When the data needed to perform valid economic evaluations are considered, it is not surprising that so few appropriately constructed studies exist. The cost of analyzing the signs and symptoms of the many different kinds of patients who are reasonable candidates for CT scanning would be great in itself; to imagine conducting such analysis for all types of patients and diagnostic procedures is unrealistic in the extreme. At best, a few controversial indications for expensive diagnostic procedures might be the subjects of economic evaluation. Research to date on CT scanning suggests that patients with headaches and suspected cerebrovascular disease would be excellent candidates for additional analysis with more appropriate methods of economic evaluation.

If one cannot expect a comprehensive analysis of the appropriate conditions of use of a diag-

REFERENCES

- 1. Abrams, H. L., and McNeil, B, J., "Medical Implications of Computed Tomography ('CAT Scanning')," N. Eng. J, Med. 298:255, 1978.
- 2. Ambrose, J., et al., "EMI Scan in the Management of Head In juries," *Lancet* 1:847, 1976.
- 3. Bahr, A. L., and Hodges, F. J., "Efficacy of Computed Tomography of the Head in Changing Patient Care and Health Costs: A Retrospective Study, " Am, J. Roent. 131:45, 1978.
- Baker, C., and Way, L. W., "Clinical Utility of CAT Body Scans, " Am.). Surg. 136:37, July 1978.
- Banta, D., "Number and Distribution of CT Scanners, 1978, " report to the Bureau of Health Planning and to State and local health planning agencies (Hyattsville, Md.: National Center for Health Services Research, August 1978).
- Banta, D., and McNeil, B. J., "The Costs of Medical Diagnosis: The Case of the CT Scanner," *Health Care Mgt. Rev*, 3:7, 1978.
- 7. Bartlett, J. R., et al., "Evaluating Cost-Effectiveness of Diagnostic Equipment: The Brain Scanner Case, " *Br. Med. J. 2:815, 1978.*
- Bunker, J. P., et al, (eds.), Costs, Risks, and Benefits of Surgery (New York: Oxford University Press, 1977).
- 9. Carrera, G. F., et al., "Computerized Tomography of the Brain in Patients With Headache and

nostic procedure, how can those responsible for decisions about the level and location of diagnostic capacity make rational choices? The task is impossible, as most health planning agency personnel have suspected all along. Instead of attempting to find analytic approaches to support what is essentially a political decision, health planning agencies might do better to set fairly arbitrary regional capacity ceilings and use economic evaluation to explore the cost and access implications of alternative locational choices.

Even better, the incentives might be improved for those who are most knowledgeable about the diagnostic alternatives: the providers themselves. If we had greater confidence that their incentives were consistent with the goals of public policy, the limitations of formal evaluation would be far less troublesome.

With Temporal Lobe Epilepsy: Findings and Cost Effectiveness, " /, Comp. Tomog, 2:108, 1978.

- Creditor, M. C., and Garrett, J. B., "The Information Base for Diffusion of Technology: Computed Tomography Scanning," N. Eng. J, *Med. 297:49, 1977.*
- 11. Dales, L. G., et al., "Evaluation of a Periodic Multiphasic Health Checkup," *Meth. Inform. Med.* 13:140, 1974.
- Evens, R, G., and Jest, R. G., "The Clinical Efficacy and Cost Analysis of Cranial Computed Tomography and the Radionuclide Brain Scan," Sem. Nuc. Med. 7:129, 1977,
- <u>"Economic Analysis of Body Computed</u> Tomography Units—Including Data on Utilization," *Radio*, 127:151, 1978.
- 14. _____ "Economic Analysis of Computed Tomography Units, "Am.], Roent. 127:191, 1976.
- 15. Evens, R. G., et al., "The Utilization, Reliability, and Cost Effectiveness of Computer Cranial Tomography in Evaluating Pseudotumor Cerebri, "*Am, J. Radio.* 129:263, 1977.
- Freeborn, D. K., et al., "Determinants of Medical Care Utilization: Physicians' Use of Laboratory Services, " Am. J. Public Health 62:846, 1972.
- 17. Gempel, P. A,, and Harris, G. H. "Comparative

Cost Analysis: Computed Tomography vs. Alternative Diagnostic Procedures, 1977-1980" (Cambridge, Mass.: Arthur D. Little, Inc., 1977).

- Greenwald, H. P., et al., "Transportation or CT Scanners: A Theory and Method of Health Resources Allocation," *Health Serv. Res.* 14:207, 1979.
- Hsiao, W. C., and Stason, W. B., "Toward Developing a Relative Value Scale for Medical and Surgical Services," *Health Care Fin. Rev.* 1;23, 1979.
- Institute of Medicine, Computed *Tomographic Scanning: A Policy Statement* (Washington, D. C.: National Academy of Sciences, 1977).
- 21. Jonsson, E., and Marke, L. A., "CAT Scanners: The Swedish Experience," *Health Care Mgt. Rev*, 2:37, 1977.
- Kassirir, J. P., and Pauker, S. G., "Should Diagnostic Testing Be Regulated?" N. Eng.]. *Med.* 299:947, 1978.
- 23. Knaus, W. A., and Davis, D. O., "Utilization and Cost-Effectiveness of Cranial Computed Tomography at a University Hospital, "]. Comp. *Assist. Tomog.* 2:209, 1978.
- 24. Knaus, W. A., and Wagner, D., "CT Scanning Patients With Headache: A Cost-Benefit Calculation," *Am. J. Neuro.* (in press).
- Knaus, W. A., et al., "Impact of New Technology: The CT Scanner," Med. *Care* 15:533, July 1977.
- Larson, E. B., and Omenn, G., "The Impact of Computed Tomography on the Care of Patients With Suspected Brain Tumor, " Med. Care 15:543, 1977.
- 27. <u>"Computed Tomography in Patients</u> With C'erebrovascular Disease: Impact of a New Technology on Patient Care, " *Anl. J. Roent. 131:35, 1978.*
- 28. _____ "Diagnostic Evaluation of Headache: Impact of Computerized Tomography and Cost-Effectiveness, "J. A.M.A. 243:359, 1980.
- 29. _____ "Effect of Computed Tomography on Utilization of Cerebral Angiography, " *Am. J. Roent*, 129:1, 1977.
- 30. <u>"Impact of Computed Tomography on</u> the Care of Patients With Suspected Hydrocephalus, " *Am. J. Roent.* 131 :41, 1978.
- McNeil, B. J., and Adelstein, S. J., "Determining the Value of Diagnostic and Screening Tests," J. Nucl. Med. 17:439, 1976.
- 32. _____, "Measures of Clinical Efficacy: The Value of Case Finding in Hypertensive Renovascular Disease, " N. *Eng. J. Med.* 293:221, 1975.
- 33. McNeil, B. J., et al., "Measures of Clinical Ef -

ficacy: Cost-Effectiveness Calculations in the Diagnosis and Treatment of Hypertensive Renovascular Disease, "N. *Eng. J. Med.* 293:216, 1975.

- Neuhauser, D., and Lewicki, A. J., "What Do We Gain From the Sixth Stool Guaiac?" N. Eng. j. Med. 293:266, 1975.
- Office of Technology Assessment, U.S. Congress, Policy Implications of the Computed To-Mography (CT) Scanner, GPO stock No. 052-003 -00565-4 (Washington, D. C.: U.S. Government Printing Office, 1978).
- The Implications of Cost-Effectiveness) less Analysis of Medical Technolology, GPO stock No. 052-003 -00765-7 (Washington, D. C.: U.S. Government Printing Office, August 1980).
- Orkand Corp., Planning Approach, Criteria, and Standards for Specialized Trauma Services: Optimal, Intermediate, and Minimal Levels of Care (Silver Spring, Md.: Orkand Corp., Sept. 30, 1976). (Also available as publication No. HRP-0015437 from Department of Commerce, National Technical Information Service, Springfield, Va.)
- Pete, R., et al., "Design and Analysis of Randomized Clinical Trials Requiring Prolonged Observation of Each Patient," Br.]. *Cancer* 34:585, 1976.
- 39, ReVelle, C., et al., "Facility Location: A Review of Context-Free and EMS Model s," *Health Serv. Res.* 12:129, 1977.
- Schoenbaum, S. C., et al., "Benefit Cost Analysis of Rubella Vaccination Policy," N. Eng. J. Med. 24:306, 1976.
- 41. Thomson, J. L. G., "Cost-Effectiveness of an EMI Brain Scanner: A Review of a Two-Year Experience," *Health Trends* 9:16, 1977.
- Weinstein, M. C., "Economic Evaluation of Medical Procedures and Technologies," in *Medical Technology*, J. Wagner (ed.), Urban Institute Conference, NCHSR Research Proceedings Series, DHEW publication No. (PHS) 79-3254 (Washington, D. C.: National Center for Health Services Research, Office of Health Research, Statistics, and Technology, PHS, DHEW, 1979).
- Weinstein, M. C., and Stason, W. B., "Foundations of Cost-Effectiveness Analysis for Health and Medical Practices," N. Eng. J. Med. 296:716, 1977.
- 44. Willems, J., et al., "The Computed Tomography (CT) Scanner, " in *Medical Technology: The Culprit Behind Health Care Costs?* proceedings of the 1977 Sun Valley Forum on National Health, S. H. Altman and R. Blendon (eds.),

DHEW publication No. (PHS) 79-3216 (Washington, D. C.: DHEW, $1979\,)$.

- 45. Wortzman, G., and Holgate, R. C., "Reappraisal of the Cost Effectiveness of Computed Tomography in a Government-Sponsored Health Care System, "*Radio.* 130:257, 1979.
- 46. Wortzman, G., et al., "Cranial Computed To-

mography: An Evaluation of Cost-Effectiveness, "*Radio.* 117:75, 1975.

47. Zimmerman, R. A., et al., "Cranial Computed Tomography in Diagnosis and Management of Acute Head Trauma, "Am. J, Roernt. 131:27, 1978.

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