares study measurements to the same (baseline) measurements collected prior to introduction of the resource of interest (see historically controlled experiment). [11]

Behaviorism: A social science framework for analyzing and modifying behavior. [4]

Belief network: A diagrammatic representation used to perform probabilistic inference; an influence diagram that has only chance nodes. [3,20]

Bias: A systematic difference in outcome between groups that is caused by a factor other than the intervention under study. [3,11]

Binary: The condition of having only two values or alternatives. [5]

Bibliographic content: In information retrieval, information abstracted from the original source. [19]

Bibliographic database: A collection of citations or pointers to the published literature. [19]

Biocomputation: The field encompassing the modeling and simulation of tissue, cell, and genetic behavior; see **biomedical computing**. [1]

Bioinformatics: The study of how information is represented and transmitted in biological systems, starting at the molecular level. [10,22]

Biomed Central: An independent publishing house specializing in the publication of electronic journals in biomedicine (see www.biomedcentral.com). [19]

Biomedical computing: The use of computers in biology or medicine. [1]

Biomedical engineering: An area of engineering concerned primarily with the research and development of biomedical instrumentation and biomedical devices. [1]

Biomedical informatics: A field of study concerned with the broad range of issues in the management and use of biomedical information, including biomedical computing and the study of the nature of biomedical information itself. Formerly called **medical informatics**, the new name is intended to clarify that the domain encompasses biological and biomolecular informatics as well as clinical, imaging, and public health informatics. [1]

Biomedical Information Science and Technology Initiative (BISTI): An initiative launched by the NIH in 2000 to make optimal use of computer science, mathematics, and technology to address problems in biology and medicine. It includes a consortium of senior-level representatives from each of the NIH institutes and centers plus representatives of other Federal agencies concerned with biocomputing. (see <http://www.bisti.nih.gov>). [1]

Biometric identifier: A measurable physical attribute of an organism (usually, a human being) that helps to establish that individual's identity; examples include fingerprints and retinal scans. [6]

Bit map: A digital representation of an image in memory, in which there is a one-to-one correspondence between groups of bits (one or more bytes) and pixels of a displayed image. [9]

Bit rate: The rate of information transfer; a function of the rate at which signals can be transmitted and the efficacy with which digital information is encoded in the signal. [5]

Bit: A digit that can assume the value of either 0 or 1. [5]

Bit-mapped display: A display screen that is divided into a grid of tiny areas (pixels), each associated with a bit that indicates whether the area is on (black) or off (white). [9]

Body (of e-mail): The portion of a simple electronic mail message that contains the free-text content of the message. [5]

Boolean operators: The mathematical operators AND, OR, and NOT, which are used to combine index terms in information retrieval searching. [19]

Boolean searching: A search method in which search criteria are logically combined using AND, OR, and NOT operators. [19]

Bootstrap: A small set of initial instructions that is stored in read-only memory and executed each time a computer is turned on. Execution of the bootstrap is called *booting* the computer. By analogy, the process of starting larger computer systems. [5]

Bound morpheme: A morpheme that creates a different form of a word but must always occur with another morpheme (e.g., -ed, -s). [8]

Bridge: A device that links or routes signals from one network to another. [5]

Broadband transmission: A data transmission technique in which multiple signals may be transmitted simultaneously, each modulated within an assigned frequency range. [5]

Browser: A user interface to the World Wide Web that allows users to search for and display remote information resources in a suitable format. [6]

Browsing: Scanning a database, a list of files, or the Internet, either for a particular item or for anything that seems to be of interest. [5]

Business services: Remote network services that are designed for controlled or contractual user access (also see **informational services**). [6]

Business logic layer: A conceptual level of system architecture that insulates the applications and processing components from the underlying data and the user interfaces that access the data. [13]

Buttons: Graphic elements within a dialog box or user-selectable areas within an HTML document that, when activated, perform a specified function (such as invoking other HTML documents and services). [5]

Byte: A sequence of 8 bits, often used to store an ASCII character. [5]

Canonical form: A preferred string or name for a term or collection of names; the canonical form may be determined by a set of rules (e.g., “all capital letters with words sorted in alphabetical order”) or may be simply chosen arbitrarily. [19]

Capitated system: System of health care reimbursement in which providers are paid a fixed amount per patient to take care of all the health needs of a population of patients. [12,23]

Capitation: In health care financing, the payment of premiums or dues directly to the provider organization in the form of a fixed periodic payment for comprehensive care, set in advance (also called per capita payment). [23]

Case manager: A health professional assigned to monitor and coordinate a patient’s care across care providers and health settings throughout an episode of treatment. [16]

Cathode-ray tube (CRT): A data output device that displays information by projecting streams of electrons onto a fluorescent screen to create programmed patterns of light and dark or color. [5,17]

Centering theory: A theory that attempts to explain what entities are indicated by referential expressions (such as pronouns) by noting how the center (focus of attention) of each sentence changes across the text. [8]

Centers for Disease Control (and Prevention) (CDC): The U.S. government health agency responsible for monitoring and reporting incidences and trends in infectious disease, bacterial-resistance patterns, and other public health information. [2,15]

Central computer system: A single system that handles all computer applications in an institution using a common set of databases and interfaces. [13]

Central monitor: Computer-based monitoring system with waveform analysis capabilities and high-capacity data storage. [17]

Central processing unit (CPU): The “brain” of the computer. The CPU executes a program stored in main memory by fetching and executing instructions in the program. [5]

Certificate: Coded authorization information that can be verified by a certification authority to grant system access. [5]

Chance node: A symbol that represents a chance event. By convention, a chance node is indicated in a decision tree by a circle. [3]

Charge coupled device (CCD) camera: A device used to convert light directly to digital form without the need for film. [9]

Charges: In a health care institution, the established prices for services; charges often do not reflect the cost of providing the service. [23]

Check tag: In MeSH, terms that represent certain facets of medical studies, such as age, gender, human or nonhuman, and type of grant support; check tags provide additional indexing of bibliographic citations in databases such as Medline. [19]

Checklist effect: The improvement observed in decision making due to more complete and better structured data collection when paper- or computer-based forms are used to collect patient data. [11]

Chronology: The primary ranking criterion in many information retrieval systems, in which the most recent entries are output first. [19]

CINAHL Subject Headings: A set of terms based on MeSH, with additional domain-specific terms added, used for indexing the Cumulative Index to Nursing and Allied Health Literature (CINAHL). [19]

Citation database: A database of citations found in scientific articles, showing the linkages among articles in the scientific literature. [19]

Classification (of features): In image processing, the categorization of segmented regions of an image based on the values of measured parameters, such as area and intensity. [9]

Client-server: Information processing interaction that distributes application processing between a local computer (the client) and a remote computer resource (the server). [5]

Clinical data repository (CDR): Clinical database optimized for storage and retrieval for individual patients and used to support patient care and daily operations. [13]

Clinical decision-support system: A computer-based system that assists physicians in making decisions about patient care. [20]

Clinical Document Architecture (CDA): An HL7 standard for naming and structuring clinical documents, such as reports. [19]

Clinical expert system: A computer program designed to provide decision support for diagnosis or therapy planning at a level of sophistication that an expert physician might provide. [10,20]

Clinical guidelines: Systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances. [1,20]

Clinical informatics: The application of biomedical informatics methods in the patient care domain; a combination of computer science, information science, and clinical science designed to assist in the management and processing of clinical data, information, and knowledge to support clinical practice. [1,16]

Clinical information system (CIS): The components of a health care information system designed to support the delivery of patient care, including order communications, results reporting, care planning, and clinical documentation. [13]

Clinical judgment: Decision making by clinicians that incorporates professional experience and social, ethical, psychological, financial, and other factors in addition to the objective medical data. [10]

Clinical modifications: A published set of changes to the International Classification of Diseases (ICD) that provides additional levels of detail necessary for statistical reporting in the United States. [7]

Clinical pathway: Disease-specific plan that identifies clinical goals, interventions, and expected outcomes by time period. [13,16]

Clinical practice guidelines: See **clinical guidelines**. [4,20]

Clinical prediction rule: A rule derived from statistical analysis of clinical observations that is used to assign a patient to a clinical subgroup with a known probability of disease. [3]

Clinical research: The collection and analysis of medical data acquired during patient care, to improve medical science and the knowledge clinicians use in caring for patients. [10]

Clinical subgroup: A subset of a population in which the members have similar characteristics and symptoms, and therefore similar likelihood of disease. [3]

Clinical trials: Experiments in which data from specific patient interactions are pooled and analyzed in order to learn about the safety and efficacy of new treatments or tests and to gain insight into disease processes that are not otherwise well understood. [1]

Clinically relevant population: The population of patients that is seen in actual practice. In the context of estimating the sensitivity and specificity of a diagnostic test, that group of patients in whom the test actually will be used. [3]

Closed-loop control: Regulation of a physiological variable, such as blood pressure, by monitoring the value of the variable and altering therapy without human intervention. [17]

Coaching system: A computer-based education system that monitors the session and intervenes only when the student requests help or makes serious mistakes (see **tutoring system**). [21]

Coaxial cable: A cable typically used in the cable television industry that has a concentric arrangement of conductors and insulators, usually with a solid wire core, an insulator sheath, and an outer web of conductor wires. [18]

COBOL: COmmon Business Oriented Language. A programming language designed for business data processing and the first ANSI standard programming language. [7]

Coded: Form of data that has been standardized and classified for processing by a computer. [12]

Coding scheme: A system for classifying objects and entities (such as diseases, procedures, or symptoms) using a finite set of numeric or alphanumeric identifiers. [2]

Coercion: A function of a computer language that provides for automatic conversion of data types when a mismatch is identified. [5]

Cognitive artifacts: Human-made materials, devices, and systems that extend people's abilities in perceiving objects, encoding and retrieving information from memory, and problem solving. [4]

Cognitive heuristics: Mental processes by which we learn, recall, or process information; rules of thumb. [3]

Cognitive load: An excess of information that competes for limited cognitive resources, creating a burden on working memory. [4]

Cognitive science: Area of research concerned with studying the processes by which people think and behave. [1,4]

Cognitive walkthrough: An analytic method for characterizing the cognitive processes of users performing a task. The method is performed by an analyst or group of analysts "walking through" the sequence of actions necessary to achieve a goal, thereby seeking to identify potential usability problems that may impede the successful completion of a task or introduce complexity in a way that may frustrate users. [4]

Coinsurance: The percentage of charges that is paid by the insuree rather than by the insurance company once the deductible has been satisfied. [23]

Color resolution: A measure of the ability to distinguish among different colors (indicated in a digital image by the number of bits per pixel). Three sets of multiple bits are required to specify the intensity of red, green, and blue components of each pixel color. [5]

Communication (computer): Data transmission and information exchange between computers using accepted protocols via an exchange medium such as a telephone line or fiberoptic cable. [5]

Community Health Information Network (CHIN): A computer network developed for exchange of sharable health information among independent participant organizations in a geographic area (or community). [10,15]

Compact disk (CD): A round, flat piece of material used to encode data through the use of a laser that alters the material's reflectivity. [5]

Compact-disk read-only memory (CD-ROM): An optical-disk technology for storing and retrieving large numbers of prerecorded data. Data are permanently encoded through the use of a laser that marks the surface of the disk, then can be read an unlimited number of times using a finely focused semiconductor laser that detects reflections from the disk. [5]

Comparison-based approach: Evaluation approach that studies an experimental resource in contrast to a control resource or placebo. [11]

Compiler: A program that translates a program written in a high-level programming language to a machine-language program, which can then be executed. [5]

Comprehensibility and control: Security function that ensures that data owners and data stewards have effective control over information confidentiality and access. [5]

Computability theory: The foundation for assessing the feasibility and cost of computation to provide the complete and correct results to a formally stated problem. Many interesting problems cannot be computed in a finite time and require heuristics. [1]

Computed check: Procedure applied to entered data that verifies values based on calculation of a correct mathematical relationship; for example, white blood cell differential counts (reported as percentages) must sum to 100. [12]

Computed radiography: An imaging technique in which a latent image is recorded on a specially coated cassette that is then scanned by a computer to capture the image in digital form. [9]

Computed tomography (CT): An imaging modality in which X-rays are projected through the body from multiple angles and the resultant absorption values are analyzed by a computer to produce cross-sectional slices. [5,9,12,18]

Computer architecture: The basic structure of a computer, including memory organization, a scheme for encoding data and instructions, and control mechanisms for performing computing operations. [5]

Computer interpretation: Translation by computer of voice input into appropriate text, codes, or commands. [12]

Computer program: A set of instructions that tells a computer which mathematical and logical operations to perform. [5]

Computer system: An integrated arrangement of computer hardware and software, operated by users to perform prescribed tasks. [6]

Computer-aided instruction (CAI): The application of computer technology to education (also called **computer-assisted learning** and **computer-based education**). [21]

Computer-assisted learning: See **computer-aided instruction**. [21]

Computer-based education (CBE): See **computer-aided instruction**. [21]

Computer-based monitoring: Use of computers to acquire, process, and evaluate analog physiological signals captured from patients. [17]

Computer-based patient monitor: A patient monitoring device that supports other data functions, such as database maintenance, report generation, and decision making. [17]

Computer-based patient record (CPR): See **electronic health record (EHR)**.

Computer-based patient record system: See **electronic health record system**.

Computer-based physician order entry (CPOE): A clinical information system that allows physicians and other clinicians to record patient-specific orders for communication to other patient care team members and to other information systems (such as test orders to laboratory systems or medication orders to pharmacy systems). Sometimes called **provider order entry** or **practitioner order entry** to emphasize such systems' uses by clinicians other than physicians. [13]

Concept: An abstract idea generalized from specific instances of objects that occur in the world. [19]

Conceptual knowledge: Knowledge about **concepts**. [4]

Concordant (test results): Test results that reflect the true patient state (true-positive and true-negative results). [3]

Conditional independence: Two events, A and B , are conditionally independent if the occurrence of one does not influence the probability of the occurrence of the other, when both events are conditioned on a third event C . Thus, $p[A|B,C] = p[A|C]$ and $p[B|A,C] = p[B|C]$. The conditional probability of two conditionally independent events both occurring is the product of the individual conditional probabilities: $p[A,B|C] = p[A|C] \times p[B|C]$. For example, two tests for a disease are conditionally independent when the probability of the result of the second test does not depend on the result of the first test, given the disease state. For the case in which disease is present, $p[\text{second test positive}|\text{first test positive and disease present}] = p[\text{second test positive}|\text{first test negative and disease present}] = p[\text{second test positive}|\text{disease present}]$. More succinctly, the tests are conditionally independent if the sensitivity and specificity of one test do not depend on the result of the other test (see **independence**). [3]

Conditional probability: The probability of an event, contingent on the occurrence of another event. [3]

Conditioned event: A chance event, the probability of which is affected by another chance event (the **conditioning event**). [3]

Conditioning event: A chance event that affects the probability of occurrence of another chance event (the **conditioned event**). [3]

Confidentiality: The ability of data owners and data stewards to control access to, or release of, private information. [5,10]

Consensus opinion: With respect to medical care, general agreement regarding proper action. [11]

Consistency check: Procedure applied to entered data that detects errors based on internal inconsistencies; e.g., recognizing a problem with the recording of *cancer of the prostate* as the diagnosis for a female patient. [12]

Constructive (approach to learning): An approach to teaching in which students learn through reassembly of separated parts; e.g., learning anatomy by putting together body parts or by placing cross sections at the correct location in the body. [21]

Consulting model: A style of interaction in a decision-support system, in which the program serves as an adviser, accepting patient-specific data, asking questions, and generating advice for the user about diagnosis or management. [20]

Consulting system: A computer-based system that develops and suggests problem-specific recommendations based on user input (see **critiquing system**). [20]

Consumer health informatics (CHI): Applications of medical informatics technologies that focus on patients or healthy individuals as the primary users. [10,14]

Content structuring: The process by which distinct semantic regions of content, such as title, author names, and abstract, are identified. [19]

Content: In information retrieval, media developed to communicate information or knowledge. [19]

Context: The placement of a word in text that helps determine the intended meaning of the word. [19]

Context deficit: A lack of clues in a document that might help a human being or natural language processor infer the intended meaning of words in the document. [19]

Context-free grammar: A mathematical model of a set of strings whose members are defined as capable of being generated from a starting symbol, using rules in which a single symbol is expanded into one or more symbols. [8]

Contingency table: A 2×2 table that shows the relative frequencies of true-positive, true-negative, false-positive, and false-negative results. [3]

Continuity of care: The coordination of care received by a patient over time and across multiple health care providers. [2]

Continuous-speech recognition: Translation by computer of voice input, spoken using a natural vocabulary and cadence, into appropriate text, codes, and commands. [12]

Continuum of care: The full spectrum of health services provided to patients, including health maintenance, primary care, acute care, critical care, rehabilitation, home care, skilled nursing care, and hospice care. [16]

Contract-management system: A computer system used to support managed care contracting by estimating the costs and payments associated with potential contract terms and by comparing actual with expected payments based on contract terms. [13]

Contrast radiography: A technique used to increase the contrast resolution of X-ray images by injection of radiopaque contrast material into a body cavity or blood vessels. [9]

Contrast resolution: A measure of the ability to distinguish among small differences in intensity (indicated in a digital image by the number of bits per pixel). [5,9]

Controlled terminology: A finite, enumerated set of terms intended to convey information unambiguously. [7]

Controls: In an experiment, subjects who are not affected by the intervention of interest. [11]

Convolution: In image processing, a mathematical edge-enhancement technique used to sharpen blurred computed tomographic images. [9]

Copyright law: Protection of written materials and intellectual property from being copied verbatim. [10]

Cost center: An organizational department that does not have revenue associated with the services it provides (e.g., administration, data processing, billing, and house-keeping). [23]

Cost-benefit analysis (CBA): An analysis of the costs and benefits associated with alternative courses of action that is designed to identify the alternative that yields the maximum net benefit. CBA is generally used when it is possible to assign dollar values to all relevant costs and benefits. [11]

Cost-effectiveness analysis (CEA): An analysis of alternative courses of action, the objective of which is to identify either the alternative that yields the maximum effectiveness achievable for a given amount of spending, or the alternative that minimizes the cost of achieving a stipulated level of effectiveness. CEA is generally used when it is not possible to measure benefits in dollar units. [11]

Cost-effectiveness threshold: Threshold level in a cost-effectiveness analysis that reflects a decision maker's value judgment regarding a maximum (or minimum) value; e.g., the maximum value of a quality-adjusted life year to be used in an analysis. [11]

Credentialing: Certification of an individual or resource's quality by a recognized body such as a clinical professional association. [14]

Critical care: Monitoring and treatment of patients with unstable physiologic systems, with life-threatening conditions, or at high-risk of developing life-threatening conditions, typically in an intensive care or coronary care unit. [10]

Critiquing model: A style of interaction in a decision-support system, in which the program acts as a sounding board for the user's ideas, expressing agreement or suggesting reasoned alternatives. [20]

Critiquing system: A computer-based system that evaluates and suggests modifications for plans or data analyses already formed by a user (see **consulting system**). [20]

Cross validation: Verification of the accuracy of data by comparison of two sets of data collected by alternate means. [17]

Cryptographic encoding: Scheme for protecting data based on use of keys for encrypting and decrypting information (see secret-key and private-key cryptography). [5]

Cumulative Index to Nursing and Allied Health Literature (CINAHL): A non-NLM bibliographic database that covers nursing and allied health literature, including physical therapy, occupational therapy, laboratory technology, health education, physician assistants, and medical records. [19]

Cursor: A blinking region of a display monitor, or a symbol such as an arrow, that indicates the currently active position on the screen. [5]

Customary, prevailing, and reasonable: The payment system used by Medicare (prior to implementation of the Resource-Based Relative Value Scale and Volume Performance Standard) that reimbursed practitioners generously for doing procedures and relatively poorly for providing cognitive services such as history taking and advice giving. [23]

Custom-designed system: A computer system designed and developed within an institution to meet the special needs of that institution. [6]

Customer: The user who interacts with the software and hardware of a computer system and uses the results. [6]

Data acquisition: The input of data into a computer system through direct data entry, acquisition from a medical device, or other means. [16]

Data bus: An electronic pathway for transferring data; e.g., between a CPU and memory. [5]

Data capture: The acquisition or recording of information. [12]

Data compression: A mathematical technique for reducing the number of bits needed to store data, with or without loss of information. [18]

Data Encryption Standard (DES): A widely used method for securing information storage and communications that uses a private (secret) key for encryption and requires the same key for decryption (see also public key cryptography). [5]

Data flow: The input, processing, storage, and output of information in a computer system. [6]

Data flow diagram (DFD): A graphical representation for the sources, transformation processes, storage, and presentation of data in a computer system. [6]

Data independence: The insulation of applications programs from changes in data storage structures and data access strategies. [5]

Data interchange standards: Adopted formats and protocols for exchange of data between independent computer systems. [7]

Data layer: A conceptual level of system architecture that isolates the data collected and stored in the enterprise from the applications and user interfaces used to access those data. [13]

Data overload: The inability to access or use crucial information due to an overwhelming number of irrelevant data or due to the poor organization of data. [17]

Data processing: The manipulation of data to convert it to some desired result (also called **data transformation**). [16]

Data recording: The documentation of information for archival or future use through mechanisms such as handwritten text, drawings, machine-generated traces, or photographic images. [2]

Data standard: A set of syntactic and semantic rules for defining elements of information to be recorded or exchanged. [7,16]

Data storage: The methods, programs, and structures used to organize data for subsequent use. [16]

Data transcription: The transfer of information from one data-recording system to another. Typically, the entry into a computer by clerical personnel of the handwritten or dictated notes or datasheets created by a health professional. [12]

Data transformation: The manipulation of data to convert it to some desired result (also called **data processing**). [16]

Data warehouse: Database optimized for long-term storage, retrieval, and analysis of records aggregated across patient populations, often serving the longer-term business and clinical analysis needs of an organization. [13]

Database: A collection of stored data—typically organized into fields, records, and files—and an associated description (schema). [2,5]

Database management system (DBMS): An integrated set of programs that manages access to databases. [5]

Database mediator: A software component that serves as a conduit between one or more other client software components and a database server. The mediator insulates the client components from logistical issues associated with accessing the database server. [20]

Datum: Any single observation of fact. A medical datum generally can be regarded as the value of a specific parameter (e.g., red blood cell count) for a particular object (e.g., a patient) at a given point in time. [2]

Debugger: A system program that provides traces, memory dumps, and other tools to assist programmers in locating and eliminating errors in their programs. [5]

Decision analysis: A methodology for making decisions by identifying alternatives and assessing them with regard to both the likelihood of possible outcomes and the costs and benefits of those outcomes. [20]

Decision node: A symbol that represents a choice among actions. By convention, a decision node is represented in a decision tree by a square. [3]

Decision tree: A diagrammatic representation of the outcomes associated with chance events and voluntary actions. [3]

Decision facilitation approach: A formative evaluation approach designed to resolve issues important to system developers and administrators by asking and answering successive questions during the course of resource development. [11]

Decryption: The process of transforming encrypted information back to its original form; see **encryption**. [1]

Deductible: A set dollar amount of covered charges that must be paid by the insuree before the insurance company begins to reimburse for outlays or to make direct payments to providers of service. [23]

Deformable model: In image processing, a generic shape that is close in shape to a structure of interest, and which can be reshaped (deformed) until it matches the imaged structure. The deformation is controlled by an optimization procedure that minimizes a cost function. [9,18]

Delta check: Procedure applied to entered data that compares the values of new and previous results to detect large and unlikely differences in value; e.g., a recorded weight change of 100 pounds in 2 weeks. [12]

Demonstration study: An experiment designed to draw inferences about performance, perceptions, or effects of an information resource. [11]

Deoxyribonucleic acid (DNA): The genetic material that is the basis for heredity. DNA is a long polymer chemical made of four basic subunits. The sequence in which these subunits occur in the polymer distinguishes one DNA molecule from another and in turn directs a cell's production of proteins and all other basic cellular processes. [22]

Departmental system: A system that focuses on a specific niche area in the health care setting, such as a laboratory, pharmacy, radiology department, etc. [13]

Dependent variable: In a statistical analysis, the variable that measures experimental outcome. Its value is assumed to be a function of the experimental conditions (**independent variables**). [11]

Derivational morpheme: A morpheme that changes the meaning or part of the speech of a word (e.g., -ful as in painful, converting a noun to an adjective). [8]

Derived parameter: A parameter that is calculated indirectly from multiple parameters that are measured directly. [17]

Descriptive (or uncontrolled) study: Experiment in which there is no control group for comparison. [11]

Diagnosis: The process of analyzing available data to determine the pathophysiologic explanation for a patient's symptoms. [1,10,20]

Diagnosis-related group (DRG): One of almost 500 categories based on major diagnosis, length of stay, secondary diagnosis, surgical procedure, age, and types of services required. Used to determine the fixed payment per case that Medicare will reimburse hospitals for providing care to elderly patients. [21,23]

Diagnostic process: The activity of deciding which questions to ask, which tests to order, or which procedures to perform, and determining the value of the results relative to associated risks or financial costs. [20]

DICOM (Digital Imaging and Communications in Medicine): A standard developed by the National Equipment Manufacturers Association for the electronic exchange of medical images and the data associated with the image, related to the patient, the study, the series, the image acquisition and presentation method, annotations, and associated reports. This multipart standard has been widely adopted and is one of the most successful examples of the benefits of standardization. [18]

Differential diagnosis: The set of active hypotheses (possible diagnoses) that a physician develops when determining the source of a patient's problem. [2]

Digital acquisition of images: Medical images may be acquired from a number of image generation devices. Digital acquisition refers to the process of obtaining the image data in electronic form, usually in the form of an array of picture elements (pixels) or for three-dimensional images, volume elements (voxels). Digital acquisition may be primary through a variety of digital image capture technologies, or secondary, through scanning of film-based images. [18]

Digital computer: A computer that processes discrete values based on the binary digit or bit. Essentially all modern computers are digital, but **analog computers** also existed in the past. [5]

Digital image: An image that is stored as a grid of numbers, where each picture element (pixel) in the grid represents the intensity, and possibly color, of a small area. [9,18]

Digital Imaging and Communications in Medicine: See **DICOM**.

Digital library: Organized collections of electronic content, intended for specific communities or domains. [19]

Digital object identifier (DOI): A system for providing unique identifiers for published digital objects, consisting of a prefix that is assigned by the International DOI Foundation to the publishing entity and a suffix that is assigned and maintained by the entity. [19]

Digital Preservation Coalition: An initiative in the United Kingdom directed at insuring the preservation of scientific information. [19]

Digital radiography: The process of producing X-ray images, which are stored in digital form in computer memory, rather than on film. [9]

Digital radiology: The use of digital radiographic methods for medical imaging to support the clinical interpretation of those images. [18]

Digital signal processing (DSP) chip: An integrated circuit designed for high-speed data manipulation and used in audio communications, image manipulation, and other data acquisition and control applications. [5]

Digital signal: A signal that takes on discrete values from a specified range of values. [5]

Digital subscriber line (DSL): A digital telephone service that allows high-speed network communication using conventional (twisted pair) telephone wiring. [5]

Digital subtraction angiography (DSA): A radiologic technique for imaging blood vessels in which a digital image acquired before injection of contrast material is subtracted pixel by pixel from an image acquired after injection. The resulting image shows only the differences in the two images, highlighting those areas where the contrast material has accumulated. [9]

Digital versatile disk (DVD): A plastic-and-metal disk that is used to store data optically, at a very high density; also called a **digital video disk**. [5]

Digital video disk (DVD): Next generation optical disk storage technology that allows encoding and high-volume storage of video, audio, and computer data on a compact disk. [5,21]

Direct cost: A cost that can be directly assigned to the production of goods or services. For example, direct costs in the laboratory include the cost of the technician's salary, equipment, and supplies. [11]

Direct entry: The entry of data into a computer system by the individual who personally made the observations. [12]

Discounting: Calculation that accounts for time preference by reducing the value of expenditures and payments that accrue in the future relative to those that occur immediately. [11]

Discrimination learning: An approach to teaching in which students are presented with a series of examples of increasing complexity, thereby learning to detect subtle differences. [21]

Display monitor: A device for presenting output to users through use of a screen (see also **cathode-ray tube**). [5]

Display: In information retrieval, the last step of the information retrieval process, in which the final result set is shown to the user. [19]

Distributed cognition: A view of cognition that considers groups, material artifacts, and cultures and that emphasizes the inherently social and collaborative nature of cognition. [4]

Distributed computer system: A collection of independent computers that share data, programs, and other resources. [13]

DNA arrays: Small glass plates onto which specific DNA fragments can be affixed and then used to detect other DNA fragments present in a cell extract. [22]

DNA sequence database: A searchable, stored collection of known DNA sequences (GENBANK is one of the largest). Individual databases may also contain information about the biological source of the sequence, reference information, and annotations regarding the data. [22]

Domain Name System (DNS): A hierarchical name management system used to translate computer names to Internet protocol (IP) addresses. [5]

Domain: A unique corporate or institutional address that designates one or multiple hosts on the Internet. [1]

Doppler shift: A perceived change in frequency of a signal as the signal source moves toward or away from a signal receiver. [18]

Double-blind: A clinical study methodology in which neither the researchers nor the subjects know to which study group a subject has been assigned. [2]

Drill and practice: An approach to teaching in which students are presented with a small amount of information, and then asked questions about the material, and thus receive immediate feedback to support the learning process. [21]

Dublin Core Metadata Initiative (DCMI): A standard metadata model for indexing published documents. [19]

DXplain: A diagnostic decision-support system produced by the Massachusetts General Hospital that maintains profiles of findings for over 2000 diseases and generates differential diagnoses when sets of findings are entered. [19,20]

Dynamic (simulation program attribute): A simulation program that models changes in patient state over time and in response to students' therapeutic decisions. [21]

Dynamic programming: A computationally intensive computer science technique used, for example, to determine optimal sequence alignments in many computational biology applications. [22]

EBM database (evidence-based medicine database): A highly organized collection of clinical evidence to support medical decisions based on the results of controlled clinical trials. [19]

Edge-detection technique: A method, such as application of an edge-following algorithm, used to identify a region of interest from an overall image by delineating the borders of the region. [9]

Efficacy: The capacity for producing a desired result. [11]

Electrocardiogram (ECG): The graphic recording of minute differences in electric potential caused by heart action. Also often called **EKG**. [5,7,17]

Electroencephalography (EEG): A method for measuring the electromagnetic fields generated by the electrical activity of the neurons using scalp sensors, the outputs of which may be processed to localize the source of the electrical activity inside the brain. [9]

Electronic Data Interchange (EDI): Electronic exchange of standard data transactions, such as claims submission and electronic funds transfer. [7,13]

Electronic health record (EHR): A repository of electronically maintained information about an individual's lifetime health status and health care, stored such that it can serve the multiple legitimate users of the record. [12]

Electronic health record system: The addition to an electronic health record of information management tools that provide clinical alerts and reminders, linkages with external health knowledge sources, and tools for data analysis. [12]

Electronic textbook: An online reference containing nonpatient-specific information. [20]

Electronic-long, paper-short system (ELPS): A publication method that provides on the Web site supplemental material that did not appear in the print version of the journal. [19]

Electrophoresis: A method of separating substances based on the rate of movement of each component in a colloidal suspension while under the influence of an electric field, for the purpose of analyzing molecular structure. [22]

EMBASE: A commercial biomedical and pharmacological database from Excerpta Medica that provides information about medical and drug-related subjects. [19]

Emergent: Experimental design whereby the results of earlier stages of investigation are used to identify future issues for evaluation. [11]

Empiricism: The view that experience is the only source of knowledge. [4]

EMTREE: A hierarchically structured, controlled vocabulary used for subject indexing, used to index **EMBASE**. [19]

Encrypted: Data that have been rendered unreadable through the process of **encryption**. [1]

Encryption: The process of transforming information such that its meaning is hidden, with the intent of keeping it secret, such that only those who know how to decrypt it can read it; see **decryption**. [1,5]

Enterprise master patient index (EMPI): An architectural component that serves as the name authority in a health care information system composed of multiple independent systems; the EMPI provides an index of patient names and identification numbers used by the connected information systems. [13]

Entrez: A search engine from the National Center for Biotechnology Information (NCBI), at the National Library of Medicine; Entrez can be used to search a variety of life sciences databases, including PubMed. [19]

Entry term: A synonym form for a subject heading in the Medical Subject Headings (MeSH) controlled, hierarchical vocabulary. [19]

Epidemiology: The study of the incidence, distribution, and causes of disease in a population. [1,15]

Escrow: Use of a trusted third party to hold cryptographic keys, computer source code, or other valuable information to protect against loss or inappropriate access. [5]

Ethernet: A network standard that uses a bus or star topology and regulates communication traffic using the Carrier Sense Multiple Access with Collision Detection (CSMA/CD) approach. [5]

Ethics: A system of moral principles; the rules of conduct recognized in respect to a particular class of human actions or a particular group or culture. [10]

Ethnography: A branch of anthropology dealing with the scientific description of individual cultures. [11]

Evaluation: Data collection and analysis designed to appraise a situation, answer a question, or judge the success of an intervention. [11,19,21]

Evidence-based guidelines: Consensus approaches for handling recurring health management problems aimed at reducing practice variability and improving health outcomes. Clinical guideline development emphasizes using clear evidence from the existing literature, rather than expert opinion alone, as the basis for the advisory materials. [1]

Evidence-based medicine (EBM): An approach to medical practice whereby the best possible evidence from the medical literature is incorporated in decision making. Generally such evidence is derived from controlled clinical trials. [10,19]

Evoking strength (ES): One of two numbers used by the Internist-1 decision-support system to reflect the strength of the relationship between a disease and a finding; the evoking strength is a number between 0 and 5 that reflects the likelihood that a patient with the finding has the disease in question (see **frequency weight**). [20]

Exact-match searching: A search method that looks for a literal match of the search term, allowing precise control over the items retrieved. [19]

Excerpta Medica: A collection of life sciences databases published by Elsevier Science Publishers. [19]

Expected value: The value that is expected on average for a specified chance event or decision. [3]

Expected-value decision making: A method for decision making in which the decision maker selects the option that will produce the best result on average (i.e., the option that has the highest expected value). [3]

Experimental science: Systematic study characterized by posing hypotheses, designing experiments, performing analyses, and interpreting results to validate or disprove hypotheses and to suggest new hypotheses for study. [1]

Expert system: See **knowledge-based system**.

Expert witness: A person, such as a physician, who provides testimony at a legal proceeding in the form of professional opinions. [10]

Explosion: In information retrieval systems, the process in which a general vocabulary term and the more specific terms beneath it in the hierarchy are combined using the OR Boolean operator. [19]

Extended Binary Coded Decimal Interchange Code (EBCDIC): An 8-bit code for representing alphanumeric characters and other symbols. [7]

Extensible Markup Language (XML): A subset of the **Standard Generalized Markup Language (SGML)** from the World Wide Web Consortium (W3C), designed especially for Web documents. It allows designers to create their own custom-tailored tags, enabling the definition, transmission, validation, and interpretation of data between applications and between organizations. [19]

External router: A computer that resides on multiple networks and that can forward and translate message packets sent from a local or enterprise network to a regional network beyond the bounds of the organization. [5]

External validity: Characteristic of a well-founded study methodology, such that the study conclusions can be generalized from the specific setting, subjects, and intervention studied to the broader range of settings that other people will encounter. [11]

Factual knowledge: Knowledge of facts without necessarily having any in-depth understanding of their origin or implications. [4]

False-negative rate (FNR): The probability of a negative result, given that the condition under consideration is true—e.g., the probability of a negative test result in a patient who has the disease under consideration. [3]

False-negative result (FN): A negative result when the condition under consideration is true—e.g., a negative test result in a patient who has the disease under consideration. [3]

False-positive rate (FPR): The probability of a positive result, given that the condition under consideration is false—e.g., the probability of a positive test result in a patient who does not have the disease under consideration. [3]

False-positive result (FP): A positive result when the condition under consideration is false—e.g., a positive test result in a patient who does not have the disease under consideration. [3]

Feature detection: In image processing, determination of parameters, such as volume or length, from segmented regions of an image. In signal processing, identification of specific waveforms or other patterns of interest in a signal. [9,17]

Feature extraction: Computer processing to identify patterns of interest and characteristics within imaged, waveforms, and other signals (see **feature detection**). [17]

Feedback: In a computer-based education program, system-generated responses, such as explanations, summaries, and references, provided to further a student's progress in learning. [21]

Fee-for-service model: Unrestricted system of health care reimbursement in which payers pay providers for those services the provider has deemed necessary. [12]

Fiber-optic cable: A communication medium that uses thin glass fibers to guide light waves to transmit information signals. [5,18]

Field qualification: In information retrieval systems, the designation of which index or field should be searched. [19]

Field: The smallest named unit of data in a database. Fields are grouped together to form records. [5] In the context of an evaluation study, the setting or settings in which the activity under study is carried out. [11]

File server: A computer that is dedicated to storing shared or private data files. [5]

File Transfer Protocol (FTP): The protocol used for copying files to and from remote computer systems on a network using **TCP/IP**. [5]

File: In a database, a collection of similar records. [5]

Filtering algorithm: A defined procedure applied to input data to reduce the effect of noise. [5]

Finite state automaton: See finite state machine. [8]

Finite state machine: A mathematical model of a set of strings whose members are defined by following transitions (characters of a given alphabet) among a finite number of states, until arriving at a designated final state. [8]

Firewall: A security system intended to protect an organization's network against external threats by preventing computers in the organization's network from communicating directly with computers external to the network, and vice versa. [5]

Fixed cost: A cost that does not vary with the volume of production during a given period. Examples are expenses for plant, equipment, and administrative salaries. [23]

Fixed fee: Restricted system of health care reimbursement in which payers pay providers a set amount for health services approved by the payer. [12]

Flash card: A portable electronic storage medium that uses a semiconductor chip with a standard physical interface; a convenient method for moving data between computers. [5]

Floppy disk: An inexpensive magnetic disk that can be removed from the disk-drive unit and thereby used to transfer or archive files. [5]

Flowsheet: A tabular summary of information that is arranged to display the values of variables as they change over time. [12]

Fluoroscopy: An imaging method in which a screen coated with a fluorescent substance is used for viewing objects by means of X-ray or other radiation. [9]

Food and Drug Administration (FDA): Division of the Department of Health and Human Services that regulates medical devices, as well as food, drugs, and cosmetics. [10,17,20]

Foreground question: Question that asks for general information related to a specific patient (see also **background question**). [19]

Formal systems analysis: A methodology for evaluating requirements and generating specifications for developing computer systems and other information resources. [11]

Formative decision: A decision made as a result of a study undertaken while a resource is being developed and that can affect future development of the resource. [11]

Formative evaluation: An assessment of a system's behavior and capabilities conducted during the development process and used to guide future development of the system. [21]

Fortran (also FORTRAN): A computer programming language developed in the 1950s and used for scientific and numerical computation. The name stands for Formula Translator/Translation. [5]

Fourier transform: A mathematical method for analyzing complex electrical or sound signals to extract intensities of multiple frequencies over time. [18]

Frame relay: A high-speed network protocol designed for sending digital information over shared wide-area networks using variable length packets of information. [5]

Free morpheme: A morpheme that is a word and that does not contain another morpheme (e.g., arm, pain). [8]

Free text: Unstructured, uncoded representation of information in text format; e.g., sentences describing the results of a patient's physical examination. [12]

Frequency weight (FW): One of two numbers used by the Internist-1 decision-support system to reflect the strength of the relationship between a disease and a finding; the FW is a number between 1 and 5, where 1 means that the finding is seldom seen in the disease and 5 means it is essentially always seen (see **evoking strength**). [20]

Frequency modulation: A method of encoding information in which changes in input signal amplitude are encoded as frequency changes in a corresponding transmitted signal around the base frequency of a carrier wave. Because the input amplitude is encoded as a frequency shift, the encoded signal is less subject to outside interference, which primarily affects the amplitude of transmitted signals. [5]

Front-end application: In database applications, a front-end application is a program, often with a graphical user interface, that helps a user manipulate information in the database without having to know details of the database design or how to program queries. [5]

Full disclosure: In ECG monitoring, a process whereby all data regarding the full set of leads are stored and available for reconstruction of the complete cardiogram as it would have appeared during a period of abnormal rhythms. [17]

Full-text content: The complete textual information contained in a bibliographic source. [19]

Full-text database: A bibliographic database that contains the entire text of journal articles, books, and other literature, rather than only citations and abstracts. [19]

Functional image: An image, such as a computed tomographic image or a digital subtraction angiogram image, which is computed from derived quantities, rather than being measured directly. [9]

Functional magnetic resonance imaging (fMRI): A magnetic resonance imaging method that reveals changes in blood oxygenation that occur following neural activity. [9]

Functional mapping: An imaging method that relates specific sites on images to particular physiologic functions. [9,18]

Gateway: A computer that resides on multiple networks and that can forward and translate message packets sent between nodes in networks running different protocols. [5]

Gene: A hereditary unit consisting of a sequence of DNA that occupies a specific location on a chromosome and determines a particular characteristic in an organism. [22]

Genetic data: Information regarding a person or organism's genome and heredity. [10]

Genome: The total collection of DNA for a person or other organism. [22]

Genomics: The study of all of the nucleotide sequences, including structural genes, regulatory sequences, and noncoding DNA segments, in the chromosomes of an organism. [22]

Genomics database: An organized collection of information from gene sequencing, protein characterization, and other genomic research. [19]

Genotype: The genetic makeup, as distinguished from the physical appearance, of an organism or a group of organisms. [22]

Gigabits per second (Gbps): A common unit of measure for data transmission over high-speed networks. [5]

Gigabyte: 2^{30} or 1,073,741,824 bytes. [5]

Global processing: Any image-enhancement technique in which the same computation is applied to every pixel in an image. [9]

Goal-free approach: An evaluation approach in which evaluators are purposely unaware of the intended effects of an information resource and collect evidence to enable identification of all effects, intended or not. [11]

Gold-standard test: The test or procedure whose result is used to determine the true state of the subject—e.g., a pathology test such as a biopsy used to determine a patient's true disease state. [3]

Google: A commercial search engine that provides free searching of documents on the World Wide Web. [19]

Grammar: A mathematical model of a potentially infinite set of strings. [8]

Granularity: The level of detail of a search strategy, ranging from general topics to very specific concepts. [19]

Graphic editor: A program used to create and manipulate drawings or images for storage as computer files. [5]

Graphical user interface (GUI): A type of environment that represents programs, files, and options by means of icons, menus, and dialog boxes on the screen. [4, 5]

Gray scale: A scheme for representing intensity in a black-and-white image. Multiple bits per pixel are used to represent intermediate levels of gray. [5]

Group-model HMO: A type of HMO that is based on contracts between physicians organized in a medical group and the HMO; the medical group accepts risks of costs of care and usually rewards the partners if the group is successful in managing costs (see **staff-model HMO**). [23]

Guidance: In a computer-based education program, proactive feedback, help facilities, and other tools designed to assist a student in learning the covered material. [21]

Haptic feedback: A user interface feature in which physical sensations are transmitted to the user to provide a tactile sensation as part of a simulated activity. [18]

Hard disk: A magnetic disk used for data storage and typically fixed in the disk-drive unit. [5]

Hardware: The physical equipment of a computer system, including the central processing unit, memory, data storage devices, workstations, terminals, and printers. [5,6]

Hashing: A method of transforming a search key into an address for the purpose of efficiently storing and retrieving items of data. [19]

Hawthorne effect: The tendency for humans to improve their performance if they know it is being studied. [11]

Header (of email): The portion of a simple electronic mail message that contains information about the date and time of the message, the address of the sender, the addresses of the recipients, the subject, and other optional information. [5]

Health information infrastructure: The set of public and private resources, including networks, databases, and policies, for collecting, storing and transmitting health information. [15]

Health Insurance Portability and Accountability Act (HIPPA): A law enacted in 1996 to protect health insurance coverage for workers and their families when they change or lose their jobs. An “administrative simplification” provision requires the Department of Health and Human Services to establish national standards for electronic health care transactions and national identifiers for providers, health plans, and employers. It also addresses the security and privacy of health data. [5]

Health Level 7 (HL7): An ad hoc standards group formed to develop standards for exchange of health care data between independent computer applications; more specifically, the health care data messaging standard developed and adopted by the HL7 standards group. [1,7,12,]

Health on the Net (HON): A private organization establishing ethical standards for health information published on the World Wide Web. [19]

Health Security Act: The 1994 proposal (by then President Clinton) drafted to overhaul the health care financing and delivery system and to provide universal health insurance coverage for all Americans. [23]

Health care information system (HCIS): An information system used within a health care organization to facilitate communication, to integrate information, to document health care interventions, to perform record keeping, or otherwise to support the functions of the organization. [13]

Health care organizations (HCO): Any organization, such as a physician’s practice, hospital, or health maintenance organization, that provides care to patients. [13]

Health care team: A coordinated group of health professionals including physicians, nurses, case managers, dietitians, pharmacists, therapists, and other practitioners who collaborate in caring for a patient. [2]

Health maintenance organization (HMO): A group practice or affiliation of independent practitioners that contracts with patients to provide comprehensive health care for a fixed periodic payment specified in advance. [7,23]

Hearsay evidence: Testimony based on what a witness has heard from another source rather than on direct personal knowledge or experience. [10]

HELP sector: A decision rule encoded in the HELP system, a clinical information system that was developed by researchers at LDS Hospital in Salt Lake City. [20]

Helpers (plug-ins): Applications that are launched by a Web browser when the browser downloads a file that the browser is not able to process itself. [5]

Heuristic: A mental “trick” or rule of thumb; a cognitive process used in learning or problem solving. [2]

Heuristic evaluation: A usability inspection method, in which the system is evaluated on the basis of a small set of well-tested design principles such as visibility of system status, user control and freedom, consistency and standards, flexibility and efficiency of use. [4]

High-level process: A complex process comprising multiple lower-level processes. [1]

Histogram equalization: An image-enhancement technique that spreads the image’s gray levels throughout the visible range to maximize the visibility of those gray levels that are used frequently. [9,18]

Historically controlled experiment: A study that makes and compares the same measurements before and after the introduction of the resource of interest (see **before–after study**). [11]

Hospital information system (HIS): Computer system designed to support the comprehensive information requirements of hospitals and medical centers, including patient, clinical, ancillary, and financial management. [1,5,6,7,12,13,16,18]

Human–computer interaction (HCI): Formal methods for addressing the ways in which human beings and computer programs exchange information. [4]

Human Genome Project: An international undertaking, the goal of which is to determine the complete sequence of human deoxyribonucleic acid (DNA), as it is encoded in each of the 23 chromosomes. [22]

Human immunodeficiency virus (HIV): A retrovirus that invades and inactivates helper T cells of the immune system and is a cause of AIDS and AIDS-related complex. [5,7,15,21]

Hypertext: Text linked together in a nonsequential web of associations. Users can traverse highlighted portions of text to retrieve additional related information. [5,19]

HyperText Markup Language (HTML): The document specification language used for documents on the World Wide Web. [5,6,19,20,21]

HyperText Transfer Protocol (HTTP): The client–server protocol used to access information on the World Wide Web. [5,19]

Hypothetico-deductive approach: In clinical medicine, an iterative approach to diagnosis in which physicians perform sequential, staged data collection, data interpretation, and hypothesis generation to determine and refine a differential diagnosis. [2]

ICD-9-CM: see **Ninth International Classification of Diseases–Clinical Modification (ICD-9-CM)**. [7]

Icon: In a graphical interface, a pictorial representation of an object or function. [5]

IDF*TF weighting: A simple weighting measure used for document retrieval based on term frequency (TF) and inverse document frequency (IDF); terms that occur often in only a small number of documents are given the highest weighting. [19]

Image database: An organized collection of clinical image files, such as X-rays, photographs, and microscopic images. [19]

Image enhancement: The use of global processing methods to improve the appearance of an image, either for human viewing or for subsequent processing by computer. [9,18]

Image generation: The process of producing images. [9,18]

Image integration: The combination of images with other information needed for interpretation, management, and other tasks. [9]

Image management: The application of methods for storing, transmitting, displaying, retrieving, and organizing images. [9,18]

Image manipulation: The use of pre- and postprocessing methods to enhance, visualize, or analyze images. [9,18]

Image processing: The transformation of one or more input images, either into one or more output images, or into an abstract representation of the contents of the input images. [9,18]

Imaging informatics: A subdiscipline of bioedical informatics concerned with the common issues that arise in all image modalities, relating to the acquisition of images in or conversion to digital form, and the analysis, manipulation, and use of those images once they are in digital form. [1, 9, 18]

Imaging modality: A method for producing images. Examples of medical applications are X-ray imaging, computed tomography, ultrasonography, magnetic resonance imaging, and photography. [9,18]

Immersive simulated environment: A teaching environment in which a student manipulates tools to control simulated instruments, producing visual, pressure, and other feedback to the tool controls and instruments. [21]

Immunization registries: Confidential, population based, computer-based information systems that contain data about children and vaccinations. [15]

Impact printer: Output device that uses typewriter, print chain, or drum technologies to contact a paper, thus producing a character or mark. [5]

Implementation phase: A major step in the system life cycle in which the system is constructed based on its design specifications. [6]

Import number: A number used by the Internist-1 decision-support system; the import number captures the notion that some abnormalities have serious implications and must be explained, whereas others may be safely ignored. [20]

Inaccessibility: Unavailability; a limitation of traditional medical records, which can be used by only one person at a time. [12]

Incremental cost-effectiveness ratio: The difference in the costs between two interventions or options divided by the difference in benefits. [11]

Incrementalist: Person who is able to make changes gradually, by degrees. [11]

Indemnity insurance: A type of insurance modeled on casualty insurance. Typically, an insuree is reimbursed a specified amount for a hospital day, or for each of a list of surgical procedures. [23]

Independence: Two events, A and B , are considered independent if the occurrence of one does not influence the probability of the occurrence of the other. Thus, $p[A|B] = p[A]$. The probability of two independent events A and B both occurring is given by the product of the individual probabilities: $p[A, B] = p[A] \times p[B]$. (See **conditional independence**.) [3]

Independent variable: A variable believed to affect the outcome (dependent variable) of an experiment. [11]

Index: In information retrieval, a shorthand guide to the content that allows users to find relevant content quickly. [19,21]

Index attribute: A term that describes some aspect of an index item, such as the document numbers where the item appears or the frequency of the item within a document. [19]

Index item: A unit of information used for matching with a query during searching. [19]

Index Medicus: The printed index used to catalog the medical literature. Journal articles are indexed by author name and subject heading, and then aggregated in bound volumes. The Medline database was originally constructed as an online version of the Index Medicus. [19]

Index test: The diagnostic test whose performance is being measured. [3]

Indexing: In information retrieval, the assignment to each document of specific terms that indicate the subject matter of the document and that are used in searching. [19]

Indexing Initiative: An effort from the National Library of Medicine to investigate methods whereby automated indexing methods can partially or completely substitute for current (manual) indexing practices. [19]

Indirect care: Activities of health professionals that are not directly related to patient care, such as teaching and supervising students, continuing education, and attending staff meetings. [16]

Individual practice association (IPA): A group of individual physicians that has joined together to contract with one or more insurance carriers to see patients enrolled with those carriers. The physicians continue to practice in their own offices and continue to see patients with other forms of insurance coverage. The group is paid on a per capita basis for services delivered by member physicians under the IPA contracts. Individual physician members agree to fee schedules, management controls, and risk-sharing arrangements (also known as **network-model HMOs**). [23]

Inflectional morpheme: A morpheme that creates a different form of a word without changing the meaning of the word or the part of speech (e.g., -ed, -s, -ing as in activated, activates, activating.) [8]

Influence diagram: A belief network in which explicit decision and utility nodes are also incorporated. [3,20]

InfoMastery: For Information Mastery, a set of methods from evidence-based medicine for determining the value and validity of information. [19]

Information: Organized data or knowledge that provide a basis for decision making. [2]

Information extraction: Methods that process text to capture and organize specific information in the text and also to capture and organize specific relations between the pieces of information. [8]

Information need: In information retrieval, the searchers' expression, in their own language, of the information that they desire. [19]

Information resources: In biomedical informatics, computer systems developed to collect, process, and disseminate health information. [11]

Information retrieval (IR): Methods that efficiently and effectively search and obtain data, particularly text, from very large collections or databases. It is also the science and practice of identification and efficient use of recorded media. [8,19]

Information retrieval (IR) database: An organized collection of stored bibliographic data, which typically contains both an index and the full original content. [19,8]

Information science: The field of study concerned with issues related to the management of both paper-based and electronically stored information. [1]

Information Sources Map (ISM): One component of the Unified Medical Language System, the Information Sources Map (ISM) is a database of available databases, indexed by terms in the Metathesaurus. [19]

Information theory: The theory and mathematics underlying the processes of communication. [1]

Informational services: Remote network services that are designed to be broadly accessible (see also **business services**). [6]

Ink-jet printer: Output device that uses a moveable head to spray liquid ink on paper; the head moves back and forth for each line of pixels. [5]

Input: The data that represent state information, to be stored and processed to produce results (output). [6]

Institute of Electrical and Electronics Engineers (IEEE): An international organization through which many of the world's standards in telecommunications, electronics, electrical applications, and computers have been developed. [7,17]

Institutional review board (IRB): A committee responsible for reviewing an institution's research projects involving human subjects in order to protect their safety, rights, and welfare. [5,8]

Integrated circuit (IC): A circuit of transistors, resistors, and capacitors constructed on a single chip and interconnected to perform a specific function. [5]

Integrated delivery network (IDN): A large conglomerate health care organization developed to provide and manage comprehensive health care services. [10,13,18]

Integrated Services Digital Network (ISDN): An international communications standard for sending digital information over telephone lines. ISDN supports data transfer rates of 64 Kbps. [5]

Integrative model: Model for understanding a phenomenon that draws from multiple disciplines and is not necessarily based on first principles. [22]

Intellectual property: Software programs, knowledge bases, Internet pages, and other creative assets that require protection against copying and other unauthorized use. [10]

Intensive care unit (ICU): A hospital unit in which critically ill patients are monitored closely. [1,7,17]

Interdisciplinary care: A patient care approach that recognizes and coordinates the complementary contributions of multiple clinicians, including physicians, nurses, dietitians, pharmacists, physical therapists, etc. [16]

Interface engine: A computer system that translates and formats data for exchange between independent (sending and receiving) computer systems. [12, 13]

Intermittent monitoring: The periodic measurement of a physiological parameter. [17]

Internal validity: Characteristic of a well-founded experiment; the ability to have confidence in an experiment's conclusions due to the quality of its methodology. [11]

Internet: A worldwide collection of gateways and networks that communicate with each other using the TCP/IP protocol, collectively providing a range of services including electronic mail and World Wide Web access. [5]

Internet 2: The initial project of the University Consortium for Advanced Internet Development (UCAID), Internet 2 is a test bed for high-bandwidth communications to support research and education that builds on existing federally funded or experimental networks. [1]

Internet (or IP) address: A 32-bit number, written as a sequence of four 8-bit numbers, that identifies uniquely a device attached to the Internet. IP addresses are often written as a dotted sequence of numbers: a.b.c.d. Although not assigned geographically, the first number identifies a region, the second a local area, the third a local net, and the fourth a specific computer. [5]

Internet Control Message Protocol (ICMP): A network-level Internet protocol that provides error correction and other information relevant to processing data packets. [5]

Internet Corporation for Assigned Names and Numbers (ICANN): The organization responsible for managing Internet domain name and IP address assignments. [5]

Internet Mail Access Protocol (IMAP): A protocol used by electronic mail programs to access messages stored on a mail server. [5]

Internet Protocol (IP): The protocol within **TCP/IP** that governs the creation and routing of data packets and their reassembly into data messages. [5]

Internet service provider (ISP): A commercial communications company that supplies fee-for-service Internet connectivity to individuals and organizations. [5]

Internet standards: The set of conventions and protocols all Internet participants use to enable effective data communications. [5]

Interoperability: The ability for systems to exchange data and operate in a coordinated, seamless manner. [19]

Interpreter: A program that converts each statement in a high-level program to a machine-language representation and then executes the binary instruction(s). [5]

Interventional radiology: The use of needles, catheters, biopsy instruments, or other invasive methodologies with the aim of producing a diagnostic or therapeutic, or possibly palliative, effect. Examples are balloon angioplasty for coronary stenosis and cyst aspiration and drainage. [18]

Intranet: An enterprise-wide network that is managed and controlled by an organization for communication and information access within the organization by authorized users. [1]

Intuitionist-pluralist: A philosophical orientation whereby an observation depends on both the resource under study and the perspective of the observer. [11]

Invasive monitoring technique: A method for measuring a physiological parameter that requires breaking the skin or otherwise entering the body. [17]

Inverse document frequency (IDF): A measure of how infrequently a term occurs in a document collection. $IDF_i = \log\left(\frac{\text{number of documents.}}{\text{number of documents with term } i}\right) + 1$. [19]

Inverted index: In information retrieval, a simple guide to the content that includes items (such as words) and item attributes (such as documents that contain the words). [19]

Ionizing radiation: X-rays and other forms of radiation that penetrate cells, and, when sufficiently intense, inhibit cell division, thereby causing cell death. [9]

IP address: A 32-bit number that uniquely identifies a computer connected to the Internet. [5]

Job: A set of tasks submitted by a user for processing by a computer system. [5]

Joystick: A lever-like device (like the steering stick of an airplane) that a user moves to control the position of a cursor on a screen. [5]

“Just in time” information model: An approach to providing necessary information to a user at the moment it is needed, usually through anticipation of the need. [19]

Kernel: The core of the operating system that resides in memory and runs in the background to supervise and control the execution of all other programs and direct operation of the hardware. [5]

Key field: A field in the record of a file that uniquely identifies the record within the file. [5]

Keyboard: A data input device used to enter alphanumeric characters through typing. [5]

Kilobyte: 2^{10} or 1024 bytes. [5]

Knowledge: Relationships, facts, assumptions, heuristics, and models derived through the formal or informal analysis (or interpretation) of data. [2]

Knowledge base: A collection of stored facts, heuristics, and models that can be used for problem solving. [2,20]

Knowledge-based information: Information that has been derived and organized from observational or experimental research. [19]

Knowledge-based system: A program that symbolically encodes, in a knowledge base, facts, heuristics, and models derived from experts in a field and uses that knowledge to provide problem analysis or advice that the expert might have provided if asked the same question. Also known as *expert system*. [10, 20]

Large-Scale Networking: A federal initiative to coordinate advanced network components, technologies, security, infrastructure, and middleware; grid and collaboration networking tools and services; and engineering, management, and use of large-scale networks for science and engineering research and development. It is the successor to the **Next Generation Internet** program that was active in the 1990s (see <http://www.nitrd.gov/subcommittee/lsn.html>). [1]

Laser printer: Output device that uses an electromechanically controlled laser beam to generate an image on a xerographic surface, which is then used to produce paper copies. [5]

Latency: The time required for a signal to travel between two points in a network. [1]

Legacy system: A computer system that remains in use and is difficult to phase out after an organization installs new systems. [13]

Legal issues: The aspects of using software applications in clinical practice and in biomedical research that are defined by law, including liability under tort law, legislation governing privacy and confidentiality, and intellectual property issues. [10]

Level: One of a set of discrete values that can be assumed by a categorical variable. [11]

Lexeme: A minimal lexical unit in a language that represents different forms of the same word. [8]

Lexical-statistical retrieval: Retrieval based on a combination of word matching and relevance ranking. [19]

Lexicography: The study of analyzing electronic dictionaries and creating lexical resources. [8]

Light pen: A penlike photosensitive device with which a user can select and enter data by pointing at the screen of a video display terminal. [5]

Light: Electromagnetic radiation that can be detected by the organs of sight. [9]

Likelihood ratio (LR): A measure of the discriminatory power of a test. The LR is the ratio of the probability of a result when the condition under consideration is true to the probability of a result when the condition under consideration is false (e.g., the probability of a result in a diseased patient to the probability of a result in a nondiseased patient). The LR for a positive test is the ratio of true-positive rate (TPR) to false-positive rate (FPR). [3]

Link-based indexing: An indexing approach that gives relevance weight to web pages based on how often they are cited by other pages. [19]

Liquid crystal display (LCD): A display technology that uses rod-shaped molecules to bend light and alter contrast and viewing angle to produce images. [5,17]

Listserve: A distribution list for electronic mail messages. [5]

Literature reference database: See **bibliographic database**. [19]

Local-area network (LAN): A network for data communication that connects multiple nodes, all typically owned by a single institution and located within a small geographic area. [5,18]

Logical link control (LLC): A sublayer of the data link layer of the ISO Open Systems Interconnection model. [7]

Logical positivism: The view that all statements are analytic (true by logical deduction), verifiable by observation, or meaningless. [4]

Logical-positivist: A philosophical orientation that holds factual only that which has verifiable consequences in experience. [11]

Long-term memory: The part of memory that acquires information from short-term memory and retains it for long periods of time. [4]

Lossless compression: A mathematical technique for reducing the number of bits needed to store data while still allowing for the re-creation of the original data. [18]

Lossy compression: A mathematical technique for reducing the number of bits needed to store data but which results in loss of information. [18]

Lots of Copies Keep Stuff Safe (LOCKSS): An initiative that seeks to preserve important documents by making numerous digital copies, combined with the ability to detect and repair damaged copies as well as to prevent subversion of the data. [19]

Low-level process: An elementary process that has its basis in the physical world of chemistry or physics. [1]

Machine code: The set of primitive instructions to a computer represented in binary code (machine language). [5]

Machine language: The set of primitive instructions represented in binary code. [5]

Machine translation: Automatic mapping of text written in one natural language into text of another language. [8]

Macro: In assembly language, a set of instructions, often with parameters that specify arguments or conditions for assembly, that provide a higher level operator for programming above the machine instruction. As with subroutines, macros make programming easier and facilitate reuse of common program segments (like saving a block of registers to the stack). [5]

Magnetic disk: A round, flat plate of material that can accept and store magnetic charge. Data are encoded on magnetic disk as sequences of charges on concentric tracks. [5]

Magnetic resonance imaging (MRI): A modality that produces images by evaluating the differential response of atomic nuclei in the body when the patient is placed in an intense magnetic field and perturbed by an orthogonal radiofrequency pulse. [5,9,18]

Magnetic tape: A long ribbon of material that can accept and store magnetic charge. Data are encoded on magnetic tape as sequences of charges along longitudinal tracks. [5]

Magnetism: The properties of attraction possessed by magnets. Many atomic nuclei within the body act like tiny magnets, a characteristic that is used in the creation of images through methods such as nuclear magnetic resonance spectroscopy. [9]

Magnetoencephalography (MEG): A method for measuring the electromagnetic fields generated by the electrical activity of the neurons using a large arrays of scalp sensors, the outputs of which are processed in a similar way to CT in order to localize the neuronal activity. [9]

Mailing list: A set of mailing addresses used for bulk distribution of electronic or physical mail. [5]

Mainframe computer: A large, expensive, multiuser computer, typically operated and maintained by professional computing personnel. [5]

Maintenance phase: The final step in the system life cycle during which the system is in routine use and is periodically modified based on changing requirements. [6]

Major medical insurance: Comprehensive insurance for medical expenses. Typically, the insurer pays a certain percentage of covered charges once the insuree has satisfied the deductible. [23]

Malpractice: Class of litigation in health care based on negligence theory; failure of a health professional to render proper services in keeping with the standards of the community. [10]

Managed competition: A strategy used by health services purchasers intended to use market forces to transform the health care delivery system; to create integrated, efficient provider organizations capable of delivering high-value health services and good health outcomes; and to create incentives for continuous quality improvement and cost reduction. [23]

Management: The process of treating a patient (or allowing the condition to resolve on its own) once the medical diagnosis has been determined. [20]

Manual indexing: The process by which human indexers, usually using standardized terminology, assign indexing terms and attributes to documents, often following a specific protocol. [19]

Marginal cost: The increase in total cost associated with the production of one more unit of a good or service. [23]

Marginal cost-effectiveness ratio: The relative value of two interventions, calculated as the difference in the measured costs of the two interventions divided by the difference in the measured benefits of the interventions. [11]

Markov cycle: The period of time specified for a transition probability within a Markov model. [3]

Markov model: A mathematical model of a set of strings in which the probability of a given symbol occurring depends on the identity of the immediately preceding symbol or the two immediately preceding symbols. Processes modeled in this way are often called **Markov processes**. [3,8]

Markup language: A document specification language that identifies and labels the components of the document's contents. [6]

Markup: Labeling of distinct semantic regions of content in a document. [19]

Master patient index (MPI): The module of a health care information system used to identify a patient uniquely within the system. Typically, the MPI stores patient identification information, basic demographic data, and basic encounter-level data such as dates and locations of service. [13]

Matching: The first step of the information retrieval process, in which a query is compared against an index to create a result set. [19]

Mean average precision (MAP): A method for measuring overall retrieval precision in which precision is measured at every point at which a relevant document is obtained, and the MAP measure is found by averaging these points for the whole query. [19]

Measurement study: An experiment that seeks to determine how accurately an attribute of interest can be measured in a population of objects. [11]

Measurement: The process of assigning a value corresponding to presence, absence, or degree of a specific attribute in a specific object. [11]

Measures of concordance: Measures of agreement in test performance: the true-positive and true-negative rates. [3]

Measures of discordance: Measures of disagreement in test performance: the false-positive and false-negative rates. [3]

Medicaid: A program of federal grants to help states pay for the medical care of welfare recipients and of other individuals who fall into special categories of support for their health care needs. [23]

Medical computer science: The subdivision of computer science that applies the methods of computing to medical topics. [1]

Medical computing: The application of methods of computing to medical topics (see **medical computer science**). [1]

Medical datum: Any single observation of medical fact; the value of a specific parameter (e.g., red blood cell count) for a particular object (e.g., a patient) at a given point in time. [2]

Medical informatics: Former name for **biomedical informatics**, now generally viewed as a synonym for **clinical informatics**, although these definitions and conventions are in transition. [1]

Medical information bus (MIB): A data communication system that supports data acquisition from a variety of independent devices. [7,17]

Medical information science: The field of study concerned with issues related to the management and use of biomedical information (see also **biomedical informatics**). [1]

Medical Literature Analysis and Retrieval System (MEDLARS): The initial electronic version of Index Medicus developed by the National Library of Medicine. [19]

Medical logic module (MLM): A single chunk of medical reasoning or decision rule, typically encoded using the **Arden Syntax**. [20]

Medical management: Process employed by a health plan or integrated delivery network to manage patient care proactively and to ensure delivery of (only) appropriate health services. [13]

Medical record: A paper-based or computer-stored document in which are recorded the data gathered during a patient's encounters with the health care system. [12]

Medical spreadsheet: A tool within the Quick Medical Reference decision-support system used to determine how coexisting diseases might give rise to a user-specified combination of diseases or findings. [20]

Medical Subject Headings (MeSH): Some 18,000 terms used to identify the subject content of the biomedical literature. The National Library of Medicine MeSH vocabulary has emerged as the de facto standard for biomedical indexing. [7,19]

Medical technology: Techniques, drugs, equipment, and procedures used by health care professionals in delivering medical care to individuals, and the system within which such care is delivered. [11]

Medical record committee: An institutional panel charged with ensuring appropriate use of medical records within the organization. [10]

Medicare: The federal program of hospital and medical insurance for Social Security retirees, the long-term disabled, and patients suffering from chronic renal failure. [23]

MEDLARS Online (MEDLINE): The National Library of Medicine's electronic catalog of the biomedical literature, which includes information abstracted from journal articles, including author names, article title, journal source, publication date, abstract, and medical subject headings. [19]

MEDLINEplus: An online resource from the National Library of Medicine that contains health topics, drug information, medical dictionaries, directories, and other resources, organized for use by health care consumers. [19]

MedWeaver: A Web application that was designed to integrate functions from the DXplain decision-support system, the WebMedline literature search system, and the CliniWeb clinical Web search system using the UMLS Metathesaurus for vocabulary translation. [19]

Megabit: One million bits; usually used in reference to transmission speed, as in "megabits per second". [5]

Megabits per second (Mbps): A common unit of measure for specifying a rate of data transmission. [5]

Megabyte: 2^{20} or 1,048,576 bytes. [5]

Member checking: Step in a subjectivist study during which the investigator shares emerging thoughts and beliefs with the participants themselves in order to validate and reorganize the structure of the study. [11]

Memorandum of understanding: Document that represents the general goals, scope, methods, conditions, and expected outcomes of a research study. [11]

Memory stick: A portable electronic storage medium that uses a semiconductor chip with a standard physical interface; a convenient method for moving data between computers. [5]

Memory: Areas that are used to store programs and data. The computer's working memory comprises read-only memory (ROM) and random-access memory (RAM). [5]

Mental models: A form of mental representation that enables one to understand how something in the world works. One can "run" a mental model to predict future states of a system (e.g., what happens when I click on this link?) or to explain the cause of a change in state of a system (e.g., why did my computer crash?). [4]

Menu: In a user interface, a displayed list of valid commands or options from which a user may choose. [5]

Merck Medicus: An aggregated set of resources, including Harrison's Online, MDConsult, and DXplain. [19]

MeSH: See **Medical Subject Headings**.

MeSH subheading: One of 76 qualifier terms that can be added to an MeSH entry term to specify the meaning further. [19]

Metadata: Literally, data about data, describing the format and meaning of a set of data. [5,19]

Meta-analysis: A summary study that combines quantitatively the estimates from individual studies. [3]

Meta data: In database applications, abstract descriptors of record structures and their interrelationships that facilitate locating records and fields and manipulating their contents. If programs use meta data to access and process database information, they can achieve data independence in that changes to a database structure can be made and reflected in the meta data in such a way that the program continues to operate without reprogramming. [5]

Metacontent: Information that describes the content of an information resource and thus adds structure to the content. [21]

Meta-tool: A computer program used to generate automatically a domain-specific knowledge-elicitation tool based on a model of the intended application area for a decision-support system. [20]

Metathesaurus: One component of the Unified Medical Language System, the Metathesaurus contains linkages between terms in Medical Subject Headings (MeSH) and in dozens of controlled vocabularies. [19]

Microarray chip: A microchip that holds DNA probes that can recognize DNA from samples being tested. [22]

Middleware: Software that resides between, and translates information between, two or more types of software. For example, middleware components may support access, processing, analysis, and composition of lower-level resources available through basic services, such as access to image data or clinical data. [18]

Mixed-initiative system: An educational program in which user and program share control of the interaction. Usually, the program guides the interaction, but the student can assume control and digress when new questions arise during a study session. [21]

Model organism database: Organized reference databases that combine bibliographic databases, full text, and databases of sequences, structure, and function for organisms whose genomic data has been highly characterized, such as the mouse, fruit fly, and *Saccharomyces* yeast. [19]

Modeling: Task in the creation of a computer-based decision-support system that entails deciding what distinctions and data are relevant, identifying the concepts and relationships among concepts that bear on the decision-making task, and ascertaining a problem-solving strategy that can use the relevant knowledge to reach appropriate conclusions. [20]

Modem: A device used to modulate and demodulate digital signals for transmission to a remote computer over telephone lines; converts digital data to audible analog signals, and vice versa. [5]

Modular computer system: A system composed of separate units, each of which performs a specific set of functions. [13]

Molecular imaging: A technique for capturing images at the cellular and subcellular level by marking particular chemicals in ways that can be detected with image or radiodetection. [9]

Morpheme: The smallest unit in the grammar of a language that has a meaning or a linguistic function; it can be a root of a word (e.g., -arm), a prefix (e.g., re-), or a suffix (e.g., -it/-is). [8]

Morphology: The study of meaningful units in language and how they combine to form words. [8, 19]

Morphometrics: The quantitative study of growth and development, a research area that depends on the use of imaging methods. [9,18]

Mouse (input device): A small boxlike device that is moved on a flat surface to position a cursor on the screen of a display monitor. A user can select and mark data for entry by depressing buttons on the mouse. [5]

Multi-axial terminology: A terminology that separates terms into multiple “axes” (usually, separate hierarchies) for the purposes of selecting terms from more than one axis to express meaning (see **postcoordination**). [7]

Multidisciplinary care: A system of patient care characterized by the collaboration of health professionals, including physicians, nurses, therapists, technicians, dieticians, pharmacists, and other care providers. [16]

Multimedia content: Information sources that encompass all common computer-based forms of information, including texts, graphics, images, video, and sound. [19]

Multimodality image fusion: Image processing that uses multiple techniques of image manipulation to generate a composite visualization that combines images from more than one source. [9]

Multiprocessing: The use of multiple processors in a single computer system to increase the power of the system (see **parallel processing**). [5]

Multiprogramming: A scheme by which multiple programs simultaneously reside in the main memory of a single central processing unit. [5]

Multipurpose Internet Mail Extensions (MIME): An extended standard for exchange of electronic mail that allows the direct transmission of video, sound, and binary data files by Internet electronic mail. [5]

Multiuser system: A computer system that shares its resources among multiple simultaneous users. [5]

MUMPS: Massachusetts General Hospital Utility Multi-Programming System; a specialized programming language (the second ANSI standard programming language, after **COBOL**) developed for use in medical applications; also known as **M**. [1]

Mutually exclusive: State in which one, and only one, of the possible conditions is true; e.g., either A or not A is true, and one of the statements is false. When using Bayes' theorem to perform medical diagnosis, we generally assume that diseases are mutually exclusive, meaning that the patient has exactly one of the diseases under consideration and not more. [3]

MYCIN: A computer-assisted decision support system developed in the 1970s that used artificial intelligence techniques (production rules) to recommend appropriate therapy for patients with infections. [20]

Name authority: The component of a health care information system that uniquely identifies a patient within the system. [13]

Name-server: In networked environments such as the Internet, computers that convert a host name into an IP address before the message is placed on the network. [5]

National Digital Information Infrastructure Preservation Program (NDIIPP): A program of the U.S. Library of Congress intended to help assure preservation of scientific

information through a preservation program that will evolve with technical storage modalities. [19]

National Center for Biotechnology Information (NCBI): Established in 1988 as a national resource for molecular biology information, the NCBI is a component of the National Library of Medicine that creates public databases, conducts research in computational biology, develops software tools for analyzing genome data, and disseminates biomedical information. [19]

National Guidelines Clearinghouse: A public resource, coordinated by the Agency for Health Research and Quality, that collects and distributes evidence-based clinical practice guidelines (see www.guideline.gov). [19]

National Health Information Infrastructure (NHII): A comprehensive knowledge-based network of interoperable systems of clinical, public health, and personal health information that is intended to improve decision making by making health information available when and where it is needed. [1]

National Information Standards Organization (NISO): A nonprofit association accredited by the American National Standards Institute (ANSI) that identifies, develops, maintains, and publishes technical standards to manage information (see www.niso.org). [19]

National Institute for Standards and Technology (NIST): A nonregulatory federal agency within the U.S. Commerce Department's Technology Administration; its mission is to develop and promote measurement, standards, and technology to enhance productivity, facilitate trade, and improve the quality of life (see www.nist.gov). [19]

Natural-language query: A question expressed in unconstrained text, from which meaning must somehow be extracted or inferred so that a suitable response can be generated. [19]

Naturalistic: In evaluation studies, an environment that is drawn from the real world and not constrained or externally controlled as a part of the study design. [11]

Negative Dictionary: A list of **stop words** used in information retrieval. [19]

Negative predictive value (PV⁻): The probability that the condition of interest is absent if the result is negative—e.g., the probability that a specific disease is absent given a negative test result. [3]

Negligence law: Laws, such as those governing medical malpractice, that are based on negligence theory. [20]

Negligence theory: A concept from tort law that states that providers of goods and services are expected to uphold the standards of the community, thereby facing claims of negligence if individuals are harmed by substandard goods or services. [10]

Net present value (NPV): The difference between the present value of benefits and the present value of costs (see **present value**). [11]

Network access provider: A company that builds and maintains high-speed networks to which customers can connect, generally to access the Internet (see also **Internet service provider**). [5]

Network-based hypermedia: The mechanism by which media of all types (text, graphics, images, audio, and video) are integrated, interlinked, and delivered via networks. [19]

Network-model HMO: A model whereby groups of physicians in private practice band together to offer contracted services, generally simulating a prepaid group practice approach (see also **individual practice associations**). [23]

Network node: One of the interconnected computers or devices linked in a communications network. [5]

Network protocol: The set of rules or conventions that specifies how data are prepared and transmitted over a network and that governs data communication among the nodes of a network. [5]

Network stack: The method within a single machine by which the responsibilities for network communications are divided into different levels, with clear interfaces between the levels, thereby making network software more modular. [5]

Network topology: The configuration of the physical connections among the nodes of a communications network. [5]

Neuroinformatics: An emerging subarea of biomedical informatics in which the discipline's methods are applied to the management of neurological data sets and the modeling of neural structures and function. [9]

Next Generation Internet: A federally funded research program in the late 1990s and early in the current decade that sought to provide technical enhancements to the Internet to support future applications, which currently are infeasible or are incapable of scaling for routine use. [1]

Ninth International Classification of Diseases–Clinical Modification (ICD-9-CM): A coding system for medical diagnoses, symptoms, and nonspecific complaints. It is frequently used on insurance claim forms to identify the reasons for providing medical services. [7]

Node: In networking topologies, a machine on the network that sits at the intersection of incoming and outgoing communications channels. [5]

Noise: The component of acquired data that is attributable to factors other than the underlying phenomenon being measured (e.g., electromagnetic interference, inaccuracy in sensors, or poor contact between sensor and source). [5]

Nomenclature: A system of terms used in a scientific discipline to denote classifications and relationships among objects and processes. [2,4,7]

Noninvasive monitoring technique: A method for measuring a physiological parameter that does not require breaking the skin or otherwise entering the body. [17]

Nonionizing radiation: Radiation that does not cause damage to cells; e.g., the sound waves used in ultrasonography (see **ionizing radiation**). [9]

Nonquantifiable benefits and costs: In a cost-benefit analysis, those elements that are important to consider but may defy formal numeric measurements. [23]

Notifiable disease: In communicable disease management, a disease that must be reported to a public health agency when a new case occurs. [15]

NP hard: A complexity class of problems, which are intrinsically harder than those that can be solved in polynomial time. When a definitive version of a combinatorial optimization problem is proven to belong to a class of well-known complex problems such as satisfiability, traveling salesman, and bin packing, an optimization version is said to be NP hard. [11]

Nuclear magnetic resonance (NMR) spectroscopy: A spectral technique used in chemistry to characterize chemical compounds by measuring magnetic characteristics of their atomic nuclei. [9]

Nuclear-medicine imaging: A modality for producing images by measuring the radiation emitted by a radioactive isotope that has been attached to a biologically active compound and injected into the body. [9]

Null hypothesis: In evaluation studies, the negatively stated hypothesis that is the subject of study, generally because of a suspicion that the hypothesis is incorrect. [11]

Nursing care plan: A proposed series of nursing interventions based on nursing assessments and nursing diagnoses. It identifies nursing care problems, states specific actions to address the problems, specifies the actions taken, and includes an evaluation of a client's response to care. [16]

Nursing informatics: The application of biomedical informatics methods and techniques to problems derived from the field of nursing. Viewed as a subarea of clinical informatics. [16]

Nursing information system (NIS): A computer-based information system that supports nurses' professional duties in clinical practice, nursing administration, nursing research, and education. [16]

Nursing intervention: Any of a variety of interactions between nurse and client, including physical care, emotional support, and client education. [16]

Nyquist frequency: The minimum sampling rate necessary to achieve reasonable signal quality. In general, it is twice the frequency of the highest-frequency component of interest in a signal. [5]

Object-oriented database: A database that is structured around individual objects (concepts) that generally include relationships among those objects and, in some cases, executable code that is relevant to the management and or understanding of that object. [22]

Object-oriented programming: An approach to computer programming in which individual concepts are modeled as objects that are acted upon by incoming messages and that act upon other objects by outgoing messages. [6]

Objectives-based approach: An evaluation methodology in which a study seeks to determine whether a resource meets its designers' objectives. [11]

Objectivist: A philosophy of evaluation that suggests that the merit and worth of an information resource—the attributes of most interest in evaluation—can in principle be measured with all observations yielding the same result. [11]

Occam's razor: A philosophical and scientific rule that the simpler explanation is preferred to a more complicated one, all else being equal. [2]

Odds: An expression of the probability of the occurrence of an event relative to the probability that it will not occur. [3]

Odds-likelihood form: See **odds-ratio form**. [3]

Odds-ratio form: An algebraic expression for calculating the posttest odds of a disease, or other condition of interest, if the pretest odds and **likelihood ratio** are known (an alternative formulation of **Bayes' theorem**, also called the **odds-likelihood form**). [3]

Offline device: A device that operates independently of the processor; e.g., a photographic printer with input from storage devices such as flash memory cards or memory sticks. [5]

ONCOCIN: An expert system built in the 1980s to assist physicians with the management of patients enrolled in cancer chemotherapy clinical trials. [20]

Online bibliographic searching: The use of computers to search electronically stored databases of indexed literature references. [19]

Online device: A device that is under the direct control of a computer's processor; e.g., a magnetic-disk drive. [5]

Ontology: A description (like a formal specification of a program) of the concepts and relationships that can exist for an agent or a community of agents. In biomedicine, such ontologies typically specify the meanings and hierarchical relationships among terms and concepts in a domain. [9, 20]

OPAL: A knowledge acquisition program, related to **ONCOCIN**, designed to allow clinicians to specify the logic of cancer clinical trials using visual-programming techniques. [20]

Open Archives Initiative: An effort to provide persistent access to electronic archives of scientific (and other) publications; its fundamental activity is to promote the specification of archives' metadata such that digital library systems can learn what content is available and how it can be obtained. [19]

Open-loop control: A computer system that assists in regulation of a physiological variable, such as blood pressure, by monitoring the value of the variable and reporting measured values or therapy recommendations. Health care personnel retain responsibility for therapeutic interventions (see **closed-loop control**). [17]

Open policy: In standards group, a policy that allows anyone to become involved in discussing and defining the standard. [7]

Open source: An approach to software development in which programmers can read, redistribute, and modify the source code for a piece of software, resulting in community development of a shared product. [12]

Operating system (OS): A program that allocates computer hardware resources to user programs and that supervises and controls the execution of all other programs. [5]

Opportunity cost: The value of the alternatives foregone that might have been produced with those resources (also called the **economic cost**). [23]

Optical disk: A round, flat plate of plastic or metal that is used to store information. Data are encoded through the use of a laser that marks the surface of the disk. [5]

Order entry: In a hospital or health care information system, online entry of orders for drugs, laboratory tests, and procedures, usually by nurses or physicians. [13]

Order-entry systems: See **computer-based physician order-entry (CPOE) systems**. [1]

Orienting issues: Initial investigations that help to define the issues of interest in a subjectivist study design. [11]

Orienting questions: The aims of a study, defined at the outset and sometimes contractually mandated. [11]

Original content: Online information created and provided by the same organization. [19]

Outcomes: In a study, the events or measurements that reflect the possible influences of the interventions being studied. [11]

Outcomes data: Formal information regarding the results of interventions. [10]

Outcome measure: A parameter for evaluating the success of a system; the parameter reflects the top-level goals of the system. [11]

Outcome variable: See **outcome measure**. [11]

Output: The results produced when a process is applied to input. Some forms of output are hardcopy documents, images displayed on video display terminals, and calculated values of variables. [5,6]

Overhead: See **indirect cost**. [23]

Packet: In networking, a variable-length message containing data plus the network addresses of the sending and receiving nodes, and other control information. [5]

Page: A partitioned component of a computer user's programs and data that can be kept in temporary storage and brought into main memory by the operating system as needed. [5]

PageRank (PR) indexing: In indexing for information retrieval on the Internet, an algorithmic scheme for giving more weight to a Web page when a large number of other pages link to it. [19]

Parallel processing: The use of multiple processing units running in parallel to solve a single problem (see **multiprocessing**). [5]

Parse tree: The representation of structural relationships that results when using a grammar (usually context-free) to analyze a given sentence. [8]

Part of speech tagging: Assignment of syntactic classes to a given sequence of words, e.g., determiner, adjective, noun and verb. [8]

Partial-match searching: An approach to information retrieval that recognizes the inexact nature of both indexing and retrieval, and attempts to return the user content ranked by how close it comes to the user's query. [19]

Patent: A specific legal approach for protecting methods used in implementing or instantiating ideas (see **intellectual property**). [10]

Pathfinder: A computer program that uses Bayesian methods in the diagnosis of lymph node pathology. [20]

Pathognomonic: Distinctively characteristic, and thus, uniquely identifying a condition or object (100 percent specific). [2,20]

Pathways: See **clinical pathways**. [1]

Patient care system: Comprehensive computer systems used by health workers in the management of individual patients, usually in hospital settings. [16]

Patient chart: Another name for the medical record of a patient. [12]

Patient monitor: An instrument that collects and displays physiological data, often for the purpose of watching for, and warning against, life-threatening changes in physiological state. [17]

Patient monitoring: Repeated or continuous measurement of physiological parameters for the purpose of guiding therapeutic management. [17]

Patient record: Another name for the medical record, but one often preferred by those who wish to emphasize that such records often need to contain information about patients that extends beyond the details of their diseases and medical or surgical management. [12]

Patient-specific information: Clinical information about a particular patient (as opposed to general knowledge of a disease, syndrome, relationship, etc.). [19]

Patient-tracking application: A computer system used to monitor and manage the movement of patients through multistep processes, such as in the emergency department or imaging department. [13]

Patient triage: A computer system that helps health professionals to classify new patients and direct them to appropriate health resources. [13]

Pattern check: A method for verifying the accuracy of an identifier by assuring that it follows a predefined pattern (e.g., that a Social Security Number must be of the form xxx-yy-zzzz where x, y, and z are digits). [12]

Pattern recognition: The process of organizing visual, auditory, or other data and identifying meaningful motifs. [17]

Peer review: In scientific publication, the process of requiring that articles be reviewed by other scientists who are peers of the author and that, before acceptance for publica-

tion, the author subsequently revise the paper in response to comments and criticisms from such reviewers. [19]

Per capita payment: See **capitation**. [23]

Perimeter definition: Specification of the boundaries of trusted access to an information system, both physically and logically. [5]

Personal computer (PC): A small, relatively inexpensive, single-user computer. [5,21]

Personal digital assistant (PDA): A small, relatively inexpensive, handheld device with electronic schedule and contact list capabilities, possibly with handwriting recognition and other productivity tools. [13]

Phantom: In image processing, an object of known shape, used to calibrate imaging machines. The reconstructed image is compared to the object's known shape. [9]

Pharmacokinetic parameters: The drug-specific and patient-specific parameters that determine the shape of the mathematical models used to forecast drug concentrations as a function of drug regimen. [20]

Pharmacokinetics: The study of the routes and mechanisms of drug disposition over time, from initial introduction into the body, through distribution in body tissues, biotransformation, and ultimate elimination. [1,20]

Pharmacy benefits managers (PBMs): A product of the U.S. health care financing system, PBMs are hired by health plans, insurers, and large employers to fulfill the prescription benefits that are due to their members. A PBM generally negotiates for bulk discounts in purchasing drugs from pharmaceutical companies, and seeks to reduce the total drug cost to the payers, while often providing other services such as mail-order pharmacy deliveries. [24]

Pharmacy information system: A computer-based information system that supports pharmacy personnel. [13]

Phased installation: The incremental introduction of a system into an institution. [6]

Phenotype: The observable physical characteristics of an organism, produced by the interaction of **genotype** with environment. [22]

Physician-hospital organization (PHO): An approach wherein one or a group of hospitals team up with their medical staffs to offer subscribers comprehensive health services for a per capita prepayment. [23]

Picture-archiving and communication system (PACS): An integrated computer system that acquires, stores, retrieves, and displays digital images. [18]

Picture-archiving and communication system (PACS) workbench: A set of tools to study PACS design and to conduct experiments related to image acquisition, transmission, archiving, and viewing. [7,18]

Pixel: One of the small picture elements that makes up a digital image. The number of pixels per square inch determines the spatial resolution. Pixels can be associated with a single bit to indicate black and white or with multiple bits to indicate color or gray scale. [5,9,18]

Placebo effect: In some drug trials, simply giving patients an inactive tablet or other placebo can cause a measurable improvement in some clinical variables because patients feel good about receiving attention and potentially useful medication. This placebo effect may be more powerful than the drug effect itself, and may obscure a complete absence of pharmaceutical benefit. [11]

Plug-ins: Software components that are added to Web browsers or other programs to allow them a special functionality, such as an ability to deal with certain kinds of media (e.g., video or audio). [5]

Point-of-care system: A hospital information system that includes bedside terminals or other devices for capturing and entering data at the location where patients receive care. [13]

Point of service (POS): A type of health plan introduced by HMOs in the mid-1980s to allow patients, at some expense, to seek care outside of the network that includes their contracted providers. [23]

Pointing device: A manual device, such as a mouse, light pen, or joystick, that can be used to specify an area of interest on a computer screen. [5]

Polysemy: The characteristic of a word having multiple possible meanings. [19]

Population-based atlas: An atlas that encodes the anatomy and variation from a group of individuals constituting some relevant population. Compare with a template atlas that is created from a single individual. [9]

Portable Document Format (PDF): Invented by Adobe, Inc., PDF is a published specification used for secure, reliable electronic document distribution and exchange. When converted to PDF, a document maintains its original look and integrity. [19]

Positive predictive value (PV+): The probability that the condition of interest is true if the result is positive—e.g., the probability that a disease is present given a positive test result. [3]

Positron emission tomography (PET): A tomographic imaging method that measures the uptake of various metabolic products (generally a combination of a positron-emitting tracer with a chemical such as glucose), e.g., by the functioning brain, heart, or lung. [9]

Postcoordination: Coding of data by using multiple terms, as needed, to express meaning that cannot be accurately captured by any single term. [7]

Postgenomic database: A database that combines molecular and genetic information with data of clinical importance or relevance. *Online Mendelian Inheritance in Man* (OMIM) is a frequently cited example of such a database. [22]

Postgenomic era: The coming period in which genomic information will be combined with other types of clinical or patient-specific data to provide new approaches to diagnosis and therapy. [9]

Post Office Protocol (POP): A protocol used in the delivery of electronic mail services to any of a number of client software packages used to read e-mail from a central server. [5]

Posterior probability: The updated probability that the condition of interest is present after additional information has been acquired. [3]

Post-test probability: The updated probability that the disease or other condition under consideration is present after the test result is known (more generally, the **posterior probability**). [3]

Practice management system (PMS): A computer information system designed to support all information requirements of a physician office or group practice, including registration, appointment scheduling, billing, and clinical documentation. [13]

Pragmatics: The study of how contextual information affects the interpretation of the underlying meaning of the language. [8]

Precision: The degree of accuracy with which the value of a sampled observation matches the value of the underlying condition, or the exactness with which an operation is performed. In information retrieval, a measure of a system's performance in retrieving relevant information (expressed as the fraction of relevant records among total records retrieved in a search). [5,19]

Precoordination: Expansion of a terminology, as needed, to express meanings with single terms, without needing to resort to the use of multiple terms (see **postcoordination**). [7]

Predicate calculus: The branch of symbolic logic that uses symbols for quantifiers and for arguments and predicates of propositions as well as for unanalyzed propositions and logical connectives. [4]

Predictive model: In evaluation studies, the unusual situation in which investigators have a mechanism to tell them what would have happened to patients if they had not intervened. Such models allow comparisons of what actually happens with what is predicted. [11]

Predictive value: The posttest probability that a condition is present based on the results of a test (see positive predictive value and negative predictive value). [2]

Preferred-provider insurance (PPI): In managed care, an insurance plan in which companies contract with large numbers of providers that are not otherwise related to one another. [23]

Preferred-provider organization (PPO): A method of health care financing based on selective contracting in advance for the services of health care providers. A PPO typically is composed of a panel of providers, a negotiated fee schedule that providers agree to accept as payment in full for their services, a mechanism for utilization control, and incentives for consumers to select providers from the panel, usually in the form of reduced coinsurance. [7,23]

Prepaid group practice: An affiliation of health care providers that agrees to provide comprehensive health care to members for a fixed annual fee set in advance. [23]

Present value (PV): The current value of a payment or stream of payments to be received in the future. The concept of present value generally reflects the fact that \$1 received 1 year from now is not worth as much as \$1 received today both because of inflation and because that dollar is not available to earn interest over the course of the year. [23]

Presentation: The forms in which information is delivered to the end user after processing. [16]

Presentation layer: In software systems, the components that interact with the user. The term generally connotes an architecture in which the system components are modular and *layered* between the underlying data structures and the user interface. [18]

President's Information Technology Advisory Committee (PITAC): A federal advisory body, comprising individuals from academia and industry in the private sector, which was created under the High Performance Computing and Communications initiative of the 1990s and provides advice to the White House on matters related to information technology, including its role in science and health care. [19]

Pressure transducer: A device that produces electrical signals proportional in magnitude to the level of a pressure reading. [17]

Pretest probability: The probability that the disease or other condition under consideration is present before the test result is known (more generally, the **prior probability**). [3]

Prevalence: The frequency of the condition under consideration in the population. For example, we calculate the prevalence of disease by dividing the number of diseased individuals by the number of individuals in the population. Prevalence is the prior probability of a specific condition (or diagnosis), before any other information is available. [2,3]

Primary care: The level of care normally provided by a personal physician or walk-in clinic. The point of entry to the health care system. [12]

Primary care gatekeepers: In managed care settings, those primary care physicians who provide all initial care and then make determinations about when referral of a patient to a specialist is necessary or appropriate. [23]

Primary knowledge-based information: The original source of knowledge, generally in a peer-reviewed journal article that reports on a research project's results. [19]

Primary literature: Scientific articles that present the initial research results, as opposed to review articles or textbooks that synthesize such studies into general coverage of a topic. [19]

Prior probability: The probability that the condition of interest is present before additional information has been acquired. In a population, the prior probability also is called the **prevalence**. [3]

Privacy: A concept that applies to people, rather than documents, in which there is a presumed right to protect that individual from unauthorized divulging of personal data of any kind. [5,10]

Privacy-Enhanced Mail protocol (PEM): A protocol whereby electronic mail is encrypted to assure that only the sender and intended receiver can read it. [5]

Private branch exchange (PBX): A telephone switching center. PBXs can be extended to provide a local-area network in which digital data are converted to analog signals and are transmitted over an existing telephone system. [5]

Probabilistic context-free grammar: A context-free grammar in which the possible ways to expand a given symbol have varying probabilities rather than equal weight. [8]

Probabilistic relationship: Exists when the occurrence of one chance event affects the probability of the occurrence of another chance event. [3]

Probability: Informally, a means of expressing belief in the likelihood of an event. Probability is more precisely defined mathematically in terms of its essential properties. [3]

Problem-oriented medical record (POMR): A clinical record in which the data collected, the physician's assessment, and the proposed therapeutic plans are grouped by association with the patient's specific medical problems. [12]

Problem solver: A program designed to address a certain class of problems using a defined methodology. [20]

Problem space: The range of possible solutions to a problem. [4]

Procedural knowledge: Knowledge of how to perform a task (as opposed to factual knowledge about the world). [4]

Process measure: A parameter for evaluating the success of a system; the parameter measures a byproduct of the system's function. [11]

Product: An object that goes through the processes of design, manufacture, distribution, and sale. [10]

Production: The process of executing a product's design in an ongoing, maintained manner. [21]

Production rule: A conditional statement that relates premise conditions to associated actions or inferences. [20]

Productivity cost: Costs that accrue because of changes in productivity due to illness or death. [11]

Professional-developed: A reference to educational and other resources created by health professionals and their organizations for direct use by patients. [14]

Professional-patient relationship: Refers to a set of assumptions regarding the primacy of patient well-being rather than other external factors in the determination of actions by health professionals. [10]

Professional-review approach: An approach to evaluation in which panels of experienced peers spend several days in the environment where the resource or activity to be assessed is operational. [11]

Professional Standards Review Organization (PSRO): A physicians' organization created to review use of Medicare and Medicaid services and to deny payment for unnecessary services. [23]

Prognostic scoring system: An approach to prediction of patient outcomes based on formal analysis of current variables, generally through methods that compare the patient in some way with large numbers of similar patients from the past. [10]

Projection: In imaging systems, a measured attenuation or superposition. [9]

Proposition: An expression, generally in language or other symbolic form, that can be believed, doubted, or denied or is either true or false. [4]

Prospective payment: A method of health care reimbursement in which providers receive a set payment specified in advance for providing a global unit of care, such as hospitalization for a specified illness or a hospital day. [23]

Prospective payment system (PPS): A scheme for health care financing enacted by Congress in 1983, in which hospitals receive from Medicare a fixed payment per hospital admission, adjusted for **diagnosis-related group**. [23]

Prospective study: An experiment in which researchers, before collecting data for analysis, define study questions and hypotheses, the study population, and data to be collected. [2,12]

PROTÉGÉ: A software meta-tool used by developers to create automatically domain-specific knowledge-elicitation tools by taking as input analysts' models of the relevant applications areas. [20]

Protein-sequence database: A database that contains the known sequences of amino acids of proteins. [22]

Proteomics: By analogy with **genomics**, and the study of genes, the study of the structure and function of proteins. [22]

Protocol: A standardized method or approach. [5,20]

Protocol analysis: In cognitive psychology, methods for gathering and interpreting data that are presumed to reveal the mental processes used during problem solving (e.g., analysis of "think-aloud" protocols). [4]

Protocol for Metadata Harvesting (PMH): A method for harvesting summary information from metadata, which are stored with archival materials (see Open Archive Initiative). [19]

Prototype system: A working model of a planned system that demonstrates essential features of the operation and interface. [6,21]

Provider-profiling system: Computer system used to manage utilization of health resources by tracking and comparing physicians' resource utilization (e.g., cost of drugs prescribed, laboratory tests ordered) compared to severity-adjusted outcomes of the providers' patients. [13]

Proximity searching: A technique used with full-text databases that retrieves documents containing the specified words when they are adjacent in the text, or when they occur within a certain number of words of each other. [19]

PubMed: A software environment for searching the Medline database, developed as part of the suite of search packages, known as **Entrez**, by the NLM's **National Center for Biotechnology Information (NCBI)**. [19]

PubMed Central: An effort by the National Library of Medicine to gather the full text of scientific articles in a freely accessible database, enhancing the value of Medline by providing the full articles in addition to titles, authors, and abstracts. [19]

Public health: The field that deals with monitoring and influencing trends in habits and disease in an effort to protect or enhance the health of the population. [10,15]

Public Health Informatics: An application area of biomedical informatics in which the field's methods and techniques are applied to problems drawn from the domain of public health. [1]

Publication type: One of several classes of articles or books into which a new publication will fall (e.g., review articles, case reports, original research, textbook, etc.). [19]

Public-key cryptography: In data encryption, a method whereby two keys are used, one to encrypt the information and a second to decrypt it. Because two keys are involved, only one needs to be kept secret. [5]

Purchasing coalitions: Groups of employers that together structure their health care benefits program and negotiate with health plans. [23]

QRS wave: In an electrocardiogram (ECG), the portion of the waveform that represents the time it takes for depolarization of the ventricles. [5]

Qualitative arrangement: An approach to image retrieval that looks at the relative relationships of regions in the image, without trying to identify them, and retrieves images that have similar relationships. [18]

Qualitative model: A method for capturing the characteristics of a process or phenomenon in descriptive terms without attempting to define or simulate it quantitatively. [20]

Quality-adjusted life year (QALY): A measure of the value of a health outcome that reflects both longevity and morbidity; it is the expected length of life in years, adjusted to account for diminished quality of life due to physical or mental disability, pain, and so on. [3]

Quality assurance: A means for monitoring and maintaining the goodness of a service, product, or process. [23]

Quality management: A specific effort to let quality of care be the goal that determines changes in processes, staffing, or investments. [16]

Quantitation: In imaging, global processing and segmentation to characterize meaningful regions of interest. [9]

Quasi-legal approach: An evaluation method that establishes a *mock trial*, or other formal adversarial proceeding, to judge a resource. [11]

Query: In a database system, a request for specific information that is stored in the computer. By extension, updates to the database. [12,19]

Query formulation: The process of stating information needs in terms of queries. Also the process by which information needs are translated into queries suitable for searching. [19]

Query and retrieval: An approach to information retrieval in which the user selects the terms. Terms can be matched against a predetermined index or against a thesaurus that searches for synonyms, more global concepts, and more specific concepts. [21]

Queue: In a computer system, an ordered set of jobs waiting to be executed. [5]

Quick Medical Reference (QMR): A decision-support system that grew out of the Internist-1 program. QMR has been marketed commercially for use by both students and practitioners. [20,21]

Radioactive isotope: Chemical compounds used in nuclear medicine imaging techniques. Specific compounds are selected because they tend to concentrate in specific types of tissues. [9]

Radiography: The process of making images by projecting X-rays through the patient onto X-ray-sensitive film. [9]

Radiology: The medical field that deals with the definition of health conditions through the use of visual images that reflect information from within the human body. [9,18]

Radiology information system (RIS): Computer-based information system that supports radiology department operations; includes management of the film library, scheduling of patient examinations, reporting of results, and billing. [7,18]

Random-access memory (RAM): The portion of a computer's working memory that can be both read and written into. It is used to store the results of intermediate computation, and the programs and data that are currently in use (also called **variable memory** or **core memory**). [5,18]

Randomization: A research technique for assigning subjects to study groups without a specific pattern. Designed to minimize experimental bias. [11]

Randomized clinical trial (RCT): A prospective experiment in which subjects are randomly assigned to study subgroups to compare the effects of alternate treatments. [2]

Randomly: Without bias. [2]

Range check: Verification that a clinical parameter falls in an expected (normal) range. [12]

Ranking: In information retrieval, the specification of a retrieved item's match to the query, based on some kind of sorting criteria. [19]

Raster-scan display: A pattern of closely spaced rows of dots that forms an image on the cathode-ray tube of a video display monitor. [9]

Readability: In information retrieval, the notion of identifying and displaying an information resource that uses words, concepts, and sentence structures that will be understandable to the typical user of the search tool in question. [19]

Read-only memory (ROM): The portion of a computer's working memory that can be read, but not written into. [5,17]

Real-time acquisition: The continuous measurement and recording of electronic signals through a direct connection with the signal source. [5]

Recall: In information retrieval, the ability of a system to retrieve relevant information (expressed as the ratio of relevant records retrieved to all relevant records in the database). [19]

Receiver: In data interchange, the program or system that receives a transmitted message. [7]

Receiver operating characteristic (ROC) curve: A curve that depicts the trade-off between the sensitivity and specificity of a test as the criteria for when that test is to be judged abnormal are varied. [3]

Record: In a data file, a group of data fields that collectively represent information about a single entity. [5]

Reductionist approach: An attempt to explain phenomena by reducing them to common, and often simple, first principles. [22]

Region-detection techniques: A technique in which structures are delineated by their composition on the image. [9]

Regional network: A network that provides regional access from local organizations and individuals to the major backbone networks that interconnect regions. [5]

Reference Information Model (RIM): The data model for HL7 version 3.0. [7]

Referent: A person, object or event referenced by a given linguistic expression, e.g., the pronoun "she" in clinical text typically has the patient as its referent. [8]

Referential expression: A sequence of one or more words that refers to a particular person, object or event, e.g., "she," "Dr. Jones," or "that procedure". [8]

Referral bias: In evaluation studies, a bias that is introduced when the patients entering a study are in some way atypical of the total population, generally because they have

been referred to the study based on criteria that reflect some kind of bias by the referring physicians. [3]

Refinement: In information retrieval, the adjustment of a search query in order to obtain more appropriate information than was initially retrieved. [19]

Region-detection technique: A method, such as application of a connected-components algorithm, used to identify a region of interest from an overall image by grouping together pixels that are both adjacent and have similar intensities. [9]

Regional Health Information Network (RHIN): A public-private alliance among health care providers, pharmacies, public health departments and payers, designed to share health information among all health participants, thereby improving community health and health care (see also **CHIN**). [13,15]

Regional Health Information Organization (RHIO): An organization that works to create a **RHIN**. [15]

Register: In a computer, a group of electronic switches used to store and manipulate numbers or text. [5]

Registration: One of the problems to solve in multimodality image fusion, specifically the alignment of separately acquired image volumes. [9]

Regular expression: A mathematical model of a set of strings, defined using characters of an alphabet and the operators concatenation, union and closure (zero or more occurrences of an expression). [8]

Relative recall: An approach to measuring recall when it is unrealistic to enumerate all the relevant documents in a database. Thus the denominator in the calculation of **recall** is redefined to represent the number of relevant documents identified by multiple searches on the query topic. [19]

Relevance feedback: The process that allows a searcher to obtain more relevant documents by designating retrieved documents as relevant and adding terms from them into a new query. [19]

Relevance ranking: The degree to which the results are relevant to the information need specified in a query. [19]

Reliability: In networking, the ability of a networked resource to be available and to meet expectations for performance, as related to network bandwidth and quality of service. [1]

Reminder systems: A decision-support system that monitors a patient's care over time and uses encoded logic to generate warnings and reminders to clinicians when situations arise that require clinical attention. [20]

Remote access: Access to a system or to information therein, typically by telephone or communications network, by a user who is physically removed from the system. [5]

Remote-presence health care: The use of video teleconferencing, image transmission, and other technologies that allow clinicians to evaluate and treat patients in other than face-to-face situations. [10]

Report generation: A mechanism by which users specify their data requests on the input screen of a program that then produces the actual query, using information stored in a database schema, often at predetermined intervals. [5]

Representation: A level of medical data encoding, the process by which as much detail as possible is coded. [7]

Representativeness: A heuristic by which a person judges the chance that a condition is true based on the degree of similarity between the current situation and the stereotypical situation in which the condition is true. For example, a physician might estimate the probability that a patient has a particular disease based on the degree to which the patient's symptoms matches the classic disease profile. [3]

Requirements analysis: An initial analysis performed to define a problem clearly and to specify the nature of the proposed solution (e.g., the functions of a proposed system). [6]

Research protocol: In clinical research, a prescribed plan for managing subjects that describes what actions to take under specific conditions. [2]

Resource-based relative value scale (RBRVS): A system authorized by Congress for paying for Medicare physician's services, intended to correct the large inequities and perverse incentives in Medicare's "customary, prevailing, and reasonable" payment system (see also **volume performance standard**). [23]

Resource Description Framework (RDF): An emerging standard for cataloging meta-data about information resources (such as Web pages) using the **Extensible Markup Language (XML)**. [19]

Responsive-illuminative approach: An approach to evaluation that seeks to represent the viewpoints of both users of the resource and the people who are an otherwise significant part of the clinical environment where the resource operates. [11]

Results reporting: In a hospital or health care information system, online access to the results of laboratory tests and other procedures. [13]

Retrieval: A process by which queries are compared against an index to create results for the user who specified the query. [19]

Retrospective chart review: Extraction and analysis of data from medical records to investigate a question that was not a subject of study at the time the data were collected. [2]

Retrospective payment: A method of health care financing in which providers are reimbursed based on charges for the services actually delivered. [23]

Retrospective study: An analysis of pre-existing sets of data to answer experimental questions. [12]

Revenue center: In a health care institution, a department that charges patients directly for the services provided (see also **cost center**). [13]

Review of systems: The component of a typical history and physical examination in which the physician asks general questions about each of the body's major organ systems to discover problems that may not have been suggested by the patient's chief complaint. [2]

Risk attitude: A person's willingness to take risks. [3]

Risk-neutral: Having the characteristic of being indifferent between the expected value of a gamble and the gamble itself. [3]

Role-limited access: The mechanism by which an individual's access to information in a database, such as a medical record, is limited depending upon that user's job characteristics and their need to have access to the information. [5]

Router: In networking, a device that is connected between multiple networks and receives messages from a network and forwards them to another connected network according to their intended destination. [5]

RS-232-C: A commonly used standard for serial data communication that defines the number and type of the wire connections, the voltage, and the characteristics of the signal, and thus allows data communication among electronic devices produced by different manufacturers. [5]

Rule interpreter: The software component of a rule-based system that assesses individual rules and determines their applicability in a specific case or situation. [20]

Sample attrition rate: The proportion of the sample population that drops out before the study is complete. [11]

Sampling rate: The rate at which the continuously varying values of an analog signal are measured and recorded. [5]

Schema: In a database management system, a machine-readable definition of the contents and organization of a database. [5]

Schema (cognitive science): A mental structure that represents an aspect of the world. Schemas are used to organize categories of knowledge and enable understanding. [4]

Screening: The use of global processing, segmentation, feature detection, and classification to determine whether an image should be flagged for careful review by a human being who is an expert in an image-processing domain. [9]

Script: In software systems, a keystroke-by-keystroke record of the actions performed for later reuse. [5]

Search intermediary: In information retrieval, a specially trained information specialist who interprets users' requests for information, formulates search requests in terms of the commands and vocabulary of the search systems, and carries out the search. [19]

Secondary care: The level of care normally provided by a typical hospital. [13]

Secondary knowledge-based information: Writing that reviews, condenses, and/or synthesizes the primary literature (see **primary knowledge-based information**). [19]

Secret-key cryptography: In data encryption, a method whereby the same key is used to encrypt and to decrypt information. Thus, the key must be kept secret, known to only the sender and intended receiver of information. [5]

Secure Sockets Layer (SSL): a protocol developed by Netscape for transmitting private documents via the Internet. By convention, URLs that require an SSL connection start with 'https:' instead of 'http:'. [5]

Security: The process of protecting information from destruction or misuse, including both physical and computer-based mechanisms. [5]

Segmentation: In image processing, the extraction of selected regions of interest from an image using automated or manual techniques. [9]

Selection bias: An error in the estimates of disease prevalence and other population parameters that results when the criteria for admission to a study produce systematic differences between the study population and the clinically relevant population. [11]

Selectivity: In data collection and recording, the process that accounts for individual styles, reflecting an ongoing decision-making process, and often reflecting marked distinctions among clinicians. [2]

Self-insured plans: The system whereby (large) employers pay their employees' medical bills directly, hire insurance companies to perform claims processing, and perhaps buy outside insurance for only truly catastrophic cases. [23]

Semantic analysis: The study of how symbols or signs are used to designate the meaning of words and the study of how words combine to form or fail to form meaning. [8]

Semantic grammar: A mathematical model of a set of sentences based on patterns of semantic categories, e.g., patient, doctor, medication, treatment, and diagnosis. [8]

Semantic pattern: The study of the patterns formed by the co-occurrence of individual words in a phrase of the co-occurrence of the associated semantic types of the words. [8]

Semantic relation: A classification of the meaning of a linguistic relationship, e.g., “treated in 1995” signifies time while “treated in ER” signifies location. [8]

Semantics: The meaning of individual words and the meaning of phrases or sentences consisting of combinations of words. [5,8,19,20]

Semantic type: The categorization of words into semantic classes according to meaning. Usually, the classes that are formed are relevant to specific domains. [8]

Semantic Web: A future view that envisions the Internet not only as a source of content but also as a source of intelligently linked, agent-driven, structured collections of machine-readable information. [19]

Semi-structured interview: The process whereby an investigator specifies in advance a set of topics that he would like to address, but is flexible as to the order in which these topics are addressed and is open to discussion of topics not on the prespecified list. [11]

Sender: In data interchange, the program or system that sends a transmitted message. [7]

Sensitivity (of a test): The probability of a positive result, given that the condition under consideration is present—e.g., the probability of a positive test result in a person who has the disease under consideration (also called the **true-positive rate**). [2,3]

Sensitivity analysis: A technique for testing the robustness of a decision analysis result by repeating the analysis over a range of probability and utility estimates. [3]

Sensitivity calculation: An analysis to determine which parameters, scenarios, and uncertainties affect a decision, and by how much. [3]

Sequence alignment: An arrangement of two or more sequences (usually of DNA or RNA), highlighting their similarity. The sequences are padded with gaps (usually denoted by dashes) so that wherever possible, columns contain identical or similar characters from the sequences involved. [22]

Sequence information: Information from a database that captures the sequence of component elements in a biological structure (e.g., the sequence of amino acids in a protein or of nucleotides in a DNA segment). [22]

Server: A computer that shares its resources with other computers and supports the activities of many users simultaneously within an enterprise. [5]

Service: An intangible activity provided to consumers, generally at a price, by a (presumably) qualified individual or system. [10]

Service benefit: A type of health insurance benefit, created to ensure that the providers are paid in the manner most acceptable to them—i.e., they can choose to be paid through cost reimbursement, or through payment of billed charges to hospitals and fee-for-service payment to physicians. [23]

Service bureau: A data-processing business that produces bills, third-party invoices, and financial reports for medical practices from information recorded on encounter forms. [13]

Set-based searching: Constraining a search to include only documents in a given class or set (e.g., from a given institution or journal). [19]

Shadowgraph: In radiology, a superposition of all the structures traversed by each X-ray beam. Various body tissues differentially absorb the beams, and the X-rays produce shadows on the radiographic film. [9]

Short-run cost: The cost of producing a good or service when the levels of some inputs (e.g., plant and equipment) remain fixed (see **long-run cost**). [23]

Signal artifact: A false feature of the measured signal caused by noise or other interference. [17]

Simple Mail Transport Protocol (SMTP): The standard protocol used by networked systems, including the Internet, for packaging and distributing email so that it can be processed by a wide variety of software systems. [5]

Simulation: A system that behaves according to a model of a process or another system; for example, simulation of a patient's response to therapeutic interventions allows a student to learn which techniques are effective without risking human life. [21]

Simultaneous access: Access to shared, computer-stored information by multiple concurrent users. [5]

Simultaneous controls: In an evaluation study, subjects who are not subject to the intervention under consideration but who are subject to the other influences of the clinical environment in question. [11]

Single nucleotide polymorphism (SNP): A DNA sequence variation, occurring when a single nucleotide in the genome is altered. For example, an SNP might change the nucleotide sequence AAGCCTA to AAGCTTA. A variation must occur in at least 1% of the population to be considered an SNP. [22]

Single-user system: Computers designed for use by single individuals, such as personal computers, as opposed to servers or other resources that are designed to be shared by multiple people at the same time. [5]

Site visit: An evaluation method whereby experts visit the site of a study or experiment in order to assess the detailed local components of the study as well as the relevant expertise of the investigators. [11]

Situation-action rules: Rules in software environments that propose a specific action that should be taken when a situation arises (see **production rules**). [20]

Skeletal plans: A general approach to a problem, generally expressed as a set of steps, which can be used as the basis for developing a custom-tailored approach by adjusting one or more steps in the skeletal plan. [20]

Software: Computer programs that direct the **hardware** how to carry out specific automated processes. [5,6]

Software engineering: The discipline concerned with organizing and managing the software development process (the process of creating computer programs and documentation) to facilitate production of high-quality systems in a timely and cost-effective manner. [6]

Software-oversight committees: Groups within organizations that are constituted to oversee computer programs and to assess their safety and efficacy in the local setting. [10]

Spamming: The process of sending unsolicited e-mail to large numbers of unwilling recipients, typically to sell a product or make a political statement. [5]

Spatial resolution: A measure of the ability to distinguish among points that are close to each other (indicated in a digital image by the number of **pixels** per square inch). [5,9]

Specialist Lexicon: one of three UMLS Knowledge Sources, this lexicon is intended to be a general English lexicon that includes many biomedical terms and supports natural-language processing. [19]

Specialized registry: A bibliographic database containing documents that may extend beyond those found in the scientific literature. The **National Guideline Clearinghouse** is one such example. [19]

Specification phase: In system design, the stage during which general system requirements are analyzed and formalized. [6]

Specificity (of a test): The probability of a negative result, given that the condition under consideration is absent—e.g., the probability of a negative test result in a person who does not have a disease under consideration (also called the **true-negative rate**). [2,3]

Spectrum bias: Systematic error in the estimate of a study parameter that results when the study population includes only selected subgroups of the clinically relevant population—e.g., the systematic error in the estimates of sensitivity and specificity that results when test performance is measured in a study population consisting of only healthy volunteers and patients with advanced disease. [3]

Speech understanding: The field of computer science related to the development of computer programs that appropriately interpret and act upon information that is entered using human speech through a microphone. [5]

Speech recognition: The process of taking as input a spoken utterance (generally entered via a microphone) and translating it into a corresponding text representation in natural language. [5]

Spelling check: The software process whereby a specified selection of text is assessed for accuracy of the spelling of its words. [12]

Spiral model: A software engineering model in which an initial prototype is presented to the customers, who assess it, and expand and modify requirements in an ongoing iterative process. [6]

Spirometry: Evaluation of the air capacity and physiologic function of the lungs. [17]

Staff-model HMOs: A health maintenance organization in which doctors are retained as salaried employees on the organization's staff (see also **group-model HMOs**). [23]

Staged evaluation: Incremental evaluation of a system, in which different criteria for success are applied at successive stages of development. [11]

Standard-gamble: A technique for utility assessment that enables an analyst to determine the utility of an outcome by comparing an individual's preference for a chance event when compared with a situation of certain outcome. [3]

Standard of care: The community-accepted norm for management of a specified clinical problem. [10]

Standardized coding and classification (SCC): A generic term describing any system that is used to define a standard for data coding. [16]

Standards development organization (SDO): An organization charged with developing a standard that is accepted by the community of affected individuals. [7]

Static: In patient simulations, a program that presents a predefined case in detail but that does not vary in its response depending on the actions taken by the learner. [21]

Statistical error: In a model relating x to y , the portion of the variance in the dependent variable that cannot be explained by variance in the independent variables. [11]

Statistical life: An anonymous individual, such as a person affected by a policy that saves “one life in a thousand” (see **identified life**). [11]

Statistical package: A collection of programs that implement statistical procedures. Used to analyze data and report results. [11]

Stop-loss coverage: Reinsurance, which shifts the risk of a catastrophic case to an insurance company, thereby making it possible for small employers to self-insure (as large employers do). [23]

Stop-word list: In full-text indexing, a list of words that are low in semantic content (e.g., “the”, “a”, “an”) and are generally not useful as mechanisms for retrieving documents. [19]

Stemmed: The process of converting a word to its root form by removing common suffixes from the end. [19]

Strict product liability: The principle that states that a product must not be harmful. [10,20]

String: A sequence of like items, such as bits, characters, or words. [19]

Structural alignment: In biological sequences, the task of aligning a new structure against a database of known structures, to determine regions of identity or similarity. [22]

Structural informatics: The study of methods for organizing and managing diverse sources of information about the physical organization of the body and other physical structures. [1,9]

Structured data: Data that are organized according to a particular format. [8]

Structured encounter form: A form for collecting and recording specific information during a patient visit. [12]

Structured Query Language (SQL): A commonly used syntax for retrieving information from relational databases. [5]

Structured content: The organization and labeling of text (or other information) according to subsections that represent coherent concepts. [21]

Structured programming: The composition of computer programs using only sequences of statements and formal constructs for iteration (*do while*) and selection (*if...then...else*); implies modularity, absence of *go to* statements, and the use of stylistic conventions, such as indentation and the use of meaningful variable and subroutine names. [6]

Structured interview: An evaluation method that uses a schedule of questions that are always presented in the same words and in the same order. [11]

Study population: The population of subjects—usually a subset of the clinically relevant population—in whom experimental outcomes (e.g., the performance of a diagnostic test) are measured. [3]

Study protocol: A prescribed plan for managing experimental subjects that describes what actions to take under what conditions. [11]

Subject: An individual about whom data are collected during the conduct of a study. [11]

Subject heading: In information retrieval, the standardized terms used to categorize documents in order to facilitate their retrieval when appropriate. [19]

Subjectivist: A philosophy of evaluation that suggests that what is observed about a resource depends in fundamental ways on the observer. [11]

Subheading: In MeSH, qualifiers of subject headings that narrow the focus of a term. [19]

Sublanguage: Language of a specialized domain, such as medicine, biology, or law. [8]

Summary ROC curve: A composite **ROC curve** developed by using estimates from many studies. [3]

Summative decision: A decision made after a resource is installed in its envisioned environment; deals explicitly with how effectively the resource performs in that environment. [11]

Superbill: An itemized bill that summarizes the financial transactions occurring during a patient–physician encounter, including specification of the type of visit and a listing of the procedures performed and drugs administered; also, a checklist form for generating such a bill. [20]

Supervised learning: In automated neural networks, a process by which the values for weights are determined in an incremental fashion as the network is trained on a large collection of previously classified examples. [20]

Surface-based warping: A method for aligning 3-D surface models of anatomical structures extracted from image volumes by establishing a non-linear transformation (warp) that relates the two surface models. (see also **volume-based warping**). [9]

Surface rendering: A visualization technique that provides an alternative to volume rendering. This is the primary technique used in computer graphics, and has been applied widely in the entertainment industry for movies such as *Toy Story*. Surface

rendering requires that the surface of interest be segmented from the image volume, after which rendering speeds on standard workstations are much faster than those possible with volume rendering. [9]

Surveillance: In a computer-based medical record system, systematic review of patients' clinical data to detect and flag conditions that merit attention. [12] In public health, the ongoing collection, analysis, interpretation, and dissemination of data on health conditions and threats to health [15]

Switch: In networking, a device that joins multiple computers or LAN segments together. A switch operates at the Data Link Layer and can inspect data packets to forward them only to the intended connected device, thereby conserving network bandwidth. [5]

Symbolic programming language: A programming language in which a programmer defines variables to represent abstract entities and can specify arithmetic, logical, and/or symbolic operations without worrying about the details of how the hardware performs these operations. Symbolic languages may support mathematical operations, text or string processing, database retrievals, logical operations involved in decision processes, and so on. [5]

Syndromic surveillance: An ongoing process for monitoring of clinical data, generally from public health, hospital, or outpatient resources, whereby the goal is early identification of outbreaks, epidemics, new diseases, or, in recent years, bioterrorist events. [10]

Synonymy: Occurs when two words have identical meanings. [19]

Synoptic content: Information in computer systems and databases that is created by extracting important observations and principles from sources of original content, as well as from personal experience. [19]

Syntactic: That which relates to the *structure* of words, phrases, or sentences (as opposed to their meanings). [19]

Syntax: The grammatical structure of language describing the relations among words in a sentence. [5,8]

System: A set of integrated entities that operates as a whole to accomplish a prescribed task. [6]

System integration: The process by which software systems and components are brought together to work as a coherent whole. [6]

System programs: The operating system, compilers, and other software that are included with a computer system and that allow users to operate the hardware. [5]

System review form: A paper form used during a physical examination to record findings related to each of the body's major systems. [2,12]

Systematic Classification of Proteins (SCOP): A currently available online resource that classifies proteins based on shape and function. [22]

Systematic review: A type of journal article that reviews the literature related to a specific clinical question, analyzing the data in accordance with formal methods to assure that data are suitably compared and pooled. [19]

Systematized Nomenclature Of MEDicine (SNOMED): The expanded form of the diagnostic coding scheme, formerly known as **SNOP (Systematized Nomenclature of Pathology)**. A multiaxial nomenclature system for the coding of several aspects of a diagnosis or other clinical entity. [2,7]

Systematized Nomenclature Of Pathology (SNOP): A widely used diagnostic coding scheme, developed by pathologists. A nomenclature system of the College of American Pathologists based on four coding axes: topography, morphology, etiology, and function. A predecessor to SNOMED. [2,7]

Systems aggregation: A situation in which functions from disparate and widely distributed information systems are brought together in one application. [19]

Tactile feedback: In virtual or **telepresence** environments, the process of providing (through technology) a sensation of touching an object that is imaginary or otherwise beyond the user's reach (see also **haptic feedback**). [5]

Task: An activity of study, when computers or people solve problems or work through clinical cases. [11]

Taxonomy: An orderly classification, reflecting natural relationships among objects. [4]

Technical characteristics: The first stage in a technology assessment, in which the formal capabilities of a studied technology are defined and assessed. [11]

Technology assessment: Any process of examining and reporting properties of a medical technology used in health care, such as safety, efficacy, feasibility, and indication for use, cost, and cost-effectiveness, as well as social, economic, and ethical consequences, whether intended or unintended. [11]

Teledermatology: The application of **telemedicine** methods to dermatology, in which an expert dermatologist examines skin lesions on a patient at a distance by the use of photography and networked communication. [18]

Telemedicine: A broad term used to describe the delivery of health care at a distance, increasingly but not exclusively by means of the Internet. [1,10,14]

Telepathology: Use of telecommunication technologies to transmit data and images to and from a remote site for diagnosis, education, and research in pathology. [18]

Telepresence: A technique of telemedicine in which a viewer can be physically removed from an actual medical procedure or surgery, viewing the abnormality through a video monitor that displays the patient or operative field and allows the observer to participate in the procedure. [18]

Teleradiology: The provision of remote interpretations, increasing as a mode of delivery of radiology services. [18]

Telerobotics: A technique of telemedicine in which the manipulation of a biomedical device (e.g., a robot arm, a microscope, or an endoscope) is controlled at a distance by the hand movements of a remote operator. [18]

Template atlas: A (usually 3-D) labeled and segmented anatomical model from a single individual, to which the anatomy of other individuals is registered [9]

Temporal resolution: The time between acquisition of each of a series of images. Limited by the time needed to produce each image. [9,18]

Temporal subtraction: A technique of image enhancement that subtracts a reference image from later images that are registered to the first. A common use of temporal subtraction is **digital-subtraction angiography (DSA)**, in which a background image is subtracted from an image taken following the injection of contrast material. [9]

Term: In information retrieval, a word or phrase that forms part of the basis for a search request. [19]

Term frequency (TF): In information retrieval, a measurement of how frequently a term occurs in a document. [19]

Term weighting: The assignment of metrics to terms so as to help specify their utility in retrieving documents well matched to a query. [19]

Terminal: A simple device that has no processing capability of its own but allows a user to access a server. [5]

Terminal interface processor (TIP): A utility communications computer that is used to attach video display terminals and other communications devices to a LAN. [5]

Terminology: A set of terms representing the system of concepts of a particular subject field. [7]

Terminology authority: The component of a health care information system that defines the vocabulary standard and valid terms within the system; the medical entities dictionary. [13]

Terminology services: A set of functions provided by a health care information system and used to link, translate, and cross-reference diverse vocabulary terms for consistent use within the system. [13]

Tertiary care: The level of care normally provided by a specialized medical center. [13]

Test interpretation bias: Systematic error in the estimates of sensitivity and specificity that results when the index and gold standard test are not interpreted independently. [3]

Test referral bias: Systematic error in the estimates of **sensitivity** and **specificity** that results when subjects with a positive index test are more likely to receive the **gold standard test**. [3]

Testing: The process of formally running a newly developed computer system or set of programs to exercise them fully and to determine their reliability, accuracy, and freedom from programming errors. [6]

Text editor: A program used to create files of character strings, such as other computer programs and documents. [5]

Text generation: Methods that create coherent natural-language text from structured data or from textual documents in order to satisfy a communication goal. [8]

Text parsing: Conversion of unstructured text into a structured representation, using a given grammar. [8]

Text REtrieval Conference (TREC): Organized by **NIST**, an annual conference on text retrieval that has provided a test bed for evaluation and a forum for presentation of results (see trec.nist.gov). [19]

Text-scanning devices: A mechanical device that scans a paper document and converts text into computer-interpretable elements. [5]

Text-word searching: In an information retrieval, retrieval of relevant articles based on the words that appear in titles and abstracts, rather than the index terms that have been assigned to each entry. [19]

TF*IDF weighting: A specific approach to term weighting that combines the **inverse document frequency (IDF)** and **term frequency (TF)**. [19]

Thesaurus: A set of subject headings or descriptors, usually with a cross-reference system for use in the organization of a collection of documents for reference and retrieval. [19]

Thin client: A program on a local computer system that mostly provides connectivity to a larger resource over a computer network, thereby providing access to computational power that is not provided by the machine, which is local to the user. [20]

Think-aloud protocols: In cognitive science, the generation of descriptions of what a person is thinking or considering as they solve a problem. [4]

Three-dimensional reconstruction and visualization: The process of producing three-dimensional models from uniform data (typically from slices through a structure) and rendering them for computer visualization and manipulation. [9]

Three-dimensional-structure information: In a biological database, information regarding the three-dimensional relationships among elements in a molecular structure. [22]

Tiling: A technique used in three-dimensional surface segmentation wherein a surface is applied over manually or automatically segmented two-dimensional contours that have been stacked together, creating a continuous surface. [9]

Time-sharing mode: An interactive mode for communicating with a computer in which the operating system switches rapidly among all the jobs that require CPU services (see **batch mode**). [5]

Time trade-off: A common approach to utility assessment, comparing a better state of health lasting a shorter time, with a lesser state of health lasting a longer time. The time trade-off technique provides a convenient method for valuing outcomes that accounts for gains (or losses) in both length and quality of life. [3]

Tokenization: The process of breaking an unstructured sequence of characters into larger units called “token”, e.g., words, numbers, dates, and punctuation. [8]

Token Ring: A type of local-area network, typically used by IBM systems (see also **Ethernet**). [5]

Topology: In networking, the overall connectivity of the nodes in a network. [5]

Touch screen: A display screen that allows users to select items by touching them on the screen. [5]

Track ball: An interactive device that uses a mounted ball, which, when rolled in its housing, manipulates a pointer on the computer screen. [5]

Transaction set: In data transfer, the full set of information exchanged between a sender and a receiver. [7]

Transcription: The conversion of dictated notes into ASCII text by a typist. [12]

Transducer: A device that produces electrical signals proportional in magnitude to the level of a measured parameter, such as blood pressure. [17]

Transformation-based learning: A method of machine learning in which structural transformations are acquired incrementally by attempting to convert a random or naive representation of a text into the target or correct representation. [8]

Transition matrix: A table of numbers giving the probability of moving from one state in a **Markov model** into another state or the state that is reached in a finite-state machine depending on the current character of the alphabet. [8]

Transition probabilities: The probabilities that a person will transit from one health state to another during a specified time period. [3]

Transmission Control Protocol/Internet Protocol (TCP/IP): The standard protocols used for data transmission on the Internet and other common local- and wide-area networks. [5]

Treatment threshold probability: The probability of disease at which the expected values of withholding or giving treatment are equal. Above the threshold, treatment is recommended; below the threshold, treatment is not recommended and further testing may be warranted. [3]

Tree: In information retrieval, the hierarchically organized sets of index terms. [19]

Trigger event: In monitoring, events that cause a set of transactions to be generated. [7]

True-negative rate (TNR): The probability of a negative result, given that the condition under consideration is false—e.g., the probability of a negative test result in a patient who does not have the disease under consideration (also called **specificity**). [3]

True-negative result (TN): A negative result when the condition under consideration is false—e.g., a negative test result in a patient who does not have the disease under consideration. [3]

True-positive rate (TPR): The probability of a positive result, given that the condition under consideration is true—e.g., the probability of a positive test result in a patient who has the disease under consideration (also called **sensitivity**). [3]

True-positive result (TP): A positive result when the condition under consideration is true—e.g., a positive test result in a patient who has the disease under consideration. [3]

Turnaround document: A form that serves first as a summary form for presenting results and subsequently as a data collection form. [12]

Turnkey system: A computer system that is purchased from a vendor and that can be installed and operated with minimal modification. [6]

Tutoring system: A computer program designed to provide self-directed education to a student or trainee. [21]

Twisted-pair wires: The typical copper wiring used for routine telephone service but adaptable for newer communication technologies. [5]

Type checking: In computer programming, the act of checking that the types of values, such as integers, decimal numbers, and strings of characters, match throughout their use. [5]

Type I error: A false-positive error in an evaluation study such that the resource being studied is ineffective, but for some reason the study mistakenly shows that it is effective. [11]

Type II error: A false-negative error in an evaluation study such that the resource being studied is effective, but for some reason the study mistakenly fails to show that it is. [11]

Typology: A classification scheme (e.g., of evaluation methods). [11]

Ultrasonography: The use of pulses of high-frequency sound waves, rather than ionizing radiation, to produce images of body structures. [9,18]

Ultrasound (US): A common energy source derived from high-frequency sound waves. [9,18]

Ultrasound imaging: The transmission of sound waves through the body, with analysis of the returning echoes to produce images. [9,18]

UMLS Semantic Network: A knowledge source in the **UMLS** that provides a consistent categorization of all concepts represented in the **Metathesaurus**. Each Metathesaurus concept is assigned at least one semantic type from the Semantic Network. [19]

Unicode: A representation for international character sets using 16 bits per character; ASCII is a small subset of Unicode. [5]

Unified Medical Language System (UMLS): A terminology system, developed under the direction of the National Library of Medicine, to produce a common structure that ties together the various vocabularies that have been created for biomedical domains. [2,7,9,18,19]

Uniform Resource Locator (URL): The address of an information resource on the World Wide Web. [5]

Uniform resource identifier (URI): The combination of a URN and URL, intended to provide persistent access to digital objects. [19]

Uniform resource name (URN): A name for a Web page, intended to be more persistent than a URL, which often changes over time as domains evolve or web sites are reorganized. [19]

Universal workstation: A computer of moderate size and cost that is used to access all computer resources connected to a network. [13]

Unit-dose dispensing: An approach to the distribution of drugs, whereby patients' drugs are packaged on a unit-of-dose basis to reduce wastage and to control drug use. [13]

Unobtrusive measures: Records or data for an evaluation that are accrued as part of a routine activity under study and therefore require no special intervention. [11]

Unsharp masking: A technique of image enhancement, in which a blurred image is subtracted from the original image to increase local contrast and to enhance the visibility of fine-detail (high-frequency) structures. [9]

Unstructured interview: An interview in an evaluation study in which there are no pre-defined questions to be asked. [11]

Usability: The characteristic of being convenient and practicable for use. Generally applied to whether a computer system is optimally usable by its intended audience. [4]

User interface: An application that allows users to enter data into a computer and that presents data to the user. [8]

User-interface layer: A conceptual level of a system architecture that insulates the programs designed to interact with users from the underlying data and the applications that process those data. [13]

Usual, customary, and reasonable fee: The typical fee used as the basis for billed charges and retrospective cost reimbursement. [23]

Utility: In decision making, a number that represents the value of a specific outcome to a decision maker (see, for example, **quality-adjusted life years**). [3,20]

Utilization review: In a hospital, inspection of patients' medical records to identify cases of inappropriate care, including excessive or insufficient use of resources. [13]

Validation: Verification of correctness. [6]

Validity check: In a database system or computer-based medical record system, a test (such as a range check or a pattern check) that is used to detect invalid data values. [12]

Variable: In evaluations, specific characteristics of subjects that either are measured purposefully by the investigator or are self-evident properties of the subjects that do not require measurement. [11]

Variable cost: A cost that changes with the volume of goods or services produced during a given period. [23]

Variable memory: See **random-access memory**. [5]

Vector-space model: A method of full-text indexing in which documents can be conceptualized as vectors of terms, with retrieval based on the cosine similarity of the angle between the query and document vectors. [19]

Vendor system: A host computer system owned by a third party that provides users with access to multiple databases or other services. [6]

Video display terminal (VDT): An input–output device that is used for communication with a remote computer and that has a cathode-ray tube display for viewing output and a keyboard for entering data. [5]

View: In a database management system, a logical submodel of the contents and structure of a database used to support one or a subset of applications. [5,12]

View schemas: An application-specific description of a view that supports that program's activities with respect to some general database for which there are multiple views. [5]

Virtual addressing: A technique in memory management such that each address referenced by the CPU goes through an address mapping from the **virtual address** of the program to a physical address in main memory. [5]

Virtual memory: A scheme by which users can access information stored in auxiliary memory as though it were in main memory. Virtual memory addresses are automatically translated into actual addresses by the hardware. [5]

Virtual Private Network (VPN): A secured communications channel, often used to secure access to resources within a company or organization by a user connecting from a remote site. VPNs typically operate over public networks using encryption to keep packet content from being disclosed. [5]

Virtual reality (VR): A collection of interface methods that simulate reality more closely than does the standard display monitor, generally with a response to user maneuvers that heighten the sense of being connected to the simulation (see also **augmented reality**). [18,21]

Virus: A software program that is written for malicious purposes to spread from one machine to another and to do some kind of damage. Such programs are generally self-replicating, which has led to the comparison with biological viruses. [5]

Visible Human Project: A project of the National Library of Medicine in which detailed high-resolution images and other digital data were created from human cadavers (one male and one female) and made publicly available for research and education purposes. [19]

Visual-analog scale: A method for valuing health outcomes, wherein a person simply rates the quality of life with a health outcome on a scale from 0 to 100. [3]

Vital signs: A person's core temperature, pulse rate, respiratory rate, and arterial blood pressure. [17]

Viterbi algorithm: A procedure that computes the most likely sequence of states in a **Markov model**, given a sequence of symbols. [8]

Vocabulary: A dictionary containing the terminology of a subject field. [4, 7]

Volatile: A characteristic of a computer's memory, in that contents are changed when the next program runs and are not retained when power is turned off. [5]

Volume-based warping: A method for aligning the anatomical structures depicted in two image volumes as closely as possible by establishing a non-linear transformation (warp) that relates voxels in one volume to corresponding voxels in the other volume. Only voxel intensities are used to determine the warp. (see also **surface-based warping**). [9]

Volume performance standard (VPS): A system authorized by Congress for paying for Medicare physicians' services, intended to control volume. This approach may have instead motivated an increase in physician services as doctors sought to protect their real incomes in the face of controlled prices and a surplus of doctors (see **resource-based relative value scale**). [23]

Volume rendering: A method whereby a computer program projects a two-dimensional image directly from a three-dimensional **voxel** array by casting rays from the eye of the observer through the volume array to the image plane. [9]

von Neuman machine: A computer architecture that comprises a single processing unit, computer memory, and a memory bus. [5]

Voxel: A volume element, or small region of a three-dimensional digital image (see **pixel**). [9]

Waterfall model: A software development model in which development is seen as flowing steadily through the phases of requirements analysis, design, implementation, testing (validation), integration, and maintenance. [6]

Waveform template: A wave pattern that is stored in a computer and compared to collected waveforms, such as those acquired from patients. Used to identify and classify abnormal wave patterns. [17]

Wavelet compression: A method of lossy compression for grayscale and color images and video. Unlike methods such as JPEG and MPEG, which compress small blocks of 8×8 pixels, wavelet algorithms process the entire image, achieving compression ratios for grayscale images that can exceed 50:1. Nonuniform compression is possible, whereby different regions of an image can be compressed at different ratios. The methods are based on locally operative mathematical transforms into the frequency domain. [9, 18]

Web browser: A computer program used to access and display information resources on the World Wide Web. [5]

Web catalog: Web pages containing mainly links to other Web pages and sites. [19]

WebMedline: The first World Wide Web interface developed for searching the MEDLINE database. [19]

Weights: Values associated with the nodes of an artificial neural network; the weights propagate through the layers of the network to perform classification based on a set of inputs. [20]

White space: Spaces, punctuation, carriage returns, and other nonalphanumeric characters that appear in a text. [19]

Wide-area network (WAN): A network that connects computers owned by independent institutions and distributed over long distances. [5,18]

Wildcard character: In search and retrieval applications, a method that allows unspecified single- or multiple-character expansion somewhere in a string that is being used as the basis for the search. [19]

Willingness to pay: An approach to valuing human life based on the values implied by the choices people make every day to change their probabilities of living or dying. For example, a person's implicit valuation for life could be calculated based on how much he is willing to pay for a car airbag that will reduce his chance of by death by a certain incremental amount. [3]

Word: In computer memory, a sequence of bits that can be accessed as a unit. [5]

Word size: The number of bits that define a word in a given computer. [5]

Working memory: In cognitive science, the portion of one's memory that is used to perform the tasks related to the current focus of attention. [4]

Workstation: A powerful desktop computer system designed to support a single user. Workstations provide specialized hardware and software to facilitate the problem-solving and information-processing tasks of professionals in their domains of expertise. [5]

World Intellectual Property Organization (WIPO): An international organization, headquartered in Geneva and dedicated to promoting the use and protection of intellectual property. [19]

World Wide Web (WWW): An application implemented on the Internet in which multimedia information resources are made accessible by any of a number of protocols, the most common of which is the **HyperText Transfer Protocol (HTTP)**. [5]

Worm: A self-replicating computer program, similar to a computer virus; a worm is self-contained and does not need to be part of another program to propagate itself. [5]

Write-it-once system: A type of paper-based billing system that uses carbon paper or photocopying to generate bills from patient-encounter information that has been transcribed onto ledger cards. [12]

Write once, read many (WORM): A storage medium that is suitable for reuse but cannot be erased or rewritten. [5]

XML format: Content that is expressed using the **Extensible Markup Language (XML)**. [6]

X-ray: A type of **ionizing radiation** that has been harnessed to provide a technique of medical imaging, allowing the capture of views of structures within the body. [9]

X-ray crystallography: A technique in crystallography in which the pattern produced by the diffraction of X-rays through the closely spaced lattice of atoms in a crystal is recorded and then analyzed to reveal the nature of that lattice, generally leading to an understanding of the material and molecular structure of a substance. [22]

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COLOR PLATE I

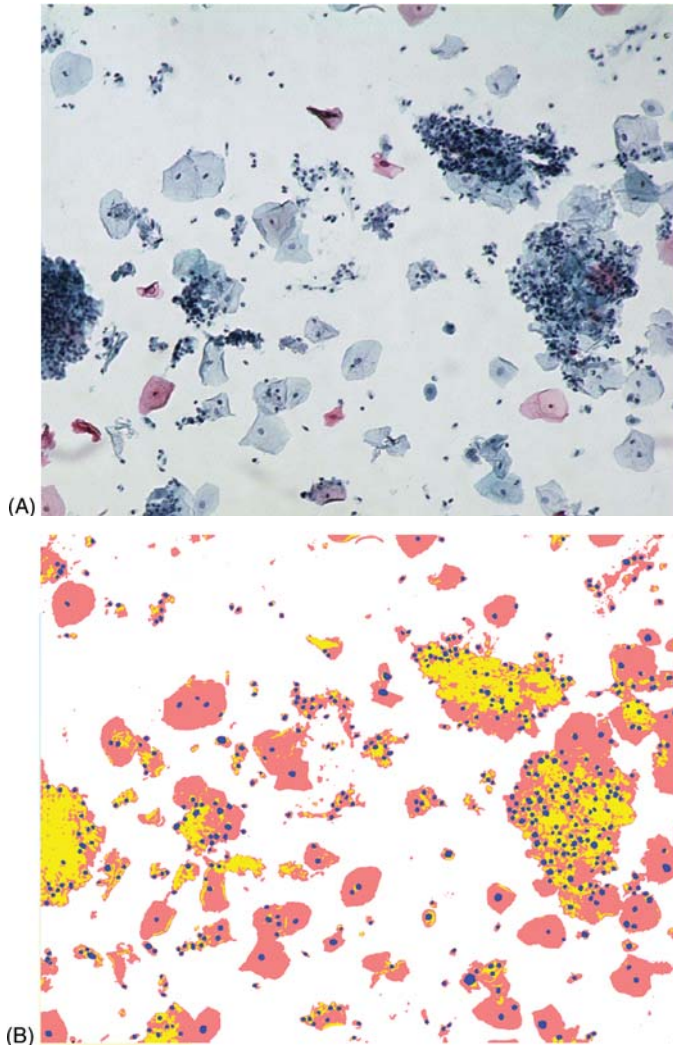


Figure 9.3. Automated screening of Papanicolaou (PAP) smears. Since large numbers of PAP smears are acquired routinely, there is a need to reduce the cost and potential errors associated with purely manual interpretation. (A) Raw microscopic image of cervical cells. (B) Segmented image. The program has segmented the cells and nuclei from the raw image, prior to feature detection and classification based on the features. Abnormally classified cells are flagged for review by the human operator. Photograph courtesy of Peter Loch, Visible Diagnostics, <http://www.imm.dtu.dk/visiondag/VD03/medicinsk/pl.pdf>.

COLOR PLATE II

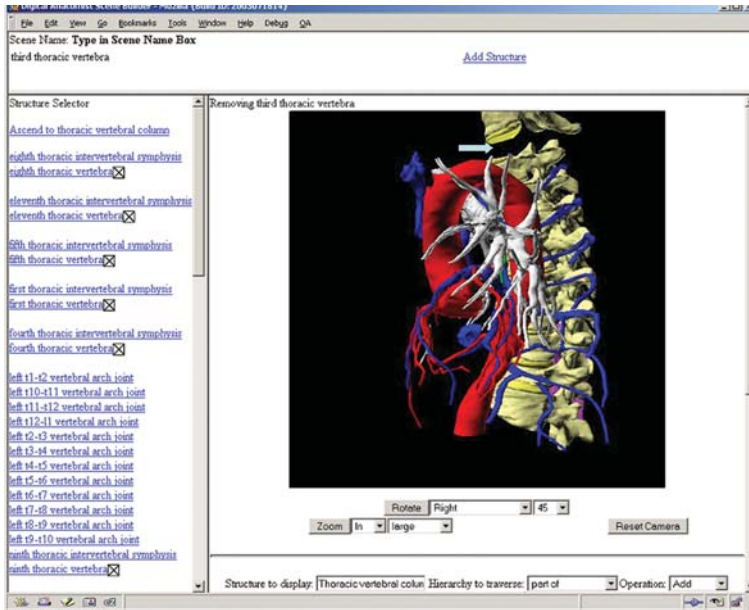


Figure 9.5. The Digital Anatomist Dynamic Scene Generator (see text). This-scene was created by requesting the following structures from the scene generator server: the parts of the aorta, the branches of the ascending aorta, the tributaries of the right atrium, the branches of the tracheo-bronchial tree, and the parts of the thoracic vertebral column. The server was then requested to rotate the camera 45 degrees, and to provide the name of a structure selected with the mouse, in this case the third thoracic vertebra. The selected structure was then hidden (note the gap indicated by the arrow). The left frame shows a partial view of the FMA part of hierarchy for the thoracic vertebral column. Checked structures are associated with three-dimensional “primitive” meshes that were loaded into the scene. Photograph courtesy of the Structural Informatics Group, University of Washington.

COLOR PLATE III

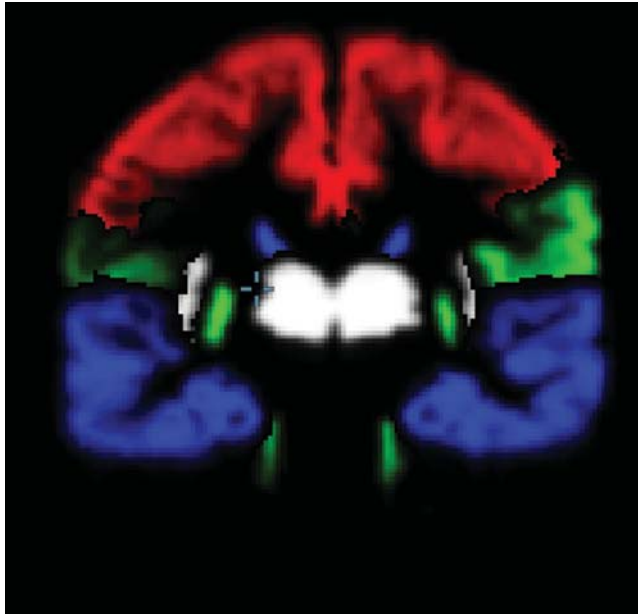


Figure 9.7. Probabilistic brain atlas, coronal section. Individual MRI image volumes from 53 subjects were linearly aligned, and each subject's lobes and deep nuclei were manually delineated. These delineations were averaged across the subjects and used to create probability maps for the likelihood of finding the specified lobe or nuclei at a given voxel position. Each structure is depicted in a different color in the color version of this image. The intensity of the color is proportional to the probability of finding that structure at the specified location. Photograph courtesy of Arthur Toga, Laboratory for Neuro Imaging, UCLA. <http://www.loni.ucla.edu/NCRR/NCRR.Probabilistic.html>.

COLOR PLATE IV

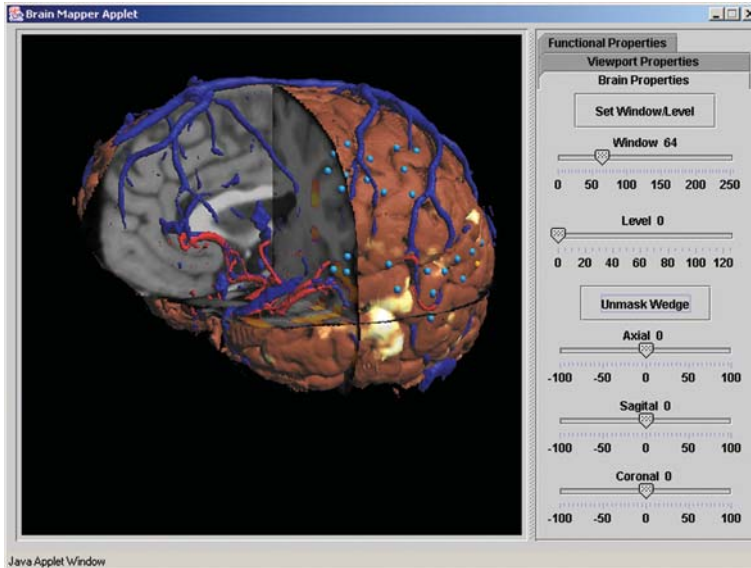


Figure 9.9. Remote visualization of integrated structural and functional brain data mapped onto a single patient's brain. MRI, MRV (veins), and MRA (arteries) brain-image volumes are acquired and registered, then segmented to generate the cortical surface, arteries, and brains. fMRI data representing areas of language processing are registered to the structural volumes, then projected to the surface as the light-colored regions. Cortical stimulation mapping (CSM) data (small spheres) acquired during neurosurgery are also registered to the patient's anatomy. The integrated data are rendered on a visualization server, which can be accessed from a web browser using a simple Java applet. Photograph courtesy of the Structural Informatics Group, University of Washington.