Application of the Tracer Technique in Studying Quality of Care

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Assessment of the quality of care provided within an active family practice was attempted by evaluation of the physicians' management of a tracer illness – in this case, hypertension. The prevalence in adults was nine percent. The discrepancy between this and higher rates described in the literature appeared to be due to population differences. Management of hypertension by participating physicians complied with a minimal care plan designed by the Institute of Medicine in 78 percent of the cases. The tracer technique for assessing quality of care appears to be a promising method which can be adapted to active community practices with a minimal allocation of time, money and other resources. By requiring a review of the practice against contemporary standards, the tracer technique also enhances the quality of care through self-teaching and evaluation.

Quality of health care is a subject presently under intensive investigation. While there is little debate in regard to the right of the patient to receive "quality" care, there is much controversy regarding the definition of "quality." Third party payers are interested in the cost of quality, the government is involved in setting standards, and community groups are demanding access and accountability as integral parts of "quality" care.

In addition to the problem of defining quality, there is also the problem of objectively measuring quality. In order to measure anything, standards must be available for comparison. Unfortunately, such standards are rare in medicine. Although many "authorities" are quite willing to express opinions on subjects within their expertise, these opinions often are based on data subject to differing interpretations; consequently, no single standard can be defined. This is partly due to the sparcity of carefully collected data on the natural history of diseases and the impact of modern treatments on the outcomes. In the end, these should determine the acceptability of any particular assessment.

The impact of multiple variables on the course of illness is seldom completely understood. Nevertheless, the health profession is required to deal with these illnesses in the most effective way possible, based on the present fund of knowledge. Just as treatment of these illnesses is not postponed until more definitive information is available, neither can evaluation of how well the health profession deals with the problems be postponed any longer. It is clear that any judgment of "quality" is not absolute, but merely reflects the currently accepted standards which must be reviewed periodically and updated.

Since the process of evaluation requires one to review the current opinion on the natural history, epidemiology, diagnosis, and management of certain diseases, it becomes a learning and teaching process as well. The process through which quality is evaluated is as important as the conclusions attained. In order to adequately evaluate their own practice, physicians must review the latest literature, debate and re-evaluate their data base in regard to what constitutes a minimum work-up, and survey their practice in regard to record-keeping, history-taking, physical examinations, laboratory procedures, and prescribing patterns. Having

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done this, these physicians will be more aware of their own practice, better informed and up-to-date, and better able to provide the best possible care to their patients. This is a goal that any method of evaluation should seek to achieve.

This paper outlines a procedure for assessing quality of care using a tracer technique as carried out in the group practice of the Family Medicine Program at the University of Rochester. The entire study was conducted by one physician in this group without outside funding or use of sophisticated techniques, equipment or consultants. The project attempted to demonstrate that this method is a practical technique which practicing physicians may use without a large commitment of time, money or other resources.

The Tracer Technique

The tracer technique assumes that careful evaluation of the manner in which physicians diagnose and manage a few selected disease entities will be representative of the practice as a whole. Thus, if a pertinent family history is consistently recorded in the charts of patients with three or four diagnostic entities, it can be assumed that a pertinent family history is obtained on patients with other diagnostic entities not specifically studied.

A recent article by Kessner et al[1] reviewed a modification of the tracer method developed by the Institute of Medicine of the National Academy of Sciences and its theoretical applicability to active community practices. This study employed the framework described by Kessner and applied it to an actual practice. In order to select those illnesses that would provide the most meaningful information, certain guidelines were followed.

First, there must be general agreement on a standard minimum treatment plan. Although the treatment of streptococcal pharyngitis is fairly well defined and agreed upon, the treatment of acne is not. Thus, there must be some generally accepted consensus on the management of the disease. By management, one includes not only specific treatment, but also measures for prevention, diagnosis, and rehabilitation.

Secondly, the tracer disease must be amenable to easy and objective diagnosis that can be made by the average physician without use of sophisticated equipment or techniques not readily available. The disease must be one in which its natural history will be affected by appropriate therapy. It would not be very useful to evaluate different modes of treatment for physiologic bowlegs, since in mild cases this resolves without specific therapy. The disease selected should also be one that has sufficient prevalence so that it is commonly encountered. At the same time, it should be a type of condition that requires the active intervention of the health profession. Alcoholic hangover is highly prevalent, but the nature of the illness does not warrant intensive evaluation regarding quality of care.

Finally, the effects of nonmedical factors on the tracer should be understood. Such variables as economic conditions, religious and cultural behavior patterns and environmental factors, for example, should at least be identified and their role in the evolution of the disease taken into account.

Methods

Benign hypertension was chosen as the tracer illness for this study. Recent studies indicate that early and vigorous treatment of hypertension can substantially reduce the morbidity and mortality associated with this disease.[2-4] Hypertension is a common problem in the general office practice. Its diagnosis is easily made and can be specifically defined.

Several aspects in the total management of hypertension were investigated. First, an attempt was made to evaluate how well the entity was diagnosed in the population at risk. This was done by comparing the population distribution of the practice to the population of the community. Once assured that the practice population was a representative one, the prevalence of the illness diagnosed among the practice population was then compared to the prevalence as reported from the literature.

Next, the actual management of the disease was considered. The Institute of Medicine had recently outlined a minimum standard of care for hypertension.[1] This included history, physical exam, laboratory studies and treatment. The protocol is outlined in Figure 1.

Ten percent of the charts in which hypertension had been diagnosed and coded were reviewed. The charts were selected at random. Historical data were noted as positive, negative, or not recorded. Physical exam data were considered to have been performed if there was an explicit note so stating or if the appropriate box had been checked on the physical exam checklist in the chart. Most charts were problem-oriented in the fashion after Weed, and this study was conducted using the techniques outlined by Metcalfe.[5]

Results

The population distribution of the Family Medicine Group closely paralleled that of the general community of Monroe County as delineated in Table 1. The practice population also shared a similar socioeconomic distribution to that of the general population. Thus, it appeared that all specific age or sex groups were adequately represented.

In the total practice population of 6,866, there were 453 cases of hypertension diagnosed and coded in the diagnostic index. When the population

Figure 1.* A Minimal-Care Plan for Hypertension

I. Screening

A. *Method*. The systolic pressure is recorded at the onset of the first Korotkoff sound, and the diastolic at the final disappearance of the second or the change if the sound persists.

B. *Criteria*. An individual patient is judged in need of evaluation for elevated blood pressure if the mean of three or more systolic or diastolic pressures exceeds the age-specific criteria specified below:

Males & Females	Systolic	Diastolic
	mm Hg	
18-44 years	140	90
45-64 years	150	95
65 or older	160	95

II. Evaluation

In the evaluation of elevated blood pressure, the history and physical-examination data listed below should be obtained early in the evaluation.

A. *History*. (1) Personal and social history; (2) family history of high blood pressure, coronary-artery disease, or stroke; (3) previous diagnosis of high blood pressure (females, toxemia of pregnancy or pre-eclampsia) and time of first occurrence; (4) previous treatment for high blood pressure (when started and when stopped, and drugs used); (5) chest pain, pressure, or tightness; location, length of symptoms, frequency of symptoms, effect of deep breathing, description of feeling (crushing, smothering, strangling), symptom temporarily curtails activity, and pain radiates into left shoulder, arm, or jaw and is accompanied by nausea, shortness of breath or fast or fluttering heart beat; (6) feet swell; (7) shortness of breath; (8) patient awakens wheezing or feeling smothered or choked; (9) patient sleeps on two or more pillows; (10) prior history of kidney trouble, nephrosis or nephritis; (11) history of kidney infection; and (12) prior x-ray examination of kidneys.

B. *Physical Examination*. (1) Weight and height; (2) blood pressure — supine and upright; (3) funduscopic; (4) heart — abnormal sounds or rhythm; (5) neck — thyroid and neck veins; (6) abdomen — standard description, including abdominal bruit; and (7) extremities, peripheral pulses and edema.

C. *Laboratory*. (1) Urinalysis; (2) hematocrit or hemoglobin; and (3) blood urea nitrogen or serum creatinine.

D. *Other Tests*. (1) Electrocardiogram; if the patient is less than 30 years of age or if diastolic pressure is 130 mm of mercury or greater; and (2) rapid-sequence intravenous pyelogram.

III. Diagnosis

A. *Essential Hypertension*. As described in above under I-B (Criteria provided there is no evidence of secondary hypertension.

B. *Secondary Hypertension*. Hypertension secondary to renal, adrenal, thyroid, or primary vascular disease.

IV. Management

All drugs are prescribed in acceptable dosages adjusted to the individual patient, contraindications are observed, and patients are monitored for common side effects according to information detailed in AMA Drug Evaluations 1971 (first edition). Fixed-dosage combinations should not be used for initial therapy.

A. *Mild Essential Hypertension (Diastolic Pressure of 115 mm of Mercury).* (1) Initial treatment with thiazides alone in a diuretic dose; (2) if pressure is not reduced by 10 mm of mercury or to lowest level that patient can tolerate without symptoms of hypotension in two to four weeks, alpha-methyldopa, reserpine of hydralazine is added to thiazide.

B. *Moderate Essential Hypertension (Diastolic Pressure of 115 to 130 mm of Mercury).* (1) Initial treatment with thiazide and alpha-methyldopa, reserpine, or hydralazine; (2) if no response after two to four weeks, change to thiazide-reserpine-hydralazine or thiazide-guanethidine combination.

C. *Severe Essential Hypertension (Diastolic Pressure of 130 mm of Mercury or Keith-Wagener Grade III or IV Funduscopic Changes).* Refer to specialist or hospitalize (or both).

D. *Secondary Hypertension*. Treat, or refer for treatment of, primary condition.

E. *Undetermined Etiology or No Response to Treatment*. Hypertension of undetermined cause or not responding to treatment regimens above requires further evaluation, to include: (1) determination of serum sodium and potassium; and, if not previously performed, (2) rapid-sequence intravenous pyelography.

*Developed by Kessner and Kalk for the National Academy of Sciences. Reprinted with permission of the authors and publishers from A Strategy for Evaluating Health Sciences, DM Kessner and CE Kalk, National Acedemy of Sciences and the New England Journal of Medicine, January 25, 1973

over the age of 15 is considered, the prevalence of hypertension in the Family Medicine Group is nine percent. The overall rate is twice as high in females as males.

To reconfirm this prevalence rate, 100 randomly selected charts from the total practice population were reviewed. In only one chart was the blood pressure greater than the age-specific criteria for hypertension and the diagnosis not made. Similarly, in the 45 charts of hypertensive patients that were reviewed, two were eventually found not to be hypertensive. One of the two patients was obese and had the blood pressure measured using a standard-sized cuff; when a large cuff was used, the patient was normotensive. The other patient was diagnosed as hypertensive based on one recording of the blood pressure and subsequent readings were normal.

Thus it appears that the prevalence figure of nine percent is a valid one for the Family Medicine Group's adult population. This prevalence rate is contrasted to that reported by other sources. The United States Health Survey[6] reported a prevalence of roughly 20 percent, the Framingham Study[4] 18 percent, and the Baltimore study,[7] 25 percent. The rate of diagnosis of hypertension among these family medicine patients was therefore less than half that of large screening studies.

In the work-up of hypertension, the data prescribed by the minimal care plan as shown in Table 2 were obtained in the large majority of cases. The social, personal, family, and past medical history of hypertension and kidney disease were obtained from over 90 percent of the patients. It is interesting to note a positive family history in 73 percent of the patients. Other history items such as previous treatment and specific symptoms were recorded less often. A prior history of renal x-rays was recorded only 26 percent of the time.

In the physical exam, the appropriate examinations were conducted in over 95 percent of the cases. However, the determination of both supine and upright blood pressures were recorded in only 29 percent of the patients; the rest were unspecified, which in most cases probably was sitting.

Laboratory procedures were also uniformly obtained except for IVPs. All patients with a diastolic blood pressure of 130 mmHg or greater, or who were less than 30 years old, received an EKG. There were many patients, however, who had EKGs taken without these criteria, apparently for other reasons. IVPs were not obtained on six out of every ten hypertensive patients.

The diagnosis was correctly made and/or appropriate studies undertaken in 91 percent of the cases. One case of essential hypertension was diagnosed when actually no hypertension existed. In three cases a definitive diagnosis was not made nor were appropriate studies undertaken to determine the etiology.

In regard to treatment, 35 cases (78 percent) were treated in a satisfactory manner as outlined by the Institute of Medicine. In the ten cases that were not treated satisfactorily, six were not treated at all, two not treated aggressively enough and two treated incorrectly. Of the latter two patients, one was treated with phenobarbital and the other was treated with a diuretic even though he was not actually hypertensive. Of the six who were not treated at all, four never returned for follow-up after the diagnosis was made, so that therapy could not be initiated. The etiology of the hypertension was not adequately determined in three of the ten cases.

The total amount of time spent in preparing the protocol, retrieving and reviewing the charts, recording and analyzing the data amounted to approximately 24 hours. No costs were

Table 1. Comparison of Populations: Family Medicine Group and Monroe County

		Family Medicine	Monroe
Men	0-14	13.6	14.8
	15-44	21.2	20.0
	45-64	6.7	9.6
	65+	2.6	3.9
	TOTAL	44.5	48.2
Women	0-14	12.0	14.1
	15-44	30.7	21.2
	45-64	8.4	10.6
	65+	4.4	5.8
	TOTAL	55.5	51.8
Socioeconomic Status*			
Class	I (highest)	19.2	12.0
	II	26.1	28.4
	III	36.9	40.2
	IV	13.9	13.0
	V (lowest)	3.9	6.4

*Determined by the technique of Wagenfeld and Willie, (1962) for use in Syracuse and Onondaga County, New York. The unit of analysis is the census tract and the data are based on the 1960 census. The socioeconomic areas are delineated on the basis of a five-part Composite Index. Unpublished communication, available on request from the author.

Table 2. Chart Review Work Sheet for Hypertension with Cumulative Results

I. History	Positive	Negative	Not Recorded
1. Personal and social history	19	22	4
2. Family history (HBP, ASHD, DVA)	32	9	4
3. Previous diagnosis HBP	34	5	6
4. Previous treatment HBP	21	6	18
5. Chest pain, description	12	18	16
6. Ankle swelling	10	15	20
7. Shortness of breath	18	13	14
8. PND	3	18	24
9. Orthopnea	7	14	24
10. History of renal disease	13	29	3
11. History of UTIs	10	31	4
12. History of IVPs	3	9	33
II. Physical Exam	**Performed**	**Not Performed**	
1. Height and weight	42	3	
2. BP upright	15	—	
supine	13	—	
unspecified	36	—	
3. Funduscopic	44	1	
4. Cardiac	45	0	
5. Neck and JVs	45	0	
6. Abdominal exam and bruits	42	3	
7. Extremities, pulses and edema	43	2	
III. Laboratory			
1. Urinalysis	44	1	
2. Hct or Hgb	43	2	
3. BUN or creatinine	41	4	
4. EKG (30 y.o. or less, BP 130+)	39	0	
5. IVP	18	27	
IV. Diagnosis	**Correct**	**Incorrect**	
1. Essential	39	1	
2. Secondary	1	0	
V. Management	**Satisfactory**	**Unsatisfactory**	
1. Mild (DBP 115 or less)	30	7	
2. Moderate (116-130)	4	1	
3. Severe (DBP 131 or more)	0	0	
4. Secondary	1	0	
5. Undetermined (Na, K, IVP)	1	3	

incurred outside the theoretical cost of 24 hours labor and the cost of materials which was subsumed in the office overhead and estimated at less than five dollars. While this study was conducted entirely and solely by a physician, a large part of this type of review could be adequately performed by someone other than a physician working from a detailed protocol.

Comment

This study, based only on one tracer disease, cannot be considered an adequate assessment of the quality of care provided by the Family Medicine Group of Rochester. The study of hypertension does not adequately investigate how the group provides preventive or rehabilitative services. Ideally, this study should be coupled with that of two or three other entities which would focus on other aspects of the health-care delivery system.

It did, however, raise some interesting points. The discrepancy between the prevalence rates is particularly interesting. The 1959 study by the Society of Actuaries[8] did not use the same age-specific criteria as employed in this study. When their stricter criteria are applied (ie, diastolic pressure greater than 92 mm Hg to the age of 50, then greater than 97 mm Hg), the prevalence is four percent as compared to 25 percent when 87 mm Hg and 92 mm Hg are used. The present study uses 90 and 95 mm Hg and the prevalence falls in between. In the Baltimore study, when 140/90 is used for those up to 50 years old, 160/95 for those over 50, and three screening levels are required for diagnosis, the prevalence is still 23 percent. However, 42 percent of their population were 50 years old or more, whereas only 19 percent of the Family Medicine population is over 50. The population of the United States over 50 years old is approximately 26 percent. Not only are there population differences in regard to age, but other factors, such as race, socioeconomic status, self-selection factors and location, are also unequal between the two groups. The study in Baltimore is that of a large urban population, compared to the small urban, suburban, and rural mixture seen in the Family Medicine Group population. Thus it appears that population differences could contribute to the variation in prevalence shown in Table 3.

Two variables influenced the frequency and regularity with which data were recorded: the person responsible for recording the data and the presence of a checklist. The nurse usually recorded the patient's family, social, personal, and past medical history. The physician usually asked about the present illness, symptoms, and other disease-specific data. Where the nurse was responsible, the data were recorded about 90 percent of the time. Where the doctor was responsible, the data were recorded about 55 percent of the time. It was impossible to determine if the questions were never asked, or if they were asked and the answer simply not recorded. Where a checklist was available, as in the physical exam, the data were recorded over 90 percent of the time. It was assumed that the examiner was competent and thorough. Thus, if "Abdomen" was checked as normal, it was assumed that the examiner had listened for renal bruits and heard none.

It is noteworthy that in only one case out of 45, or about two percent, was hypertension due to a secondary cause, as far as could be ascertained using the Institute's criteria. Of the cases of essential hypertension, 86 percent were mild, 12 percent were moderate and none were severe. The one case of secondary hypertension was treated properly by the family physician without referral. This study would indicate that hypertension is a widespread disease which can be readily diagnosed and properly treated by the family physician in almost all cases.

The use of the tracer technique appears to be a promising quality assessment method which can be utilized in family practice with a minimal allocation of time, money and other resources. By requiring a review of the practice against contemporary health-care standards, the tracer technique also enhances the quality of care through self-teaching and evaluation.

Table 3. Prevalence of Hypertension Rochester, New York and Baltimore, Maryland

Family Medicine	
Age	Prevalence
29	2.8%
36-49	15.9%
50+	18.4%
The Baltimore Study	
Age	Prevalence
35	1.4%
36-49	15.4%
50+	43.1%

References

1. Kessner DM, Kalk CE, Singer J: Assessing health quality — the case for tracers. N Engl J Med 288:189-194, 1973
2. Veterans Administration Cooperative Study Group on Antihypertensive Agents: Effects of treatment on morbidity in hypertension. I. Results in patients with diastolic blood pressure averaging 115 through 129 mm Hg. JAMA 202:1028-1034, 1967
3. Veterans Administration Cooperative Study Group on Antihypertensive Agents: Effects of treatment on morbidity in hypertension. II. Results in patients with diastolic blood pressure averaging 90 through 114 mm Hg. JAMA 213:1143-1152, 1970
4. McKee PA, Castelli WP, McNamara PM, et al: Natural history of congestive heart failure: The Framingham study. N Engl J Med 285:1441-1445, 1971
5. Metcalfe DHH: Knowing what goes on, or, cohort review in primary care. Del Med J 44(9):252-256, 1972
6. US Department of Health, Education, and Welfare National Health Survey: Hypertension and hypertensive heart disease in adults. United States, 1960-1962. National Center for Health Statistics, US Public Health Service Publication No. 1000, Series 11, No. 13, Washington, DC, Superintendent of Documents, 1966
7. Chronic Illness in the United States. Chronic Illness in a Large City, June 1949-June 1956. Vol. IV, The Baltimore Study, Cambridge, Massachusetts, 1957
8. Society of Actuaries: Build and Blood Pressure Study, vol. 1. Chicago, Society of Actuaries, 1959