and perinatal hypoxia found in this study and in other studies, the pathologic abnormality found in the brain stem thought to be secondary to hypoxia, and the physiologic abnormalities found in near miss infants will help us to ultimately understand the cause of death in some SIDS victims.

Thus, evidence which has been accumulated over the past 10 years suggests that, in the majority of infants, SIDS is related to intra-uterine and perinatal hypoxia-ischemia which affects brain stem structure and function predisposing to instability in regulation of breathing which can result in uninterrupted sleep apnea.

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REFERENCES

1. Peterson DR: Sudden unexpected death in infants: An epidemiologic study. Am J Epidemiol 1966; 84:478-482.
2. Bergman AB, Ray CG, Pomeroy, et al: Studies of the sudden infant death syndrome in King County, Washington: III. Epidemiology. Pediatrics 1972; 49:860-870.
3. Frogatt P, Lynas MA, MacKenzie G: Epidemiology of sudden unexpected death in infants ("cot death") in Northern Ireland. Brit J Prev Soc Med 1971; 25:119-134.
4. Kraus JF, Borhani NO: Post-neonatal sudden unexplained death in California: a cohort study. Am J Epidemiol 1972; 95:497-510.
5. Lewak N, van den Berg BJ, Beckwith B: Sudden infant death syndrome risk factors. Clinical Pediatrics 1979; 18:7.
6. Standfast SJ, Jereb S and Janerich DT: The epidemiology of sudden infant death in upstate New York: II. Birth characteristics. Am J Public Health 1980; 70:1061-1067.
7. Naeye RL, Ladis B, Drage JS: Sudden infant death syndrome, a prospective study. Am J Dis Child 1976; 130:1207-10.
8. Zahalkova M: Perinatal and infant mortality in twins, in Twin Research, Part B: Biology and Epidemiology, Progress in Clin and Biol Res 24B. New York: Alan R. Liss, Inc., 1978, pp 115-120.
9. Naeye RL: Brainstem and adrenal abnormalities in the sudden infant death syndrome. Am J Clin Pathol 1976; 66:526.
10. Takashima S, Armstrong D, Becker L, Bryan C: Cerebral hypoperfusion in the sudden infant death syndrome? Brainstem gleosis and vasculature. Ann Neurol 1978; 4:257.
11. Naeye RL: Pulmonary arterial abnormalities in the sudden infant death syndrome. N Engl J Med 1973; 289:1167.
12. Williams A, Vawter G, Reid L: Increased muscularity of the pulmonary circulation in victims of sudden infant death syndrome. Ped 1979; 63:18.
13. Naeye RL: Hypoxemia and the sudden infant death syndrome. Science 1974; 186:837.
14. Valdes-Dapena MA, Gillane MM, Catherman R: Brown fat retention in sudden infant death syndrome. Arch Path of Lab Med 1976; 100:547.
15. Naeye RL, Whalen P, Reper M, Fisher R: Cardiac and other abnormalities in the sudden infant death syndrome. Am J of Path 1976; 82:1.
16. Gadson DR, Emery JL: Fatty change in the brain in perinatal and unexpected death. Archives of Disease in Childhood 1976; 51:42.
17. Takashima S, Armstrong D, Becker LE: Cerebral white matter lesions in sudden infant death syndrome. Pediatrics 1978; 62:155.
18. Shannon DC, Kelly DH, O'Connell K: Abnormal regulation of ventilation in infants at risk for SIDS. N Engl J Med 1977; 297:747.
19. Steinschneider A: Prolonged apnea and the sudden infant death syndrome: Clinical and laboratory observations. Pediatrics 1972; 50:646.
20. Steinschneider A: Prolonged sleep apnea and respiratory instability: A discriminative study. Pediatrics 1977; 59 (suppl):962.
21. Guilleminault C, Ariagno R, Souquet M, Dement WC: Abnormal polygraphic findings in near-miss sudden infant death. Lancet 1976; 1:1326.
22. Kelly DH, Shannon DC: Periodic breathing in infants with near miss SIDS. Pediatrics 1979; 63:355.
23. Shannon DC, Kelly DH, O'Connell K: Impaired regulation of alveolar ventilation and the sudden infant death syndome. Science 1977; 197:367.
24. Kelly DH, Shannon DC, O'Connell K: The care of infants with near miss sudden infant death syndrome. Pediatrics 1978; 61:511.
25. Shannon DC: Pulmonary vascular muscle hyperplasia associated with impaired ventilatory control in sudden infant death syndrome (SIDS). Am Review of Resp Dis 1980; 121:419.

Who Shall Deliver Primary Care?

Virtually all aspects of the health care service system of the United States display a pluralism that is unique among the countries of the world. One of these unique aspects is the nature of the personnel who provide primary care: since World War II, primary care has been delivered to the American people by an increasing and unrivaled variety of professionals. Because maternity care is sometimes in and sometimes out of a definition of primary care, it is simplest to exclude it. The developed countries of the world can then be divided into those where primary care is in the hands of family physicians and those where primary care is in the hands of pediatricians and internists, depending upon the age of the patient. The United States falls squarely on the dividing line, both sets of hands providing care to about equal proportions of its population. To top it off, in the late 1960s the United States initiated some ambitious programs to train nurse practitioners and physician's assistants of different sorts (modeled on the diversity of its primary care physicians). Graduates of these programs also provide some portion, however small, of the primary care delivered to Americans.

Given this diversity and given the concerns about the cost and quality of care, which have mounted coincidentally with and about as rapidly as the number and variety of its professionals, it is extraordinary that the United States has made so few efforts to compare the primary care outputs and impacts of different types of physicians. The dearth of such efforts, when contrasted to the abundance of research that has checked nurse practitioner or physician assistant findings against those of physicians or compared their outputs in many other ways, is even more extraordinary. It seems to expose either a blind spot in the eyes of the medical profession or an area too sensitive to be touched by the planners

and administrators of health care services or the scientists who produce health services research.

In this issue of the Journal we publish a small study by two pediatricians from New Mexico who had the imagination to examine the hospitalization experience of children in a defined rural community before and after they set up their practice in it.[1] The choice of hospitalization as an outcome measure is particularly cogent in the case of children where hospitalization is not only a costly process, but also introduces a hazard to both the physical and mental health of the child.

The study findings indicate a decrease in the hospitalization rate of children after the pediatricians had taken over their care from the general practitioner/family physicians who had provided it before their arrival. The implications of these findings are strengthened by data showing an increase in length of stay of those children whom the pediatricians hospitalized, and an analysis of discharge diagnoses, both of which suggest that unnecessary hospitalizations were reduced.

It is interesting to find—contrary to the expectations of some—that hospital utilization should have declined after an increase in the number of physicans in practice. However, the findings provide no justification for favoring the pediatric side of the primary care dividing line. The experience was an isolated one, the impact of hospital bed reduction could not be measured, nor was it possible to discriminate between the old and new breed of family physician. The study data are of more interest because they derive from a population-based natural experiment that capitalizes on the American pluralistic system of primary care delivery.

The New Mexico findings are, however, in line with the few existing efforts to compare the primary care practices of pediatricians and family practitioners. Hulka, *et al,* in two reports found that the pediatrician's communication to[2] and management of[3] patients were superior to those of the family physician/general practitioner. Unfortunately, these studies also were unable to distinguish clearly between the old and new breed of family physician. The same criticism has been advanced[4] of a more recent attempt to differentiate the practice profile of the internist from that of the general practitioner/family physician by using data produced by the National Ambulatory Medical Care Survey.[5]

In one of the earliest efforts to assess the quality of medical care, Makover pointed out the direct relationship between indices of high quality in physician performance and the length and type of training to which the physician had been exposed.[6] This relationship has often been noted in studies using different methods of assessing physician performance.[7] Although assessment methods in general leave much to be desired,[8] a study by Becker, *et al,* provides reinforcement for the belief that recent graduation from medical school and length of postgraduate training are strongly related to appropriate prescribing practices among family physicians.[9]

The tragedy of focusing various measures of efficiency and effectiveness upon different types of primary care physicians, however, is that the well-established potential of the nurse practitioner and physician assistant may be neglected in the process. Both types of personnel must now contend with the increasing numbers of primary care physicians being produced, the entrenched dominance of the medical profession with which they must collaborate, and the legal and financial barriers erected to preserve this dominance.[10, 11] The situation should give pause to those who are naive enough to believe that planning is a rational process rather than a political balancing act that does its best to contend with vested interests and consumer plaints.

A rational answer to the question posed by the title of this editorial would begin by an analysis of the knowledge, competencies and skills demanded of the primary care provider, go on to erect educational structures and curriculums that operated over an entire professional lifetime, and then place the product in an accessible system designed to integrate primary, secondary, and tertiary care. Instead, we are barely beginning to understand the requisites needed by the primary care provider; we are confronted by continually escalating educational structures that derive from the Middle Ages, and an unintegrated series of systems that delivers care unevenly to many but not all segments of the population. It is no wonder that we are unable to cope with the rising costs that the inexorable march of advancing technology and demands for equity thrust upon us.

A rational answer to the question is not equivalent to an answer whose application is feasible. In this sense the very pluralism of primary care providers and the systems in which they are placed can work to our advantage rather than disadvantage. Health services research cannot be conducted under laboratory conditions, and double-blind trials have limited applicability. Natural experiments comparable to that reported from New Mexico must abound within this pluralism, and practitioners must be aware of them. Researchers may need to stray beyond the bounds of academe to find them and learn to cope with new kinds of constraints in order to exploit them. Regardless of whether the nurse practitioner or physician's assistant, the family practitioner, pediatrician or internist, practicing alone or in groups, comes out on top—or whether some or all of these professionals can provide services of equivalent quality and costs—the results of such research would be a welcome relief from the rhetoric which currently surrounds the apotheosis of primary care.

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REFERENCES

1. Osgood K, Bunch GP and Schonick W. The impact of a pediatric practice on hospital admissions in a rural area: Am J Public Health 1980; 70:1100-1103.
2. Hulka BS, Kupper LL, Cassel JC and Babineau RA: Practice characteristics and quality of primary care. Med Care 1975; 13:808-820.
3. Hulka BS, Kupper LL and Cassel JC: Physician management in primary care. Am J Public Health 1976; 66:1173-1179.
4. Eisenberg JM and Nicklin D: Ambulatory medical care (letter to the editor). N Engl J Med 1980; 302:1316-18.

5. Noren J, Frazier T, Altman I and Delozier J: Ambulatory medical care: a comparison of internists and family-general practitioners. New Engl J Med 1980; 302:11-16.
6. Makover HB: The quality of medical care: Am J Public Health 1951; 41:824-832.
7. Williamson JW: Improving Medical Practice and Health Care. Cambridge: Ballinger, 1977.
8. Sanazaro PJ: Quality assessment and quality assurance in medical care. Annual Reviews of Public Health 1980; 1:37-68.
9. Becker MH, Stolley PD, Lasgna L, *et al:* Differential education concerning therapeutics and resultant physician prescribing patterns. J Med Ed 1972; 47:118-127.
10. Mauksch IG: The nurse practitioner movement—where does it go from here? Am J Public Health 1978; 68:1074-1075.
11. Weston JL: Distribution of nurse practitioners and physicians' assistants: Implications of legal constraints and reimbursements. Public Health Reports 1980; 95:253-258.

ERRATA

Due to our printer's error, the cover table of contents of the August 1980 Journal incorrectly identified the authors of the two invited editorials appearing in that issue, and misspelled "Tecumseh" in the title of another article. We apologize to the authors and our readers for the mistakes; the printer failed to follow our instructions for corrections. The editorials should have been identified as follows:

Medicaid Monitoring
Leonard S. Rosenfeld 775
Adolescent Pregnancy: A New Look at a Continuing Problem
Lorraine V. Klerman 776

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Additionally, one line of typeset was dropped in the article: Whittemore AS and Korn EL: Asthma and air pollution in the Los Angeles area. Am J Public Health 1980; 70:687-696.

In paragraph 1, column 2, line 6, page 694, which begins: "As a third check, residuals were . . ." the third sentence should read: "The Figure indicates significant departures from the model: an excess of observed attacks in April and September, and a deficit of observed attacks in December." The underlined matter above is the material omitted from the published version.