Visit Frequency for Essential Hypertension: Observed Associations

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Data from the British Department of Health and Social Services Hypertension Care Computing Project were analyzed to study determinants of visit frequency in hypertension management. The 457 patients from five general practices made 7974 visits between 1971 and 1985 resulting in 7391 intervals on which evaluation could be based. The mean interval between visits was 113 days (SD = 110 days) with a median interval of 91 days. Visit interval was influenced by level of blood pressure and length of time in follow-up. For diastolic pressures less than 104 mmHg the mean visit interval was 4 months, contrasting with 2 months for diastolic pressures greater than 130 mmHg. Visit intervals became longer with increasing length of time in follow-up, independent of level of blood pressure. Shorter intervals reflected initial management and getting the blood pressure reduced; longer intervals may reflect patients' failure to keep scheduled appointments. Between practices, mean visit intervals ranged from 99 to 193 days (median 72 to 164 days). These differences were reduced after adjustment for length of time the patients had been in follow-up. Patient age, sex, body mass index, and the presence of angina pectoris were not associated with visit interval.

The analyses illustrate how process and outcome may be linked in ambulatory care practice as a means of determining rational guidelines for optimal utilization of health services.

The timing of follow-up office visits for essential hypertension has a great impact on outpatient health care delivery. Accounting for 4% of office visits, hypertension was the principal or secondary diagnosis responsible for an estimated 37.4 million annual outpatient visits in the United States in the mid-1970s.[1,2] The expense of return visits constitutes one half of the cost of hypertension treatment.[3] To date, the determinants of visit frequency or their influence on the quality of care have not been adequately evaluated.

Decisions about appointment scheduling result from a complex interaction of factors involving patient characteristics, the disease being treated, and physician practice characteristics. Unpublished data indicate that some of these factors include the patient's clinical status, the physician's workload, administrative, social, and behavioral factors, and the physician's attitudes and past experiences (S.D. Roberts, R.S. Dittus, G. Manley, personal communication, 1986). Interphysician differences in scheduling follow-up visits unexplained by patient characteristics or physician workload have been described, with "early schedulers" tending to be high users of outpatient diagnostic services.[4]

A survey of general practitioners' opinions on hypertension management indicated that patients' pretreatment diastolic blood pressure and age, as well as the physician's intention to institute therapy, all combined to influence the follow-up interval.[5] There was a large divergence of opinion regarding follow-up interval for controlled essential hypertension, ranging from every 2 weeks to only once yearly. The results of this study were consonant with the findings of an earlier study documenting lack of uniformity in follow-up practices.[6]

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TABLE 1. MEAN AND MEDIAN INTERVAL BETWEEN VISITS STRATIFIED BY GENERAL PRACTICE*

General Practice	Number of Patients	Interval Between Visits (days)		
		Number of Intervals	Mean (SD)	Median
1	151	2785	112 (105)	94
2	45	1012	99 (87)	80
3	28	202	193 (147)	164
4	64	595	119 (132)	72
5	25	181	130 (142)	79
6†	91	1814	111 (104)	91
Total	404	6589	113 (109)	91

*802 missing interval observations on 53 subjects with no general practice code
†Subjects seen by partners in the general practices

TABLE 2. MEAN AND MEDIAN INTERVAL BETWEEN VISITS STRATIFIED BY AGE AND BODY MASS INDEX

Age and Body Mass Index	Interval Between Visits (days)		
	Number of Intervals	Mean (SD)	Median
Age group (yr)			
27–49	1601	111 (113)	91
50–54	1300	110 (102)	91
55–59	1616	123 (113)	98
60–64	1168	107 (105)	87
65–85	1468	112 (109)	86
Quintile body mass index (kg/m²)			
18.16–23.43	959	110 (106)	91
23.44–24.87	1078	116 (109)	93
24.88–26.56	1056	105 (97)	91
26.57–29.22	1321	111 (106)	91
29.23–44.14	1098	112 (109)	92

Return visit intervals ranging from "a few weeks to several months," depending on the patient's status, have been recommended by the 1984 Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure.[7] Others have suggested a 3- to 4-month return interval for monitoring patients with controlled essential hypertension.[8] These recommendations have been made without quantitative knowledge of how visit frequency affects or is affected by blood pressure control.

To define further the process of ambulatory care for managing hypertension, the present analyses examine the frequency of follow-up visits in hypertensive patients seen in general practice and its association with level of blood pressure.

METHODS

The British Department of Health and Social Security has sponsored the Hypertension Care Computing Project since 1971.[9–12] The study enrolled 5451 patients with the diagnosis of hypertension; 4994 (92%) attended hospital clinics and 457 (8%) were seen solely by their general practitioners. The patients seen by their general practitioners are the subjects of this report, as they represent the subset handled exclusively in primary care. This database is unique because it links visit dates with blood pressure measurements.

The five general practice firms that volunteered to participate in the study were included to provide a contrasting subset to the majority of patients in the study who were followed through hospital-based clinics. If the principal physician was unable to attend a patient at a follow-up visit, the patient was seen by one of the physician's partners. Identifiers for the partners were not coded, so that these visits were treated as a "sixth" practice group.

The five practitioners estimated that 80% to 100% of patients with newly diagnosed hypertension and 60% to 100% of patients with established hypertension in their practices were enrolled during the time of their participation in the project.

Measurement of Blood Pressure

Blood pressure was measured using standard mercury sphygmomanometers in the supine, sitting, or erect positions. Although the intent was for blood pressure to be measured in all three positions at each visit, under practice conditions it was frequently measured in only one or two positions. For example, a subject on the first visit might have his blood pressure measured in the seated position only; on the second visit his blood pressure may have been measured in the supine and erect positions. Combining and comparing these data is problematical, as no one is certain just how general practitioners monitor blood pressure and which readings or combinations of readings trigger their actions. To be analytically consistent, therefore, the lowest blood pressure readings obtained during a visit were used for these analyses, regardless of the position in which they were obtained.

Determination of Interval Between Visits

The dates of each visit were recorded. The interval between two visits was calculated in days and linked to the visit that preceded the interval. Total length of time in follow-up prior to each visit was calculated by summing all preceding intervals up to the visit of interest.

Other Factors Examined

The potential influence of age, sex, and body mass index (kg/m²) were examined, using the values for age and body mass index at entry into the study.

TABLE 3. MEAN AND MEDIAN INTERVAL BETWEEN VISITS STRATIFIED BY LEVEL OF DIASTOLIC BLOOD PRESSURE

Diastolic Blood Pressure (mmHg)	Interval Between Visits (days)		
	Number of Intervals	Mean (SD)	Median
0- 69	72	96 (62)	97
70- 79	609	125 (88)	110
80- 89	1538	122 (97)	105
90- 94	1278	120 (108)	96
95- 99	706	119 (107)	94
100-104	1124	118 (123)	89
105-109	424	95 (113)	57
110-119	850	91 (113)	49
120-129	390	98 (127)	49
130-139	127	93 (131)	34
140-300	83	78 (114)	31
Total	7201	113 (110)	91

The influence of race was not studied because 439 of 457 (96.1%) subjects were white. Similarly, 78% of subjects were married, so that marital status was not examined. Of the complications associated with hypertension, only 56 subjects had angina pectoris, 44 myocardial infarction, 20 heart failure, 14 proteinuria, 11 retinal exudates, 10 claudication, 10 retinal hemorrhages, 9 transient ischemic attacks, 4 papilledema, and 3 glycosuria; none had suffered a stroke at entry into the study. With the exception of angina pectoris (missing data on 94 subjects), these complications were considered too infrequent to merit evaluation.

Data Analysis

The data were approached in cross-sectional manner with the interval between visits being the unit of study. Stratification by length of time in follow-up serves to partially control for the effects of dropouts. This approach was employed because of the limited outcome information available.

Frequency distributions were developed for all the variables. Systolic pressure, diastolic pressure, and interval between visits were stratified by each of the independent variables and each other. Means, standard deviations, and medians were calculated for each of the strata. Multiple regression was used to adjust for confounding between variables.[13] Missing values account for differences between table totals.

RESULTS

The 457 patients enrolled between 1971 and 1979 made 7974 visits to the five general practices through June 1985, resulting in 7517 intervals. Of these, there were 126 intervals between the date of entry into the study and the first follow-up visit that exceeded 672 days (96 weeks, 24 months). These 126 intervals were excluded from the file, leaving 7391 intervals for evaluation.

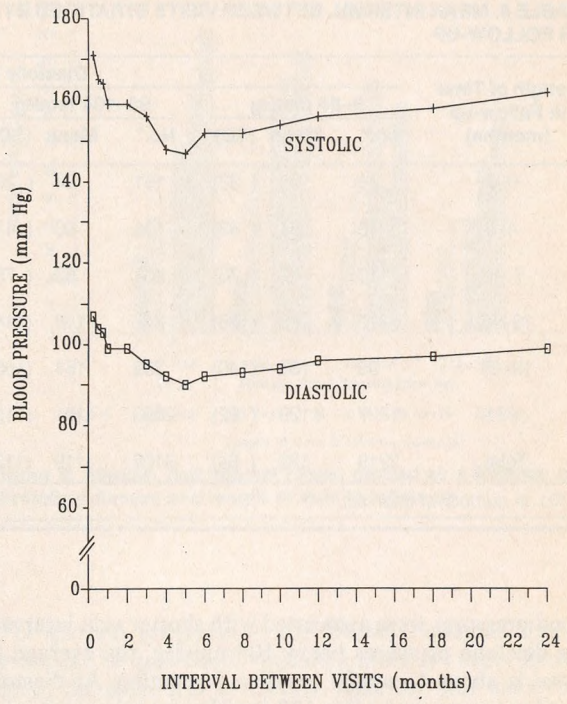

Figure 1. Mean systolic and diastolic pressure (mmHg) plotted as a function of interval between visits

The average length of time in follow-up was 1626 days (4.5 years) with a standard deviation of 1530 days (4.2 years). The median time in follow-up was 1242 days (3.4 years).

The number of patients enrolled by each practice and the mean and the median interval between visits are presented in Table 1. For all patients, the mean interval between visits was 113 days (SD = 110 days) with a median interval of 91 days. Between practices, the mean interval ranged from 99 to 193 days (median 72 to 164 days). After adjustment for diastolic pressure and length of time in follow-up, the between-practice differences in visit interval were not statistically significant.

The patients' sex did not influence visit interval. The 224 women enrolled had a mean visit interval of 113 days (SD = 112 days), and the 212 men had a mean visit interval of 114 days (SD = 107 days). Similarly, age and body mass index at study entry did not affect visit interval (Table 2). The presence of angina pectoris did not influence visit interval—those with angina had a mean visit interval of 118 days (SD = 117 days), compared with 113 days (SD = 108) for those without this symptom.

The association between level of blood pressure and interval between visits is demonstrated in Table 3 and Figure 1. In the table, mean and median interval between visits are tabulated by level of diastolic blood pressure. Higher

TABLE 4. MEAN INTERVAL BETWEEN VISITS STRATIFIED BY LEVEL OF DIASTOLIC BLOOD PRESSURE AND LENGTH OF TIME SPENT IN FOLLOW-UP

Length of Time in Follow-up (months)	Diastolic Blood Pressure											
	0–89 mmHg			90–104 mmHg			105–114 mmHg			115–300 mmHg			TOTAL		
	No.*	Mean	(SD)	No.*	Mean	(SD)	No.*	Mean	(SD)	No.*	Mean	(SD)	No.*	Mean	(SD)
0–3	23	36	(23)	161	24	(20)	174	23	(18)	167	20	(16)	525	23	(19)
4–6	48	54	(43)	134	60	(41)	88	54	(45)	59	48	(41)	329	56	(42)
7–12	110	82	(73)	264	83	(75)	125	89	(85)	78	89	(89)	577	85	(79)
13–18	112	82	(68)	247	118	(114)	81	136	(131)	71	99	(133)	511	111	(113)
19–24	99	133	(140)	209	154	(166)	80	105	(153)	56	157	(185)	444	141	(161)
>24	1827	129	(92)	2093	131	(112)	551	118	(126)	344	119	(131)	4815	128	(109)
Total	2219	122	(94)	3108	119	(113)	1099	95	(115)	775	90	(121)	7201	113	(110)

No. is number of intervals.

blood pressures were associated with shorter visit intervals. For diastolic pressures below 104 mmHg, the average interval is about 4 months (median 3 months). At diastolic blood pressures exceeding 130 mmHg, the mean visit interval is about 2 months (median 1 month). Similar intervals were noted for systolic pressures less than 170 mmHg and greater than 210 mmHg. In Figure 1 mean systolic and diastolic blood pressures are plotted against interval between visit. The plot is U-shaped with higher average pressures seen at short intervals, reaching a nadir at intervals of 4 to 6 months and increasing steadily thereafter for longer intervals between visits. For intervals up to 5 months, an inverse association with blood pressure is present (the higher the blood pressure, the shorter the visit interval). This association occurred because 56% of visits after recorded diastolic pressures of 115 to 300 mmHg occurred in the first 2 years of follow-up compared with 18% of visits after recorded diastolic pressures of 0 to 89 mmHg.

The length of time in follow-up was associated with visit interval. The longer a patient had been in follow-up, the longer the interval between visits independent of level of blood pressure. These data are illustrated in Table 4, which tabulates mean visit interval, and Figure 2, which plots median visit interval by follow-up time and diastolic blood pressure.

DISCUSSION

As the prospect of diagnosis-related groups and utilization review are extended to the ambulatory care setting, it will become imperative for physicians to know objectively how the processes of care influence the quality of outcomes in their patients. Only in this way can rational guidelines for ambulatory practice be established. While the present descriptive study cannot provide such guidelines, it quantifies the observed frequency and variability of visits for high blood pressure in primary care, and examines the association of several factors as possible determinants of visit frequency.

The patient-physician encounter itself is a therapeutic intervention; it reinforces medication compliance, permits adjustment of medications for optimal blood pressure control, provides patient education opportunities, and provides for the diagnosis and treatment of concurrent illness. As time between follow-up appointments lengthens, quality of care might decrease if the opportunities provided by regular patient-physician interactions are missed. In the Rand Health Insurance Experiment, patients under free care experienced improvement in blood pressure as a result of additional contact with physicians.[14] Other investigators have demonstrated that not visiting the physician's office in a 6-month interval is associated with poor blood pressure control.[15] At the other extreme, it is unclear whether very frequent follow-up improves patient outcome.

The present analyses examined the association between visit interval and blood pressure level in a volunteer sample of practices within the British National Health Service. In this setting, costs to the patient for physician visits should not be a determinant of care.

In the practices studied, the distribution of the interval between follow-up visits was skewed, averaging 113 days (4 months) with a median of 91 days (3 months). These figures are consistent with clinical experience and in agreement with published recommendations.[7] Based on current knowledge, the variations in follow-up intervals observed between the six practices were not surprising, although they were not statistically significant after adjusting for patients' lengths of time in follow-up and diastolic blood pressures.

The progressive shortening of the interval between visits with increasing diastolic and systolic blood pressures was an expected finding. The response to a given level of blood pressure, however, was found to depend on the length of time the patient had been in follow-up. The return visit interval lengthens with increasing time in follow-up, independent of blood pressure. One possible explanation for the observation is that hypertensive patients new to the practice were also treated for co-morbid conditions that required more frequent visits initially. The presence of coexisting conditions were not ascertained except for angina pectoris, which did not affect visit interval. A second possibility is that as physicians and patients become familiar with each other, a less frequent follow-up schedule is adopted for comparable levels of blood pressure.

When mean blood pressure was plotted against interval, a U-shaped relationship was observed (Figure 1). The decline in blood pressure represents the management phase of getting it under control. For intervals of 8 months and greater, there was a slow rise in blood pressure. The second portion of this U-shaped curve may represent visits from patients failing to return for scheduled visits. The database does not contain information on scheduled intervals to compare with actual length of time between visits.

These results should be interpreted within the limitations of the data. First, measures of morbidity other than blood pressure and angina were not uniformly assessed. Data on complications such as proteinuria, glycosuria, heart failure, claudication, transient ischemic attacks, and retinal changes were gathered but were not complete enough for analysis. Second, if visits where blood pressure was measured were incompletely recorded, the net effect of missing data would be an increase in visit interval. The participating general practitioners estimated they recorded 70% to 100% of return visits for enrolled subjects, but this rate could not be validated. Third, if the patient had been referred from the general practitioner to a hospital-based hypertension clinic within the British National Health Service, the visits to the clinic would not have been captured in the database, and the interval between visits for hypertension care would appear to be falsely long (for example, some of the patients with diastolic pressures greater than 115 mmHg may have been referred to hospital clinics, accounting for a longer interval between general practice visits). It was not possible to assess the extent of this potential bias, but the intent was for these patients to be followed exclusively in general practice.[12] Fourth, there are other factors (such as type of drug therapy) that may determine visit frequency. Drug use was not examined because of problems in tracking changes in therapy, combinations of therapy, changes in dosage, and completeness of data. Fifth, data on physician characteristics were not available to analyze as a potential determinant of visit frequency. Sixth, as the analyses are primarily cross-sectional, causal relationships for the observed associations cannot be inferred.

In spite of these problems, some associations of visit frequency in hypertensive patients followed in a selected set of general practices in the British National Health Service can be quantified. Although there are many limitations to the data, this is the only data set that links visit frequency to blood pressure level in the general practice setting. This model demonstrates the type of data needed and could be applied to process studies in the management of other chronic diseases in order to make rational recommendations for practice.

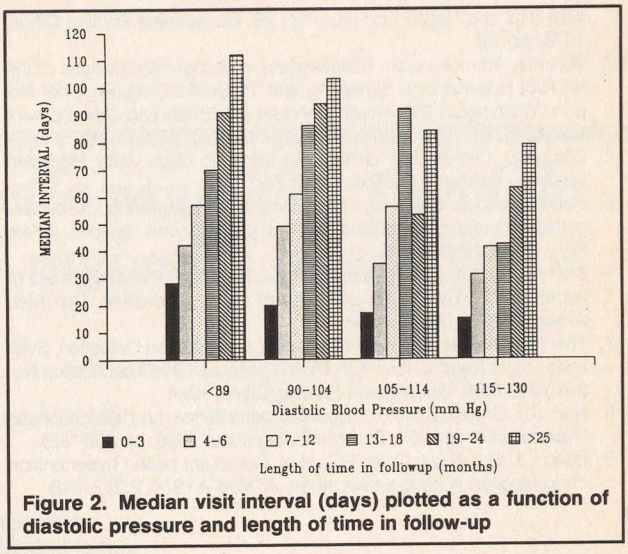

Figure 2. Median visit interval (days) plotted as a function of diastolic pressure and length of time in follow-up

To determine guidelines for visit frequencies, future studies are needed that will (1) monitor the difference between scheduled and kept appointments, (2) assess laboratory utilization and results, (3) assess treatment differences, (4) monitor morbidity of hypertension and coexisting conditions, (5) monitor alternate sources of care, and (6) study physician characteristics. The ability to reduce the number of scheduled visits for patients with stable essential hypertension from three or four a year to two would have a large economic impact on the health care system.[16]

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