Increase in Relevant Data after Introduction of a Problem-Oriented Record System in Primary Pediatric Care

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Abstract: We determined the effect of the problem list and standard data base components of the problem-oriented record (POR) on kibbutz clinic care. We compared quantity and type of data collected and number of problems identified before and after POR implementation at an experimental clinic with the same variables measured at a similar clinic. Family history, prenatal, natal, nutritional, immunization, environment, review of systems, psychosocial and total data collected, as well as number of chronic problems identified, increased significantly after POR implementation. (*Am J Public Health* 1984; 74:1410–1412.)

Introduction

A critical problem for management and evaluation of primary care is the adequacy and consistency of the health care record system. The unpredictable and often relentless pressure of time, the variety of professional personnel, and the volume of patient contacts make exacting demands on the system of medical records.

The Center for Health Sciences of Ben-Gurion University of the Negev and of the Sick Fund of the General Labor Federation is committed to a program aimed at improving the adequacy and effectiveness of primary care in the Negev region of Israel. Our students, house staff, nurses and senior staff are trained to use problem-oriented medical records (POR), and elsewhere we have reported on the usefulness of the POR in medical education.[1,2] There exists a substantial literature concerning the effect of the POR on clinical decision making, mostly in hospital settings.[3]

In this report, we examine the effect of introducing the standardized data base and problem list components of a POR system on the amount of relevant information recorded in a pediatric primary care facility.

Methods

Records of two kibbutzim (rural collective settlements) are involved in the experiment. Kibbutz Shuval, the experimental clinic, has a population of 600 persons, 146 of whom are under 18; services are staffed by three nurses providing continuously available comprehensive care, a general practitioner who visits twice weekly, and a pediatrician who visits every two weeks. During the period of data collection, there were no major disease outbreaks. There were seven pediatric hospitalizations, a rate of 0.047 admissions per child per year.

The comparison clinic is Kibbutz Lahav, 14 miles away, with a population of 400, a similar age distribution, and a similarly staffed and operated clinic; the same general practitioner and pediatrician provide medical supervision. During this period, there were no major disease outbreaks, and six children were hospitalized out of 160 for a rate of 0.0375 pediatric admissions per child per year.

The POR system introduced at the experimental clinic has been described in detail elsewhere[4] and consists of: a standard data base consisting of 12 subjective and seven objective items, lists of acute and chronic problems, problem-oriented progress note flow sheets, and an audit by the consulting pediatrician of records presenting format or content problems to the nurses on a bi-weekly basis.

All 146 pediatric records from the experimental clinic and 160 records from the comparison clinic were examined for this study. Since all earlier records from the experimental clinic were kept, a random sample of 20 pre-experiment records was also selected for grading.

These 326 records were graded by a research assistant blinded to the purpose of the study, using a check list that assigns points for each item in a standard pediatric data base.[2,5] Thus, baseline data per record are measured in contrast to data per visit. In addition, each record was evaluated for the number of problems defined, using Weed's criteria[5] for problem definition. An arbitrary list of acute problems (e.g., upper respiratory infection, pharyngitis, varicella, etc.) was defined before POR implementation. Number of times a problem had to recur to be counted as chronic was similarly defined (e.g., more than two episodes of streptococcal pharyngitis). Agreement between the research assistant and the senior investigator was evaluated for a random sample of 20 clinic records after a training period, and was greater than 0.95 (Pearson's r) for data type, data quantity, and number of problems. Student's t-test was used as guide for judging differences between clinics.

Results

Table 1 gives the types of data and mean scores for the three data sets, as well as the maximal score by item. Highly significant increases in information are effected by the data base component of the POR system for each category of item except for growth and development, previous illnesses and physical examination. Even for these, there is marginally significant improvement when the experimental and comparison clinic record scores are compared. When pre-experimental records are compared with post-experimental records at the experimental clinic, very similar results are found, but in addition to growth and development, previous illnesses, and physical examinations, psychosocial and review of systems are also not significantly improved. In both comparisons, the largest improvements as judged by student's t-test values are environmental, family history, and birth history (natal) information.

Table 2 compares number of problems identified per child. The greatest differences in both comparisons are significant differences in chronic problems. Although signifi-

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TABLE 1—Type of Data Collected in Clinics

Item	Maximum Score	Study Period: Experimental Clinic (n = 146)	Study Period: Comparison Clinic (n = 160)	Student's t Experimental versus Comparison	Pre-study: Experimental Clinic (n = 20)	Student's t Pre-versus Post-Experimental
Family history	3	2.006 ± 0.144	0.087 ± 0.340	62.70*	0	62.16*
Prenatal	3	1.260 ± 0.499	0.406 ± 0.617	13.20*	0	11.25*
Natal	8	4.000 ± 0.830	2.762 ± 1.049	11.30*	1.499 ± 0.530	10.76*
Growth and development	3	2.445 ± 0.665	2.275 ± 0.785	2.04	2.720 ± 0.590	−1.79
Nutrition	3	1.000 ± 0.947	0.193 ± 0.396	9.87*	0.166 ± 0.380	3.89*
Previous illnesses	4	1.547 ± 0.900	1.350 ± 0.933	1.88	1.380 ± 0.690	0.80
Immunizations	1	1.0	0.743 ± 0.400	7.07*	0.166 ± 0.380	27.07*
Environment	5	1.541 ± 0.577	0.031 ± 0.175	31.57*	0	11.94*
Review of systems	9	4.595 ± 1.543	3.400 ± 1.337	7.16*	4.220 ± 1.470	1.02
Psychosocial	8	0.780 ± 0.859	0.109 ± 0.321	9.34*	0.500 ± 0.780	1.38
Physical examination	2	1.938 ± 0.203	1.800 ± 0.495	2.81	2	−1.36
Total	49	22.116 ± 2.801	13.156 ± 2.840	27.70*	13.110 ± 2.210	13.79*

*$p < 0.001$

cant differences are found for both acute problems and episodes, these differences seem to be artefactual since they are not observed in the pre- and post-experimental comparison at Shuval. On the other hand, although the increased number of acute episodes at Shuval as compared with Lahav (17.40 ± 8.82 vs 9.38 ± 5.70, respectively) may reflect a difference in incidence of acute illnesses, it more likely resulted only from the Shuval nurses' more compulsive recording habits.

Discussion

Although clinical training is traditionally based on the assumption that thorough data collection and identification of all the patients problems are cornerstones of good patient care, few studies have attempted to measure whether logical problem-solving improves patient care. The POR was designed to improve problem-solving. However, most studies of POR effect on patient care, carried out in hospital settings, have examined dependent variables, such as overall care quality[6,7] or rapidity of anemia workup,[8] that the POR may be expected to affect only indirectly. Classroom studies[9] have examined such variables as rapidity and accuracy of audit, that are more directly related to medical problem-solving, but it is difficult to generalize the conclusions to real clinical settings. Most of these classroom and hospital studies have shown partial or no effect. However, Starfield[10] measured the effect of the problem list on problem follow-up in community pediatric and internal medicine clinics, and showed that follow-up increased significantly if the problem appeared on the problem list.

None of the above studies examined dependent variables such as data collection and problem identification that reflect directly the process of medical problem solving that the POR was designed to improve. By contrast, our findings show that when the standardized data base and problem list components of the POR are introduced as part of a complete POR system that also includes problem-oriented progress notes and regular audit, both data collection and chronic problem identification in a community clinic are significantly improved. These findings are consistent with those of Margolis, *et al*, who found not only that data collection and problem identification increased in a military pediatric clinic[5] and on a university pediatric service,[11] but also that after a running-in period clinic POR records did not require more time. Taken together with Starfield's[10] findings, one might conclude that the POR used in a primary care setting can both increase problem identification and ensure problem follow-up.

Future studies should define which problems are more likely to be identified using the POR, and should then measure whether the outcomes of care of these problems are improved in community clinics using the POR. Moreover, since the data base and problem list components of the POR have been shown to be easily automated,[4] a microcomputer-compatible data base and problem list might comprise important components of a primary care record suitable for the World Health Organization goal of primary care for all by the year 2000.

TABLE 2—Number of Problems per Child Identified in Clinics

Item	Study Period*: Experimental Clinic (n = 146)	Study Period*: Comparison Clinic (n = 160)	Pre-study**: Experimental Clinic (n = 20)
Chronic problems	4.19 ± 2.46	2.36 ± 1.57	2.55 ± 2.00
Acute episodes	17.40 ± 8.82	9.38 ± 5.70	18.94 ± 7.20
Acute problems	8.08 ± 3.03	6.52 ± 3.30	8.83 ± 2.68

*$p < 0.001$ (Student's t test) for all experimental-comparison clinic difference.
**$p < 0.001$ (Student's t test) for pre- versus post-experimental difference for chronic problems only.

REFERENCES

1. Margolis CZ: The pediatric problem oriented record. Pleasantville: Docent, 1977.
2. Margolis CZ, Sheehan TJ, Stickley WT: A graded problem oriented record to evaluate clinical performance. Pediatrics 1973; 51:980–985.
3. Margolis CZ: Problem oriented record: a critical review. Pediatrician 1979; 8:152–162.
4. Margolis CZ, Mendelssohn I, Halevi D, *et al*: Shuval automated problem oriented record: an off line record for a primary care clinic. Isr J Med Sci 1981; 17:170–175.
5. Margolis CZ, Newborn J, Sheehan TJ: The effect of the problem oriented

record on pediatric care in a military clinic. Pediatr Res 1979; 13:1047–1051.
6. Fernow LC, Mackie C, McColl I, *et al:* The effect of problem oriented medical records on clinical management controlled for patient risks. Med Care 1978; 16:476–480.
7. Aranda JM: The problem oriented medical record: Experiences in a community hospital. JAMA 1974; 299:549–551.
8. Switz DM: The problem oriented medical record: Evaluation and management of anemia before and during use. Arch Intern Med 1976; 136:1119–1123.
9. Fletcher RH: Auditing problem oriented records and traditional records. N Engl J Med 1974; 290:829–833.
10. Starfield BH, Simborg PW, Johns C: Coordination of care and its relationship to continuity and medical records. Med Care 1977; 15:929–938.
11. Margolis CZ, Barak N, Vardy P, Winter S: Problem oriented record effect on problem identification in the hospital. Isr J Med Sci, in press.

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Fluoride Analyses of Patient Water Supplies Requested by North Carolina Health Professionals

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Abstract: The frequencies, patterns, and results of 1,900 patient drinking water assays for fluoride content requested in a six-month period by North Carolina health professionals were determined. Twelve per cent of the samples warranted adjustment from the full dosage fluoride supplement. Less than 3 per cent of physicians and 8 per cent of dentists submitted samples. Water supplies should be tested before a systemic fluoride supplement is prescribed. Either few dentists and physicians in North Carolina test water before prescribing supplements or few prescribe them at all. (*Am J Public Health* 1984; 74:1412–1414.)

Introduction

Water fluoridation is recognized as the most efficient method for the public to receive the optimum amount of fluoride required for the prevention of dental caries.[1] Unfortunately, approximately half of the population of the United States does not have access to fluoridated water because naturally occurring fluoride at the optimum concentration is rare, some municipal water supplies are not fluoridated, and many people obtain water from wells or other sources that cannot easily be fluoridated.[2]

For children without access to fluoridated water, fluoride supplements in the form of drops or tablets are an effective and safe means of reducing the occurrence of dental caries.[3–6] However, it is difficult to document the extent of use of fluoride supplements in the United States.[7] In a 1974 survey, the American Dental Association (ADA) Bureau of Economic Research and Statistics found that 26 per cent of dentists surveyed prescribed fluoride tablets, and 17 per cent prescribed a combination of fluoride and vitamins.[8] Sixty per cent of dentists surveyed in 1982 by the ADA prescribed fluoride supplements.[9] It is not known, however, how many health care providers who prescribe fluoride supplements do so only after having the patient's water supply assayed for fluoride.

In this study, we report on the frequency, distribution, and findings of analyses for fluoride content of drinking water samples submitted by North Carolina health professionals to the state public health laboratory in one six-month period.

Methods

The North Carolina State Laboratory for Public Health has, for many years, provided assay of water samples for fluoride content, recorded to the nearest 0.01 parts-per-million (ppm).* Test results, monitored by the Centers for Disease Control, have consistently been within 0.05 ppm of readings of a blind standard.[11]

We report on analyses performed between December 1, 1982 and May 31, 1983. To verify completeness, the study investigators contacted all commercial laboratories in North Carolina equipped to perform fluoride assays and the state laboratories in the adjoining states of Virginia, Tennessee, Georgia, and South Carolina. These laboratories reported they had tested no samples of water supplies originating in North Carolina. Although it is possible individual providers performed fluoride assays in their offices, it is quite unlikely.

Results

During the six-month study period, 1,935 water samples were submitted with roughly equal numbers each month

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*The laboratory uses an ion selective electrode to determine fluoride content[10] and readings below one-tenth of a ppm are designated < 0.10.