The Effect of Clinical Pharmacy Services on Patients with Essential Hypertension

By James M. McKenney, Pharm. D., Judith M. Slining, M.S., H. Richard Henderson, M.D., Douglas Devins, M.D., and Martin Barr, Ph.D.

SUMMARY

The effect of clinical services provided by a pharmacist to 25 study patients with essential hypertension was evaluated and compared to the course followed by 25 control hypertensive patients not receiving these services. Results show a significant improvement (P < 0.001) in the study patients’ knowledge of hypertension and its treatment, a significant increase (P < 0.001) in the number of study patients who complied with prescribed therapy, and a significant increase (P < 0.001) in the number of study patients whose blood pressures were kept within the normal range during the study period. Most of these study patients had been hypertensive and noncompliant before, and they reverted to this status after the study period. The 25 control patients were hypertensive and noncompliant before, during, and after the study period. Fifty-nine incidents of suspected adverse reactions to antihypertensive drugs were identified in the study patients, occurring more frequently in those patients who were noncompliant, hypertensive, or taking progressively larger numbers of antihypertensive drugs. Patients were receptive to this service and kept appointments with the pharmacist investigator 92% of the time. The services provided which may have contributed to the success of treatment are discussed. It is concluded that pharmacy clinical services are beneficial and that pharmacists should become more involved in the long-term care given hypertensive patients.

Additional Indexing Words:
Patient compliance Adverse drug reactions

Life Insurance actuaries have demonstrated that hypertension is associated with numerous life-threatening conditions.1 Data from the Veterans Administration and the U.S. Public Health Service studies provide striking evidence that the incidence of mortality and morbidity is markedly reduced in those patients whose blood pressure is maintained within normal levels with antihypertensive medications.2-5 In spite of these findings, other studies have suggested that approximately 85% of all hypertensive patients in the United States remain undiagnosed, untreated, or inadequately treated.6-9

Probably more than 25 million Americans are hypertensive.7-10 Sheer numbers reflect the magnitude of the problem facing the present health care system. Detection, diagnostic and treatment facilities, and medical personnel cannot adequately manage this caseload. Even when the condition is detected, patients are frequently lost to follow-up.8 They often fail to follow prescribed drug therapy.2, 3, 11 Inaccessibility or unavailability of facilities, high costs of medical and pharmaceutical care, lack of continuity of care, prolonged waiting times, lack of patient motivation, lack of patient education programs, and adverse reactions to antihypertensive drugs all could contribute significantly to this problem of noncompliance.8, 12, 13

A number of authors have suggested that nonphysician health personnel can provide many services traditionally offered only by physicians.9, 10, 14-16 One such group of nonphysician health care personnel is pharmacists. Since the adequate care of hypertensive patients depends on use of antihypertensive drugs, more professional involvement of well-motivated and trained pharmacists should benefit hypertensive patients.

This study was completed 1) to identify the health care needs of the ambulatory hypertensive patients served by a comprehensive health service,
2) to initiate clinical pharmacy services in the community pharmacy which would respond to these needs, and 3) to evaluate the effect of these services.

**Methods**

The study was carried out with a selected population of patients enrolled in the Model Neighborhood Comprehensive Health Program, Inc., (MNCHP) a health organization providing comprehensive health services to a population of 12,000 in a Model Neighborhood area of Detroit, Michigan. Among the comprehensive health services offered by the MNCHP are general and specialty medical, surgical, pediatric, obstetrical, and mental health services; rehabilitative services; diagnostic testing; social services; hospitalization followed by convalescent and home care; nutritional, pharmaceutical, and emergency services; eye examinations and provision of health care items such as eye glasses and prosthetic devices.

The pharmacist investigator spent approximately 72 hours preparing for the study. An in-depth review of the literature relating to essential hypertension and discussions with medical practitioners constituted his academic preparation. In addition, he participated with two health center physicians as they provided medical care to hypertensive patients. These physicians assisted in designing the study.

Hypertensive patients who met the following specified criteria were selected for inclusion in the study by the two health center physicians participating in the study, the Director of Pharmacy Services of MNCHP, and the pharmacist investigator:

1) Patients who were receiving health services from MNCHP;
2) Patients who had essential hypertension (an average diastolic blood pressure greater than 90 mm Hg during three consecutive visits to the health center prior to treatment and without evidence of secondary causes of hypertension);
3) Patients who were receiving medical care from one of two health center physicians participating in the study;
4) Patients who were receiving pharmaceutical services from one of three community pharmacies participating in the study;
5) Patients who were not bedridden or debilitated and thus in need of transportation and assistance to reach health care;
6) Patients who were not suffering from such a complex list of problems that hypertension became a secondary concern.

This selection process identified 50 hypertensive patients, all of whom were included in the study phase. Male and female patients were listed separately and numbered consecutively. Patients with even numbers were assigned to the control group; patients with odd numbers were assigned to the study group. This division resulted in two groups with similar age, sex, race, and level of hypertension characteristics (table 1). Study patients were approximately 15 pounds heavier in weight. The total number of patients in the study was reduced from 50 to 49 when one of the study patients moved outside of the Model Neighborhood area.

Prior to the first visit and after the last visit with the pharmacist investigator each patient in both the study and control groups was requested to complete a truefalse test which was designed to evaluate the patient's general knowledge of hypertension and its drug and dietary management. The tests were administered by the Director of Pharmaceutical Services of MNCHP or her assigned agent and were not seen by the pharmacist investigator until the completion of the study period.

Throughout the study period, patients in both groups continued to receive medical care from one of the two health center physicians participating in the study as well as all other health services provided by MNCHP. Only the study group patients were provided with the services of the pharmacist investigator. Each patient in the study group was seen monthly by appointment for a period of five months by the pharmacist investigator in his community pharmacy. During the initial appointment with the study patient, the pharmacist investigator explained the scope of the services to be provided, obtained a medical and pharmaceutical history and a blood pressure recording, and questioned the patient about drug utilization and how closely he had followed the prescribed therapy. He asked for any complaints, reactions, and problems related to hypertension. During subsequent appointments the pharmacist investigator evaluated the patient's therapeutic responses to the drug and dietary management; identified and managed additional complications, reactions, and problems; evaluated the patient's understanding of the educational material; provided additional educational material; identified and managed some adverse reactions to drug therapy; referred patients to health center personnel for specialized care; and recommended therapy changes to the physician based on the patient's

**Table 1**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Control group</th>
<th>Study group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Female</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>Average age in years</td>
<td>58</td>
<td>62</td>
</tr>
<tr>
<td>Average weight in pounds</td>
<td>169</td>
<td>183</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negro</td>
<td>17</td>
<td>21</td>
</tr>
<tr>
<td>Caucasian</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild*</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Moderate†</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Severe‡</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

*Fixed initial diastolic blood pressure of 90 mm Hg to 109 mm Hg.
†Fixed initial diastolic blood pressure of 110 mm Hg to 129 mm Hg.
‡Fixed initial diastolic blood pressure of greater than 129 mm Hg.
therapeutic responses and compliance with prescribed therapy.

The information on hypertension was presented to study patients in a structured and individualized manner. Pamphlets were handed out that reinforced discussions with the patients. Control patients were talked to by the physician or other health center personnel. Commercial hypertension literature was available to these patients and physicians throughout the study period at the health center.

The following definitions were used in this study:

Normotension: Two or more consecutive monthly diastolic pressure readings averaging less than 90 mm Hg.

Pharmaceutical History: Patient demographic information; record of drugs, prescription and nonprescription, the patient is taking or has recently taken; adverse reactions to drugs; diagnosis of the patient; pertinent family medical history; patient drug utilization (an assessment of the patient's compliance with prescribed drug therapy, the patient's understanding of the directions for use of the drug, the patient's frequency of nonprescription drug use, the patient's abuse of addicting drugs; the patient's storage and handling of prescribed drugs, the patient's source of prescription drugs, and the patient's financial arrangements for procuring drugs).

Compliance: Patients received from the pharmacy, and presumably took, plus or minus 10% of the antihypertensive drug doses prescribed during the observation period. Pill counts were used to confirm this information.

Compliance Percentage:

\[
\text{Number of antihypertensive doses administered} \times 100
\]

Adverse Drug Reaction: Any undesired or unintended consequence of antihypertensive drug administration.

Mild Reaction: Those reactions which did not require stopping the drug, the use of the antidotal or corrective therapy, or hospitalization.

Moderate Reaction: Those reactions requiring corrective measures with discontinuance of the medication or hospitalization.

<table>
<thead>
<tr>
<th>Table 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Comparison of the Average and Total Number of Correct Responses to Test Questions in Control and Study Groups Before and After the Study Period</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Control group</th>
<th>Study group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before the study period</td>
<td>After the study period</td>
</tr>
<tr>
<td>Number of patients completing the test</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>Average number of correct responses by each patient</td>
<td>14</td>
<td>13</td>
</tr>
<tr>
<td>Total number of correct responses made by group</td>
<td>231</td>
<td>257</td>
</tr>
</tbody>
</table>

Severe Reaction: Life-threatening or fatal reactions.

Side Reaction: An adverse pharmacological effect of the drug unassociated with the therapeutic purpose for which the drug was given.

Toxic Reaction: An adverse pharmacological effect of the drug associated with the therapeutic purposes for which the drug was given.

Allergic Reaction: Those manifestations of drug therapy considered typical of allergic diseases and not clearly attributable to the drug's pharmacologic action.

Idiosyncratic Reaction: An uncharacteristic response of a patient to a drug, usually not occurring on administration of this drug at normal doses.

**Results**

The test results of the control and study group patients completing the questionnaire were compared. We found that patients generally were poorly informed about hypertension and its treatment. Control patients continued to miss the same average number of responses to the 21-question test before and after the study period (table 2). The patients in the study group significantly improved the number of correct responses at the end of the study period. It should be noted that the individual increase in knowledge is probably higher since two patients in the study group accounted for 50% of the incorrect responses made by the group after the study period. These two patients missed the most appointments with the pharmacist investigator and were the least compliant with the recommended therapy.

A one-way analysis of variance on the differences in correct responses demonstrated by 15 control group patients and 19 study group patients before and after the study period showed that there was a significant difference \[ F(1, 32) = 23.407; P < 0.001 \] between the two groups. It is concluded that this difference is due to the services provided by the pharmacist investigator and that this service was effective in increasing the study patient's knowledge of hypertension and its treatment.

**Compliance with Prescribed Therapy**

Patients in both the study and control groups were noncompliant with prescribed therapy during the seven month period prior to the study phase (table 3). Each of these patients took approximately 65% of the prescribed antihypertensive drug doses. Control patients remained noncompliant prior to, during, and after the study period. In contrast, during the period when they were being seen by the pharmacist, study patients closely followed the prescribed regimen. After the study...
**PHARMACISTS' SERVICES TO HYPERTENSIVES**

**Table 3**

*A Comparison of Compliance with Prescribed Antihypertensive Drug Therapy in the Control and Study Groups Before, During, and After the Study Period*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Control group</th>
<th>Study group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>During</td>
</tr>
<tr>
<td>Average length of the observation period (days)</td>
<td>209</td>
<td>150</td>
</tr>
<tr>
<td>Number of patients</td>
<td>25</td>
<td>24*</td>
</tr>
<tr>
<td>Number of compliant patients§ during observation period</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Average compliance percentage§ of patients during observation period</td>
<td>(16%)</td>
<td>(17%)</td>
</tr>
</tbody>
</table>

*Patient died.
†Five patients were lost to pharmacy follow-up.
§Compliance is defined as the administration of between 90 and 110% of prescribed doses.
§Compliance percentage = Number of doses administered / Number of doses prescribed × 100

This compliance data was analyzed by Wilks method utilizing the two-way contingency table and chi square analysis. A significant difference between the two groups was found \[\chi^2 (1) = 14.487; P < 0.001\]. The difference was attributed to the clinical services offered by the pharmacist investigator to the study patients, and it indicates the effectiveness of such services.

**Blood Pressure Results**

The level of blood pressure control was generally related to how well the patient followed his antihypertensive drug therapy. Prior to the study period, only 32% of all patients were normotensive even though all had received antihypertensive drug therapy for a minimum period of one year (table 4). Most control patients were hypertensive before, during, and after the study period. During their interaction with the pharmacist investigator, the blood pressure of most study patients dropped to normal levels; after the study period pressure rose to values found in the prestudy state.

A one-way analysis of variance on the differences in physician recorded blood pressures in the control and study patients showed a significant difference between the groups \[F (1, 46) = 21.988; P < 0.001\]. Thus the clinical services provided by the pharmacist investigator were shown to have been the factor in effectively lowering blood pressures of the study patients.

**Table 4**

*A Summary of Blood Pressures and the Number of Normotensive Patients Administering Antihypertensive Drug Therapy in Control and Study Group Before, During, and After the Study Period*

<table>
<thead>
<tr>
<th></th>
<th>Control group</th>
<th>Study group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>During</td>
</tr>
<tr>
<td>Average length of the observation period (days)</td>
<td>209</td>
<td>150</td>
</tr>
<tr>
<td>Number of patients</td>
<td>25</td>
<td>24*</td>
</tr>
<tr>
<td>Number of normotensive patients§ during observation period</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>Average blood pressure (mm Hg) as determined by the physician during observation period</td>
<td>163</td>
<td>166</td>
</tr>
<tr>
<td>Average blood pressure (mm Hg) as determined by the pharmacist investigator during observation period</td>
<td>93</td>
<td>101</td>
</tr>
</tbody>
</table>

*One patient died.
†Three patients lost to medical follow-up.
§Normotensive patients had an average diastolic blood pressure less than 90 mm Hg on two consecutive meetings.
Suspected Adverse Drug Reactions

The 24 study patients were exposed to 35 antihypertensive drugs during the five month study period. Twenty-one patients were prescribed thiazide diuretics, two patients were prescribed spironolactone, one patient was prescribed reserpine, seven patients were prescribed alpha methyl-dopa, three patients were prescribed guanethidine, and one patient was prescribed propranolol. The pharmacist investigator detected 59 undesirable or unintended reactions (suspected adverse drug reactions) to the antihypertensive drug therapy during the study period (table 5). These reactions were validated by a thorough history, physical examination or laboratory testing. Reactions to drugs other than antihypertensive drugs were infrequent and are not reported here.

Most of the suspected adverse drug reactions were mild and were managed by the pharmacist investigator. Some of these reactions (i.e., nocturia) may be considered trivial and not completely unexpected. However, since these reactions ap-

Table 5

<table>
<thead>
<tr>
<th>Adverse Drug Reactions in Hypertensive Study Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug reaction</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Nocturia</td>
</tr>
<tr>
<td>Dizziness</td>
</tr>
<tr>
<td>Exertional weakness</td>
</tr>
<tr>
<td>Leg cramps</td>
</tr>
<tr>
<td>Orthostatic hypotension</td>
</tr>
<tr>
<td>Nausea</td>
</tr>
<tr>
<td>Vomiting</td>
</tr>
<tr>
<td>Constipation</td>
</tr>
<tr>
<td>Nasal congestion</td>
</tr>
<tr>
<td>Joint pain</td>
</tr>
<tr>
<td>Drowsiness</td>
</tr>
<tr>
<td>Paresthesia</td>
</tr>
<tr>
<td>Rash</td>
</tr>
<tr>
<td>Orthostatic hypotension</td>
</tr>
<tr>
<td>Syncope</td>
</tr>
<tr>
<td>Failure to ejaculate</td>
</tr>
<tr>
<td>Shortness of breath</td>
</tr>
</tbody>
</table>

Mild

Table 6

The Incidence of Drug Reactions Compared to the Type of Antihypertensive Drugs Administered

<table>
<thead>
<tr>
<th>Drugs administered</th>
<th>Number of patients</th>
<th>Average number of drug reactions per patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diuretic</td>
<td>16</td>
<td>1.6</td>
</tr>
<tr>
<td>Diuretic + Methyldopa</td>
<td>5</td>
<td>3.8</td>
</tr>
<tr>
<td>Diuretic + Methyldopa + Guanethidine</td>
<td>2</td>
<td>4.5</td>
</tr>
</tbody>
</table>

peared to interfere with a patient's diligence in following the prescribed therapy and maintenance of a normal blood pressure level, they were considered undesirable. Management of reactions by the pharmacist investigator included changing the drug administration schedule, providing patient education, suggesting dietary changes, recommending nonprescription drug therapy, suggesting adjunctive therapy, and altering the antihypertensive drug regimen after consultation with the physician. The four patients experiencing moderate drug reactions and the one patient experiencing a severe drug reaction were referred to the physician for follow-up care with recommendations for management from the pharmacist investigator.

The 24 study patients experienced an average of 2.5 suspected adverse drug reactions during the five month study period. All study patients experienced at least one reaction attributed to antihypertensive drug therapy. Data also showed that the greater the number of drugs administered and the more potent the antihypertensive drug administered, the greater the average incidence of drug reactions (table 6). The drug reaction incidence appeared to closely correlate with the patient's compliance and whether blood pressure was controlled. Table 7 shows that compliant patients and normotensive patients experienced less than half the average number of drug reactions experienced by noncompliant and

Table 7

The Average Number of Drug Reactions Compared to the Patient's Compliance and the Degree of Blood Pressure Control

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number of patients</th>
<th>Average number of drug reactions per patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compliant with prescribed therapy</td>
<td>19</td>
<td>2.0</td>
</tr>
<tr>
<td>Noncompliant with prescribed therapy</td>
<td>5</td>
<td>4.4</td>
</tr>
<tr>
<td>Normotensive</td>
<td>19</td>
<td>1.8</td>
</tr>
<tr>
<td>Hypertensive</td>
<td>5</td>
<td>4.6</td>
</tr>
</tbody>
</table>

Circulation, Volume XLVIII, November 1973
hypertensive patients. No remarkable age differences were observed in the incidence of drug reactions in study patients. Table 8 shows that males and whites experienced drug reactions slightly more often.

Recommendations to Physicians

The pharmacist investigator was in close touch with the physician; they discussed together the pharmacist investigator's subjective and objective observations of the patients, his assessment of the patient's problems and therapeutic response, and his plan for further service with the physician. During the study period the pharmacist investigator wrote approximately 75 communications which contained a total of 37 recommendations to the physicians. Nineteen laboratory tests were requested to assist in the diagnosis of suspected adverse drug reactions. This testing was requested only when the patient's subjective responses suggested potential drug reactions. Fourteen recommendations suggested an increase or decrease in the dosage of an antihypertensive drug or a change in the antihypertensive drug regimen. These recommendations were implemented and resulted in better control of the blood pressure or of possible drug reactions. Three recommendations suggested additional diet instruction for patients while one suggested an evaluation of chest pain in a patient.

Recommendations to Patients

Sixty-five recommendations were made by the pharmacist investigator to the 24 patients in the study group. Nonprescription drug products were recommended 11 times during the study period. Recommendations included cough and cold products for flu symptoms, antacid products for gastrointestinal symptoms, and analgesics for minor arthralgias and headaches. In each case, products were recommended only if the patient required them. Choice of drugs was tailored to the patient's specific needs, avoiding those agents that might interfere with antihypertensive therapy.

The majority of the recommendations were provided to manage suspected adverse drug reactions. Nausea ceased in two patients after pharmacist investigator suggested taking the drug with meals. Eight patients were advised to include potassium-rich foods in their diets or to abate from certain salty foods when subjective complaints suggested that these measures were warranted. Eight patients experiencing bothersome nocturia were advised to take their second daily diuretic dose in the midafternoon rather than at bedtime. Orthostatic hypotension was relieved in three patients when the pharmacist investigator suggested raising the head of the bed, arising slowly in the morning, and avoiding situations causing symptoms.

Potential drug interactions prompted other recommendations. Six patients who took Phospho Soda, Alka Seltzer, Bromo Seltzer, and large doses of Maalox were advised to substitute other drug products which contained less sodium or to discontinue the use completely. Five patients taking sympathomimetic amines in cough and cold preparations or as appetite suppressants were advised to stop this self-medication. The reasons why this medicine could be harmful were explained to the patient. Two patients were found to be self-administering drugs from previous prescriptions and were advised to discontinue their use.

Professional Time

It was found that the contact time per patient visit with the pharmacist investigator was very similar to that spent by the physician. The pharmacist investigator spent approximately 25 minutes with each patient during the initial visit while the physician scheduled 30 minute appointments for initial patient visits. Subsequent visits with each patient required approximately six minutes by the pharmacist investigator while the physician spent approximately five minutes for follow-up visits with hypertensive patients. These findings are important since it was not the purpose of this study to restrict the professional time spent with each patient, but to identify problems experienced by hypertensive patients and to find ways a pharmacist might assist the patient in the resolution of these problems.

It is also interesting to note that only 34 patient appointments with physicians were scheduled during the study period for study patients while this

### Table 8

**Relationship of Drug Reaction to Characteristics of Patients**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number of patients</th>
<th>Average number of drug reactions per patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>6</td>
<td>3.3</td>
</tr>
<tr>
<td>Female</td>
<td>18</td>
<td>2.4</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>5</td>
<td>3.0</td>
</tr>
<tr>
<td>Black</td>
<td>19</td>
<td>2.0</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater than 60 years</td>
<td>8</td>
<td>2.5</td>
</tr>
<tr>
<td>Less than 60 years</td>
<td>10</td>
<td>2.5</td>
</tr>
</tbody>
</table>

_Circulation, Volume XLVIII, November 1973_
same group of patients were scheduled for 44 appointments during a similar time period before the study period. The differences may reflect better blood pressure control in study patients. Control patients were scheduled for 41 appointments before and 45 appointments after the study period. These data suggest that the pharmacist investigator's services may have decreased the need for intensive physician follow-up services.

**Patient Acceptance**

Study patients were highly receptive to the clinical services offered by the pharmacist investigator. They answered yes to all three of the following questions: 1) Have these appointments been of benefit to you? 2) Should this service be offered to all hypertensive patients of MNCHP? 3) Should similar services be made available to you for other medical problems such as diabetes and heart disease? Also, study patients kept 92% of the 100 appointments made with the pharmacist investigator during the five month study period. Even though appointments were missed, no study patient was lost to medical or pharmaceutical follow-up during the study period. At the same time, appointments with physicians were kept 88% of the time among study patients and 82% of 44 physician appointments with control patients were kept. Five control patients were lost to medical or pharmaceutical follow-up during the study period.

**Discussion and Conclusions**

This study has shown that the clinical services provided by the pharmacist investigator to hypertensive patients were effective in improving treatment results. The services apparently answered needs of patients; some of the important factors that made this approach effective are discussed below.

Suspected adverse reactions to antihypertensive drugs produced frequent, undesirable symptoms in study patients and appeared to be one of the main reasons patients stopped taking their medicine. Many of these reactions were mild but had gone undetected, untreated, or unexplained. The pharmacist investigator actively solicited complaints from his patients about reactions they believed were caused by the drug. He made an immediate attempt to help the patient, fully explaining the nature of the problem and the plan of management.

Some hypertensive patients were taking other drugs, both prescription and nonprescription, at the same time that they were taking antihypertensive drugs. These other drugs may have interfered with the successful maintenance of normal blood pressures. Potential drug interactions were identified by the solicitation of pharmaceutical histories and maintenance of appropriate pharmacy records by the pharmacist investigator. This greater effort on the part of the health professional to detect and correct potential interactions of drugs may have been partially responsible for successful treatment.

Patients were found to know very little about hypertension and needed to learn more about their condition. The educational programs offered by the pharmacist investigator were structured to insure inclusion of essential information but were modified to fit the individual patient.

The study patients knew very little about blood pressure, its significance and its relation to hypertension, and in the past had not been told what their blood pressure readings were. The pharmacist investigator explained in general what a blood pressure reading meant and what the ranges for normal blood pressure were. During each visit with the pharmacist investigator, the patient was told his blood pressure reading. In this way the patient may have been helped to understand that his blood pressure values were related to how closely he followed the drug therapy prescribed. These educational services appeared to contribute to successful treatment.

Prior to this study a lack of continuity of patient care appeared to result primarily from a lack of effective communication among health team members often leading to ineffective treatment. MNCHP pharmacists did not actively participate in the health care of these patients and generally did not know the patient's diagnosis, the physician's therapeutic intent, or whether patient's response to a drug was favorable or not. The physician had little knowledge of whether a patient was following prescribed therapy, how patients used drugs, or how many adverse drug reactions had occurred. In this study the pharmacist investigator was thoroughly familiar with the management plans for each patient, actively participated in the care of the patient, followed the patient's progress closely, solicited the advice of health center speciality groups, referred patients with complicated problems to health center specialists, and established an effective communication with other health center personnel. The active participation of the pharmacist investigator and the coordinated efforts of the
team members appeared to help assure successful treatment.

Patients were often reluctant or unable to talk freely with the physicians. Often they did not wish to bother the physician or take too much time with some complaint. They seldom called health personnel between appointments for advice. The pharmacist investigator described how the patient could make use of all facets of the health care system. He freely discussed problems with the patients and acted promptly on them. He was always accessible to the patients between appointments.

Finally, the effectiveness of treatment in this study probably was improved by the patient's association with a health professional who understood his disease, respected his ability and influence in determining the outcome of this study.

The data presented in this study suggests that a well trained and motivated clinical pharmacist can be an essential part of the health care team caring for hypertensive patients. His services appear to help insure the success of treatment and are acceptable to the patients receiving them. Since the treatment successes were generally lost after the pharmacist investigator's involvement ceased, the pharmacist's services must be continued indefinitely to be most effective. This study suggests that the pharmacist may successfully assume increased responsibility for the long term health care of patients with essential hypertension. This approach may partially relieve the physician manpower problem and increase the availability of the services we will need to adequately care for the millions of hypertensive patients yet to be detected, treated, or adequately treated. Further study of this approach with larger groups of patients and pharmacists is needed.

Acknowledgment

We wish to extend our sincere thanks to the Model Neighborhood Comprehensive Health Program and to Wayne State University's School of Pharmacy for making this study possible. Our gratitude is also extended to Jack Howell, biostatistician.

References

1. Build and Blood Pressure Study. Chicago, Society of Actuaries, 1959
2. Veterans Administration Cooperative Study Group on Antihypertensive Agents: Effects of Treatment on Morbidity in Hypertension—Results in Patients with Diastolic Blood Pressures Averaging 90 Through 114 mm Hg. JAMA 213: 1143, 1970
The Effect of Clinical Pharmacy Services on Patients with Essential Hypertension
JAMES M. McKENNEY, JUDITH M. SLINING, H. RICHARD HENDERSON, DOUGLAS DEVINS and MARTIN BARR

Circulation. 1973;48:1104-1111
doi: 10.1161/01.CIR.48.5.1104
Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 1973 American Heart Association, Inc. All rights reserved.
Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circ.ahajournals.org/content/48/5/1104

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Circulation can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Circulation is online at:
http://circ.ahajournals.org//subscriptions/