Traffic and Parking Requirements of Off-Center Medical Office Buildings

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Decentralization of population and construction of large community hospitals in suburban areas have been attracting an increasing number of medical office buildings and clinics to suburban and off-center locations. In many cases, parking requirements for these buildings have been based on existing specifications derived from data for facilities in central areas well served by public transportation. These requirements are inadequate, principally due to the high rate of auto use characteristic of suburban areas.

To obtain more appropriate estimates of parking requirements for medical buildings, intensive studies of two such facilities, one in central Evanston, Ill., the other in nearby suburban Skokie, Ill., were conducted to determine the relationships that exist between the various functions these facilities serve and the traffic and parking demands they generate. The results showed that demand varied not only with floor space and number of doctors, but also with location, services available for treatment and diagnosis, scheduling procedures, and other operational aspects of the facility. Wide variations also exist between medical specialties in the rate at which the patients are treated, ranging from an average of more than 3.5 patients per office hour in the case of pediatricians, for example, to less than 1.5 patients per hour for general surgeons.

The impact of location of the facility on parking demand was apparent in the greater use of private autos for travel to the suburban clinic as compared to auto use associated with the office building in central Evanston. Approximately 82 percent of the patients using the suburban clinic required parking, in contrast to 67 percent for the Evanston medical building. An even more pronounced difference was noted in the mode of travel used by employees. Only 9 percent of the employees interviewed at the Evanston building drove to work, whereas 74 percent at the suburban clinic used a car.

An interesting sidelight to the study of the Evanston facility was that approximately 50 percent of all patients interviewed indicated that they had shopped, gone to the bank, eaten, or made other errands as part of their medical trip. An average of 1.8 errands per person was made by this group.

•DURING RECENT YEARS an increasing number of medical buildings and clinics has been constructed at suburban or other off-center locations. In part, this policy reflects the general trend in suburbanization of many consumer-oriented or service activities. In part, too, medical clinics and offices have congregated about the larger community hospitals constructed on large tracts of land in outlying locations. The concentration of such activities in the vicinity of hospitals is a reflection of the trend in

Paper sponsored by Committee on Parking.

modern medical practice to be as closely linked as possible to large hospitals with their array of facilities for diagnosis, treatment and care.

As with other land uses, there is a danger that newly constructed medical office buildings or clinics will generate excessive parking and traffic demands on the streets adjacent to them. To guard against this, many communities have adopted zoning ordinances which specify the number of parking spaces required for a clinic of a specific size, either as a function of the floor area of the structure or in terms of the number of doctors that it will house. Most of these specifications are based on fairly old data for facilities in central areas well served by public transit. Their application to current suburban or off-center situations is open to question.

If experience with other types of land uses is at all applicable in this case, medical traffic generation should reflect not only differences in floor space or number of doctors, but also variations in location, services available, office hours, scheduling procedures, and other operational aspects of the facility. Therefore, an intensive study was undertaken of a medical office building and a clinic in order to determine the relationships existing between the various functions these facilities serve and the traffic demands they generate. As an initial effort, two parking-demand studies were made for the two types of medical buildings. The first was an investigation of the office procedures of 26 physicians practicing in a multistored office building in downtown Evanston, Ill. The second study analyzed the office practices of 21 physicians at a suburban clinic in Skokie, a village directly west of Evanston.

MEDICAL OFFICE BUILDING, EVANSTON

In 1961, a group of 20 doctors in Evanston, Ill., initiated a plan to construct and operate a medical office building near Evanston General Hospital. At present, most of the doctors are housed in a downtown building about 1½ mi from the hospital. The proposed building will provide 40 medical office suites and will contain two X-ray and clinical laboratories, as well as a prescription pharmacy and an optical dispensary. It is to be within 500 ft walking distance of the hospital and will have bus connection to the central business district the (CBD) and many of the other areas of Evanston. The location of both buildings and their relation to other features in the Evanston area are shown in Figure 1.

The off-center location also will provide for improved off-street loading and parking, as compared to the eight-story office building fronting on a busy street in downtown Evanston.

Recognition of the effect that this new facility might have on the adjacent residential neighborhood, as well as the potential impact on the Evanston CBD of the relocation of a significant portion of its medical services, led to a study of the nature and amount of traffic which this group of doctors generated. Reported here are three phases of this study:

1. Characteristics of the parking demand generated by the various doctors and estimated parking requirements of the new facility;
2. Estimated traffic impact on streets adjacent to the new facility;
3. Potential effects on the Evanston CBD of the relocation of these medical services.

The analyses of all three of these phases were based on observations of current office procedures of 26 doctors actively practicing in Evanston with offices in the eight-story downtown office building and on results of questionnaires completed by patients and employees of these doctors. The study was directed toward the practices of doctors who were proposing to relocate, in order to insure complete cooperation in what otherwise might have been construed as an invasion of privacy. Also, by concentrating on the group most directly involved, a more accurate estimate of potential parking and traffic demands at the new building could be obtained than if the practices of a random set of doctors had been studied.

A follow-up study is scheduled upon completion of the new building to test the actual traffic and parking demands generated.

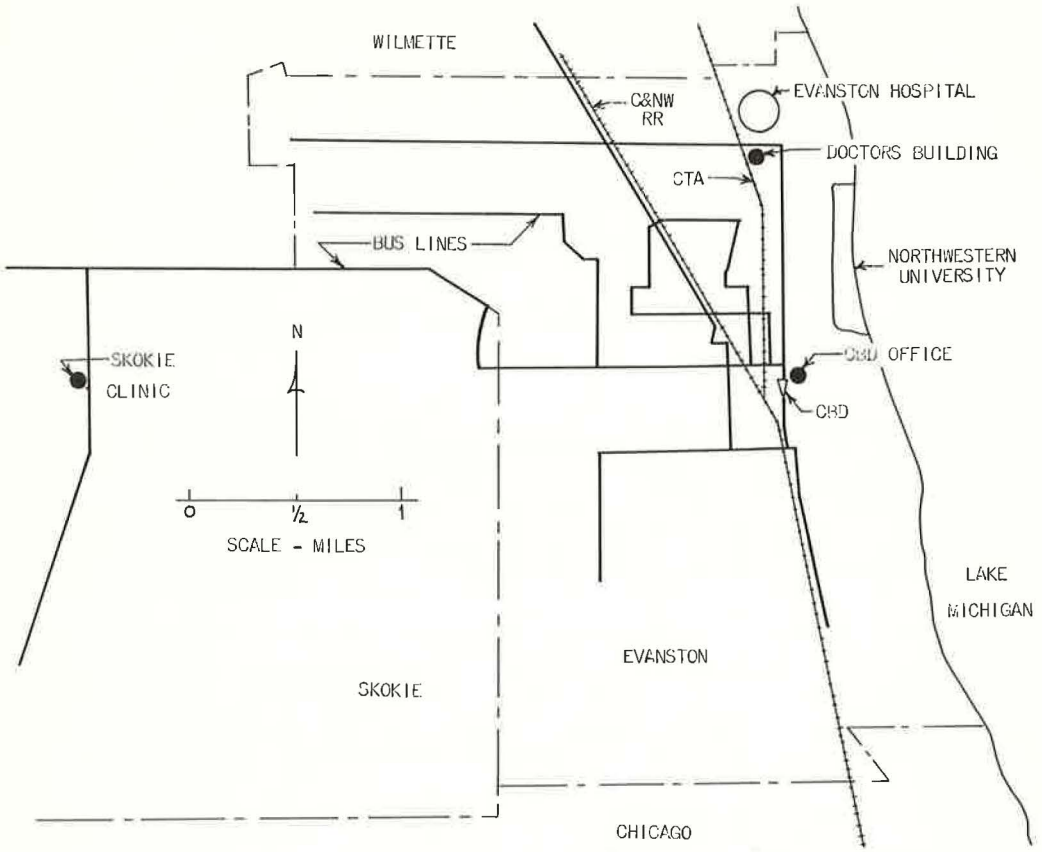

Figure 1. Location of study sites in Evanston and Skokie.

Parking Requirements

To determine the maximum probable number of parking spaces required for the new medical building, it was necessary to estimate the peak accumulation of persons likely to be on the premises on a typical active weekday and the proportion of these persons likely to come by car. Separate estimates were made for doctors, patients, employees, and other users of the building.

For Doctors.—The number of doctors expected to be present at any one time in the new building provided the basis for estimating traffic and parking demands for prospective users of the facility. The group of doctors sponsoring the project estimated that a maximum of 40 doctors would hold office hours at the same time in the new building. This figure was substantiated by a study of the intensity of the present use of medical office space in downtown Evanston.

Fourteen office suites, housing 41 doctors, in the eight-story building were selected and checks were made of actual office hours of these doctors on 3 weekdays. About a third of the doctors whose names were listed on the doors were not in active practice; they either rarely visited their offices, or were retired or deceased. The 26 doctors in active practice include internists, surgeons, orthopedic surgeons, opthalmologists, neurologists, psychiatrists, obstetricians, gynecologists, a dermatologist, and eye, ear, nose and throat specialists. Of these 26 doctors, no more than two thirds were ever observed to be in their offices at any one time (Table 1).

The proposed building, with approximately 30,000 sq ft is planned to provide offices for 60 active doctors in 40 suites. Thus, a maximum of 40 doctors will be in their

TABLE 1

OBSERVED PEAK PATIENT LOADS AT 14 DOCTORS' SUITES[a]

Day and Date	Time	No. of Doctors in Attendance	No. in Suite		No. per Doctor	
			All Persons	Patients[b]	All Persons	Patients[b]
Thursday	1:32 - 2:17	10	30	-	3.0	-
	2:19 - 2:53	15	35	-	2.3	-
	2:57 - 3:35	16	46	-	2.9	-
	3:37 - 3:52	17	38	-	2.2	-
Friday	2:14 - 2:40	15	53	44	3.5	2.9[c]
	2:42 - 3:06	15	61	39	4.1	2.6
	3:10 - 3:45	15	37	34	2.5	2.3
Monday	2:30 - 3:07	17	58	46	3.4	2.7
	3:12 - 3:53	18	49	43	2.7	2.4

[a]Study made in Evanston, Ill. [b]Patients were not counted separately on Thursday.
[c]Maximum observed load.

offices to receive patients at one time. This figure agrees with that originally suggested by the doctors themselves. Using a 1:1 auto-driver ratio, a total of 40 spaces would be required to meet the parking demands of the doctors themselves.

For Patients.—The number of patients expected to visit doctors in the new building at one time was estimated by studying office procedures currently being used by some of the same doctors. Actual counts were made of the number of patients present and persons accompanying them at different times in the 14 medical suites. Results are summarized in Table 1 for nine periods covering three days.

The pertinent totals for the determination of parking requirements for patients are the numbers of patients in the suites at one time, because accompanying persons will generally use the same car as the patient. The figures in Table 1 represent the total number of patients either being examined or waiting to be examined at any single time, including those to be given injections or undergoing laboratory tests by the doctors' employees.

In addition to the observed peak patient loads, Table 1 gives the ratios between the total number of patients in the 14 suites for any period and the number of doctors having office hours during the same period. The maximum figure of 2.9 patients per doctor in attendance was selected as the basis for determining the peak patient demand at the new building. This was based on the assumption that the doctors' office procedures will remain essentially the same in the new facility.

After determining the number of patients expected to be in the doctors' suites at one time, it was necessary to estimate the proportion of these patients requiring parking facilities. The mode of travel presently used by patients served as a partial basis for this estimate. This information was obtained from a questionnaire distributed to 300 patients at the time they visited the doctors.

A summary of the responses on the questionnaires (Table 2) shows that about 64 percent of the patients came to the doctors' offices in automobiles that were parked in the downtown area. The percentage of patients requiring parking at the new building would undoubtedly be higher because of the effect the off-central location of this new facility

TABLE 2

MODE OF TRAVEL OF PATIENTS COMING TO 3 MEDICAL ESTABLISHMENTS

Building	Location	Patients Surveyed											
		Total No.	Arrived by Car				Via Taxicab		Via CTA or Bus		Walked		Other	
			Required Parking		No Parking Required									
			No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Present med. off.[a]	Evanston CBD	300	192	64	10	3	19	6	47	16	21	7	11	4
Proposed med. off.[b]	Evanston off-center	300	225	75	10	3	19	6	40	13	2	1	4	2
Clinic[c]	Skokie suburban	429	-	82	-	4	-	1	-	2	-	11	-	-

[a]Study made November-December 1961. [b]Estimated from present Evanston data. [c]Study made June 1963.

will have on the proportions traveling by various modes. After adjusting upward the proportion expected to drive, it was estimated that no more than 75 percent of the patients will require parking space at the new building. It should be noted that the data in Table 2 are used only to obtain the proportion of patients requiring parking; they are not used to estimate the number of spaces needed. This number, based on the peak load of 40 doctors in attendance in the new building at one time on a typical active day, is estimated to be 88 spaces.

For Doctors' Employees.—The mode of travel currently used by doctors' employees in coming to work at the present offices was also obtained by questionnaire and is summarized in Table 3. At present, only 9 percent of the employees drive to work. This figure will probably rise to 26 percent for these same employees at the new building, due to improved parking conditions and to the need for riders of certain bus lines to transfer to another bus line in order to reach the new building (Fig. 2). Eventually, 40 to 50 percent of the doctors' employees may drive to work. A 46 percent figure was used to compute the number of parking spaces required for doctors' employees.

The 20 active doctors in the nine suites covered in the employee questionnaire employed a total of 23 persons. If 60 doctors actively use space in the new building, a total of 32 parking spaces would be needed for doctors' employees.

For Other Users of Building.—There are four ancillary facilities to be included in the new building: an X-ray laboratory, a clinical laboratory, a pharmacy, and an opti-

TABLE 3

MODE OF TRAVEL OF EMPLOYEES COMING TO 3 MEDICAL ESTABLISHMENTS

Building	Location	Employees Surveyed									
		Total No.	Arrived by Car				Via Bus		Walked		Other	
			Drove		Passenger							
			No.	%	No.	%	No.	%	No.	%	No.	%
Present med. off.[a]	Evanston CBD	23	2	9	5	22	9	38	5	22	2	9
Proposed med. off.[b]	Evanston off-center	23	6	26	7	30	8	35	-	-	2	9
Clinic[c]	Skokie suburban	35	-	74	-	6	-	9	-	11	-	-

[a]Study made November-December 1961. [b]Estimated from present Evanston data. [c]Study made June 1963.

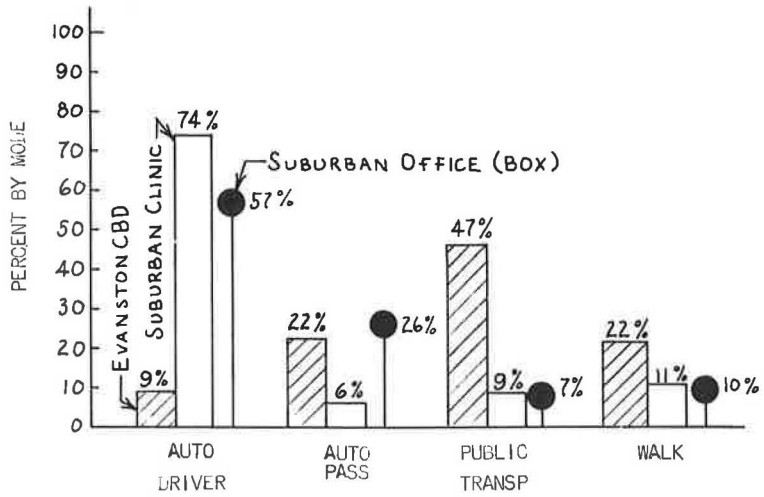

Figure 2. Mode of transportation used by employees in coming to two medical establishments.

TABLE 4

ESTIMATE OF MAXIMUM NUMBER OF VEHICLES REQUIRING PARKING AT PEAK HOUR ON TYPICAL ACTIVE WEEKDAY FOR PROPOSED MEDICAL OFFICE BUILDING (Evanston)

Parking Generators	No. Vehicles
Patients	88
Doctors' employees	32
Doctors	40
X-ray and clinical lab. (2)	
Employees	2
Patrons	8
Pharmacy	
Employees	4
Patrons	4
Optical Co.	
Employees	2
Patrons	2
Building employees	3
Detail men, sales, service, etc.	5
Total Parking Needed	190

cal dispensary. In addition, building maintenance and various sales and service personnel must also be accommodated. Table 4 specifies the number of parking spaces estimated for those purposes, based on observations of the existing operation of present medical facilities in the area.

Total Parking Requirements.—Based on the preceding information, summarized in Table 4, the total parking requirements for the new building are estimated to be 190 spaces, or approximately 3.2 spaces per doctor.

Traffic Impact

The vehicular traffic volume generated by the proposed doctors' building was estimated from studies of pedestrian volume at the entrance to the downtown office building as follows:

1. Studies were made of the total number of persons entering and leaving the downtown building (excluding the first floor in 15-min periods from 4:00 to 5:30 PM on each of three active weekdays. Separate tallies were made for children (less than 16 yr old) and for those older than 16 yr. An average for 2 days indicated 250 persons entering and 470 persons leaving the building.
2. Estimates then were made of the total numbers of persons entering and leaving the proposed new building from 4:15 to 5:15 PM. These estimates were taken as 36 percent of the numbers determined for the downtown office building, assuming that the new building will generate a demand in proportion to the total number of doctors and dentists housed in the two buildings.
3. An estimate of the total numbers of vehicles entering and leaving the new building in the evening peak hour was made by assigning a mode of travel for each of the 90 persons entering and the 170 persons leaving the building in the evening peak hour. The mode-of-travel percentages conformed to those previously used in the parking analysis.

TABLE 5

ESTIMATED TRAFFIC VOLUME TO AND FROM PROPOSED MEDICAL OFFICE BUILDING[a] (Evanston)

Direction of Travel and Mode	Peak Hour Traffic, PM[b]		
	Persons	Inbound Veh.	Outbound Veh.
Inbound			
Drivers	50	50	-
Passengers, vehicle parked	20	-	-
Passengers dropped off or via taxi	10	10	10
By transit	10	-	-
Total	90		
Outbound			
Drivers	80	-	80
Passengers, vehicle parked	30	-	-
Passengers picked up or via taxi	20	20	20
Walked	10	-	6
By transit	30	-	-
Total	170	80	116

[a] Based on counts of all persons entering and leaving from upper floors of 8-story downtown office building housing 126 doctors, 51 dentists and 28 other offices. Counts were made 4:00-5:30 pm for 3 weekdays in 1961. Peak-hour results for Inbound: 250 persons, including 55 persons below driving age. Outbound: 470 persons, including 130 children.

[b] Based on 60 active doctors and 4 less active doctors in new building of 30,000 sq ft. No. of persons taken as 36% of the number using 8-story building in the peak hour.

Results of the study (Table 5) indicate that 110 vehicles can be expected to exit from the proposed driveway onto Ridge Avenue in Evanston, with approximately half going north and half southbound. About 80 vehicles will enter the driveway in the same hour. Traffic volume on Ridge Avenue was estimated to increase by 95 vehicles in the evening peak hour and 510 vehicles in a 24-hr period.

These estimates are high because some of the people now traveling to the doctors' offices in downtown Evanston are using Ridge Avenue now. When these trips are diverted to the new building, they will not represent additional travel on Ridge Avenue.

The additional vehicular volume generated by the proposed doctors' building was estimated to add about 17 percent to the existing peak-hour flow of 568 vehicles per hr on Ridge Avenue. The total 24-hr traffic volume was estimated to increase 10 percent because of the new building.

Potential Effect on Evanston CBD

A natural concern of the City of Evanston and of others involved in the establishment of the new medical facility is the potential impact on the Evanston CBD of the relocation of a portion of its medical services to an outlying location. Of prime importance are the extent to which trips for shopping and other commercial purposes are linked to visits to doctors' offices, and the proportion of the linked trips no longer attracted to the Evanston CBD when medical visits are made elsewhere.

TABLE 6

SUMMARY OF ERRANDS LINKED TO TRIPS FOR MEDICAL VISITS[a]

Errands	No.	%
Other errands in CBD:		
No	142	50
Yes[b]	143	50
Total	285	100
Place for errand if medical trip not made:		
CBD	66	46
Elsewhere	56	39
Unspecified	21	15
Total	143	100

[a]From interviews of patients at 14 medical suites in downtown Evanston.
[b]Shop 108, 60%; bank 17, 9%; eat 37, 20%; other 21, 11%.

Table 6 summarizes the results of a survey conducted among patients visiting the 14 medical suites in downtown Evanston. Of the 285 respondents to this survey, 143, or 50 percent, indicated that they had made errands in downtown Evanston as part of their trip to the doctor. A total of 183 errands, or 1.28 errands per person, is included in this 50 percent. Viewed in another way, each medical trip resulted in approximately 0.65 other errands in the Evanston CBD. Most of these linked errands were devoted to shopping, with the next largest proportion for the purpose of eating a meal.

The offices vacated by the doctors who relocated would undoubtedly be occupied by other physicians, dentists or professionals, who would tend to mitigate the loss of patronage through the activities of their own clientele. There is no way of determining from this study the degree of patronage replacement which would take place. It should be noted, however, that the proposed new medical building would be constructed within Evanston, about 1½ mi from the CBD, in an area not served by many commercial establishments. Therefore, many of the patients at the new facility could be expected to continue to patronize downtown establishments as frequently as before.

MEDICAL CLINIC, SKOKIE

The second facility studied is a medical clinic located in Skokie, Ill., a suburb of Chicago. The clinic has been in operation for more than six years, is modern in appearance and typifies present and near-future suburban medical clinics. The area served by the clinic is distinctly suburban in nature and offers a basis of comparison with similar facilities located in both CBD and urban off-center areas. Since only one site in one specific area was studied, the data and results drawn from the study are necessarily limited. However, when this work is combined with that from other studies of a similar nature, design criteria of more general applicability may be developed.

Services offered by the clinic are given in Table 7. In addition, there are in the building a pharmacy, dental services, and an optical service not affiliated with the clinic but renting office space from the clinical association. These will be referred to hereafter as "auxiliary services." Every specialist listed in Table 7 is actively engaged in medical practice at the clinic during certain scheduled hours of the week.

There are also 35 persons employed at the clinic. In contrast to the minimal demand produced by the Evanston employees, these people generate a significant portion of the traffic and parking demand (Table 3). At present most employees driving to work must park their cars on a lot across the street from the clinic.

TABLE 7

AVERAGE HOURLY PATIENT LOADS CARRIED BY VARIOUS TYPES OF SPECIALISTS[a]

Type	No.	Total Patients Seen	No. of Hr Worked[b]	Range of Avg. Individual Hourly Loads (pph)	Avg. Hourly Load (pph)
Pediatrician	3	397	88	3.0-7.1	4.5
Ear, Nose and Throat Specialist	1	43	12	3.6	3.6
Orthopedic Surgeon	2	129	44	2.9-3.0	2.9
Dermatologist	1	22	8	2.8	2.8
Internist	5	329	144	1.6-3.4	2.3
Gynecologist	2	57	36	1.0-2.0	1.6
General Surgeon	3	35	32	0.7-2.8	1.1
Opthalmologist	1	21	28	0.8	0.8
Clinical Lab.	1	32	48	0.7	0.7[c]
Physical Therapist	1	30	48	0.6	0.6[c]
X-ray	1	18	48	0.4	0.4[c]

[a]Study conducted at suburban clinic, Skokie, Ill., in June 1963.
[b]Approximate.
[c]Patients coming directly from other offices within clinic are not included.

Since all patients wait in a common central waiting room, it was quite difficult to isolate them according to service desired. In this case, a questionnaire was considered to be both unwieldy and potentially bothersome to the patients, and, as a result, this method was rejected. The problem of determining patient loads and services desired was met by counting the billing slips used for each patient receiving clinical service. Through the tabulation of this information, average loads were computed on both a daily and hourly basis. These data were also grouped according to specialty or service received.

To attempt to correlate traffic and parking demand with patient loads, the billing slips were counted for those days on which traffic data were obtained. The billing slips do not include dental patients, optical patients, or pharmacy customers, yet these patrons account for a significant portion of the traffic activity. Data for these services were obtained on an individual basis through interviews with key personnel and examination of appointment books.

Parking requirements for doctors were determined by examination of their scheduled office hours. Travel modes and parking demand for employees were determined through printed questionnaires. The remaining pertinent information was gathered through informal interviews with clinic personnel.

Parking, Scheduling, and Medical Specialties

The traffic generated at a medical clinic is dependent on the types of medical services rendered and the related scheduling procedures. For example, an allergist, who may wish to see his patients only long enough to administer injections, will certainly generate a higher traffic flow than a surgeon, who may wish to give each patient a thorough examination.

A second consideration arises from the variation of rate of scheduling among individuals. For instance, a very active physician may see 50 patients per day and still practice good medicine, whereas another slower, more methodical man may see only 20 patients per day. For example, the opthalmologist at the Evanston facility generated a parking demand four to five times greater than that produced by his Skokie counterpart.

Adherence to these schedules is another controlling factor; since many specialists tend to fall behind schedule, a backlog of patients will accumulate in the waiting rooms. People who do not have scheduled appointments, or "walk-ins," also contribute to disruption of scheduling. Much of this walk-in traffic is caused by minor accidents requiring immediate medical treatment.

To meet patient parking demands, the preceding factors must be converted to numerical terms. From examination of billing slips and posted office hours, average hourly patient loads were calculated for each type of specialist currently practicing at the clinic. Table 7 summarizes these computations. The figures given in this table merit some explanation. Due to the very small sample sizes used, the accuracy of the figures is by no means certain. Further data are needed from other clinics in other

locations to either verify or revise these numbers. Many patients use more than one service while at the clinic. For instance, an internist may send a patient to the X-ray room after having examined him. Table 7 indicates that only 0.4 patient per hour (pph) comes to the clinic for the sole purpose of using the X-ray facilities. The actual patient load for this service is much higher, but most of the load comes from directly within the clinic and, therefore, has little bearing on parking demand. For the same reason, the clinical laboratory and physical therapy facilities are also considered to have low patient loads from a parking standpoint.

Proposed Parking Design Criteria as a Function of Medical Specialty

Inherent differences in parking demands due to type of specialty may make it expedient to classify each specialty according to average hourly load, from this devising a set of design criteria. Table 8 illustrates one possible grouping. Due to the limited data, the figures are highly arbitrary and subject to revision on completion of further research. Although no patient load data were available for dentists, they were assigned to Group I, which generates a relatively high parking demand. Eventually this table might be used for medical clinics in any area, providing that an appropriate factor is applied to account for change in patient travel modes. Placement of pediatricians in Group I is questionable, because although they have very high patient loads, much of this is "group traffic," and thus requires a fairly low parking demand per patient.

Some specialists (allergists, chiropodists) are not considered here; pertinent data should be gathered to cover these and other medical specialties and services.

Travel Modes to Medical Establishments

Several possible sources of error exist in the travel mode data for the Skokie clinic (Table 2). In data collection, a figure of 1.0 patients per group of people coming to the clinic was assumed. Examination of the billing slips revealed this to be a faulty assumption. Of 355 incoming groups of people, approximately 50, or 14 percent, of these contained two or more patients. In counting the billing slips, it was assumed that persons from the same family came to the clinic as a group. Most of this group traffic was generated by the pediatric services. To account for group traffic, the number of patients traveling to the clinic by automobile was adjusted upward. Adjustments were purposely made high, because persons from two different families may have come to the clinic as a group, and this would not be detected in the billing slips.

Examination of travel mode data for medical establishments in the three different areas suggests several apparent trends. As medical facilities become located farther from central urban areas and transit lines, the proportion of patients traveling to these facilities by automobile increases. This proportion ranged from 64 percent in downtown Evanston to 82 percent in the suburban area at Skokie. The estimated proportion for

TABLE 8

OBSERVED PARKING DESIGN RATES FOR PATIENTS AT SUBURBAN MEDICAL CLINICS (Skokie)

Group No.	Parking Demand	Range of Hourly Patient Loads[a] (pph)	Specialists in Group	No. of Parking Spaces per Specialist
I	High	≥3.5	Pediatricians; Dentists; Ear, Nose, and Throat	4.0
II	Avg.	2.5-3.5	Orthopedic Surgeons, Dermatologists	3.0
III	Low	1.5-2.5	Gynecologists, Internists	2.0
IV	Very low	<1.5	General Surgeons, Clinical Lab., Physical Therapy, X-ray	1.0

[a] Table 7.

TABLE 9

ESTIMATE OF MAXIMUM NUMBER OF VEHICLES REQUIRING PARKING AT PEAK HOUR ON MOST ACTIVE WEEKDAY (Skokie)

Parking Generators	No. Vehicles
Doctors[a]	14
Employees[b]	20
Patients	
Group I[c]	20
Group II	-
Group III[d]	14
Group IV[e]	5
Miscellaneous[f]	5
Total	78

[a]14 doctors scheduled.
[b]Derived from questionnaire.
[c]5 doctors in attendance.
[d]7 doctors in attendance.
[e]2 doctors plus 2 lab. and 1 physical therapist.
[f]Salesmen, visitors, servicemen, pharmacy customers.

TABLE 10

PEAK PARKING LOT OCCUPANCY[a]

Day	No. of Doctors in Attendance	No. of Vehicles	Time of Peak PM	Remarks
Monday	10	39	3:45-4:00	
Tuesday	12	52+[b]	3:30-3:45	Lot overloaded
Wednesday	6	47	4:30-4:45	Near capacity
Thursday	4	31	4:15-4:30	
Friday	13	49	3:34-4:00	Near capacity
Saturday	8	44	9:30-9:45[c]	Near capacity

[a]Study made at suburban clinic, Skokie, Ill., in June 1963.
[b]Lot capacity: 52 cars.
[c]Morning count taken.

the off-center area in Evanston was 75 percent. As would be anticipated, the proportion of transit riders dropped off sharply from 16 percent in the CBD to an estimated 2 percent in the suburban area. A corresponding value of 13 percent was used for the off-center area.

A similar analysis was made for employee travel modes. Results (Table 3) indicate that the distribution of employee travel modes tends to be similar to those of the patients, reinforcing the previous statements regarding travel modes and clinic location.

Parking Demand Analysis for Skokie Clinic

Until more data are gathered, it does not appear reasonable to apply a single general formula to determine adequate parking requirements for medical clinics in all locations and under every specific condition likely to be encountered. The analysis of parking demand is similar to that made for the Evanston facility. Differences arise partly from site conditions which include limited transit facilities and little on-street parking. The clinic patronage is stable. As before, the design criterion used is provision for the maximum number of vehicles requiring parking on the most active weekday of a typical week. On the basis of specialties and number of doctors scheduled, it is estimated that the peak parking demand occurs on Tuesday afternoon, when 14 specialists are scheduled.

It has been stated (1) that " ... doctors come first where parking privileges are concerned, not simply as a matter of convenience, but primarily because service to patients requires that parking space for doctors be quickly accessible." Although this statement was intended for use in design of hospital parking space, provision of service to patients at a medical clinic is also rather important. Reservation of parking space for doctors insures them a place to park and promotes better service to clinic patients.

Data summarized in Table 9 indicates that 78 parking spaces are required at the most active period. Actual parking lot occupancies for a full week are shown in Table 10. It was not possible from these observations to check adequately the preceding estimate, because the capacity of the lot was limited to 52 spaces. However, unless frequent overloading is accepted, it is clear that many zoning ordinances based on gross area would not provide for adequate parking at suburban clinics.

Comparison With Existing Standards

To provide sufficient parking space at medical clinics and office buildings, adequate design criteria must be developed. Table 11 gives the off-street parking requirements as specified in the zoning ordinances in 15 cities throughout the nation. Several other formulas using "net usable floor area" are available, but these figures are often a source of confusion and disagreement, and, therefore, were not considered. If the

specifications had been applied to the Skokie study site, only four would have yielded adequate design values. Apparently most of these formulas are based on centrally oriented clinics where parking requirements per patient are relatively low.

TABLE 11

OFF-STREET PARKING REQUIREMENTS FOR MEDICAL CLINICS AS SPECIFIED IN 15 ZONING ORDINANCES (2)

City Number	Formula Specified	Estimated Spaces Required at Skokie[a]
2	G/200	101[b]
3	3D	66[b]
4	2D + E/2	62[b]
5	G/250	82[b]
6	G/1,000 + D + E/5	50
7	50 + ((G-20,000/300))	51
8	G/400	51
9	G/400	51
10	G/400	51
11	G/400	51
12	G/800	26
13	Sq Ft Parking: G/4	17[c]
14	6 + ((G-3,000/1,000))	24
15	6 + ((G-3,000/1,000))	24
16	10 + ((G-10,000/1,000))	21

[a]Requirements based on G = gross sq footage of building, 20,300 sq ft; D = no. of doctors, 22; E = no. of employees, 35.
[b]Only adequate values.
[c]Assuming 300 sq ft per parking space.

LIMITATIONS AND COMPARISON WITH OTHER STUDIES

Available time and manpower limited the amount of data collected. Further data regarding traffic flow, travel modes, and patient loads are needed. More sites should be studied. Some medical specialties are not considered in this study and data on these are needed.

Besides the formulas given in Highway Research Board Bulletin 99 (2), some more recent work has been done in relating gross floor area to parking demand for office buildings. Box (3) found indicated design values ranging from one space per 220 sq ft to one space per 250 sq ft for large office buildings in the suburban Chicago area. He also states " ... it is probable, for example, that smaller office buildings, serving a variety of professional tenants such as doctors, dentists, lawyers, architects, and engineers, would have somewhat different parking demands." Although clinic doctors are not professional tenants but actual associates of the clinic, the above design values were applied to the Skokie study site with the following results:

$$(1 \text{ space}/220 \text{ sq ft}) \times 20,300 \text{ sq ft} = 93 \text{ spaces} \quad (1)$$

$$(1 \text{ space}/250 \text{ sq ft}) \times 20,300 \text{ sq ft} = 82 \text{ spaces} \quad (2)$$

Compared with the computed value of 78 spaces, these appear slightly high but certainly reasonable. Perhaps medical clinics do generate a slightly lower demand per square foot of floor area than office buildings. At any rate, this criterion yields more reasonable design values than the earlier formulas given in Table 11.

To better understand traffic flows, travel modes, and directional splits, it may be prudent to determine the area of attraction commanded by a medical clinic. For the particular site studied here, area of attraction could have been determined through examination of billing slips, which give the addresses of practically all patients.

CONCLUSIONS

Recognizing that this study was limited to only two locations, the following general conclusions are indicated:

1. Parking and traffic demands at medical clinics and offices vary not only with floor space and number of doctors but also with location in the community, services available for treatment and diagnosis, scheduling procedures, and other operational aspects of the facility.
2. Wide variations exist between medical specialties in the rate at which patients are treated, ranging from an average of more than 3.5 pph in the case of pediatricians, for example, down to fewer than 1.5 pph for general surgeons.
3. For suburban locations of the type studied, approximately four to five parking spaces should be provided for each doctor in attendance. The figures should be modi-

fied where necessary to reflect differences in location of the facility, compostion of the medical staff, and operational practices.

4. Many of the older formulas now still in use will not provide sufficient parking space if applied without modification to suburban clinics.

5. The effect on parking demand of location of the facility in the community is apparent in the greater use of the private auto for travel to the suburban clinic as compared to auto usage associated with the office building in the CBD. Approximately 82 percent of the patients using the suburban clinic required parking, in contrast to 67 percent for the downtown medical office building. Comparable figures for employees were 74 percent and 9 percent, respectively.

REFERENCES

1. "The Modern Hospital." 87:1 (July 1956).
2. "Parking Requirements in Zoning Ordinances." HRB Bull. 99 (1964).
3. Box, P., "Parking Generation Studies." HRB Abs., 32:17-23 (April 1962).