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Office Visits Involving X-rays, National Ambulatory Medical Care Survey: United States, 1977¹

Based on findings of the 1977 National Ambulatory Medical Care Survey, this report examines the use of X-rays by office-based physicians. An *X-ray* is defined as any single or multiple X-ray examination for diagnostic or screening purposes. Radiation therapy is *not* included. When the phrase *X-ray visit* appears in these pages, it applies to any office visit where an X-ray was either provided or ordered.

The National Ambulatory Medical Care Survey (NAMCS) is a continuing sample survey conducted annually by the Division of Health Resources Utilization Statistics of the National Center for Health Statistics. The survey—national in range except for Alaska and Hawaii—is designed to explore the provision and utilization of ambulatory care in the offices of non-Federal, office-based physicians. Since the statistics used in this report are based on a sample rather than on the entire universe of office-based physicians, they are estimates only and subject to sampling variability. Along with more information on the survey design and definitions of terms used in NAMCS, the Technical Notes at the end of the report provide guidelines for judging the precision of the estimates presented.

DATA HIGHLIGHTS

In 1977 an estimated 570,052,000 visits were made to office-based physicians within the NAMCS scope. An estimated 7.8 percent (44,662,000) of these were X-ray visits involving the provision or ordering of single or multi-

ple X-ray examinations for diagnostic or screening purposes.

Table 1 shows the 15 reasons—that is, symptoms, complaints, or nonsymptomatic problems—most commonly motivating patients to make X-ray visits; the reasons are ranked according to the frequency of X-ray visits associated with each. Note, however, that these were *principal* reasons only. Up to two other reasons could have been given by the patient, often creating symptom clusters, which, though they are not analyzed in this brief report, undoubtedly influenced the physician's choice of diagnostic mechanisms, including the use of X-rays. As a group these 15 principal reasons accounted for 43 percent of all X-ray visits. The importance of the X-ray as a routine screening mechanism is evident from the finding that the largest single block of X-ray visits (an estimated 2,815,000) was associated with patients' requests for general medical examinations—annual physical examinations, routine checkups, etc. As a diagnostic mechanism—clearly their chief role—X-rays were applied most frequently to symptoms or complaints of the musculoskeletal system. Nine of the 15 reasons listed in table 1 center on musculoskeletal problems.

Tables 2 and 3 focus attention on the involvement of X-rays in the physicians' diagnoses of the symptoms presented by patients. As with the principal reasons motivating patients to make X-ray visits, these tabulations are based on the *principal* diagnoses only—that is, the diagnoses most closely linked to the chief problems presented by patients. Up to two other concurrent conditions could have been listed, and it is possible that the use of X-rays was prompted in whole or in part by the presence of these other

¹This report was prepared by Hugo Koch and Raymond O. Gagnon, Division of Health Resources Utilization Statistics.

Table 1. Number and percent distribution of X-ray visits; number of all visits and percent involving X-rays, by the 15 leading principal reasons for visits given by patients (ranked according to the frequency of X-ray visits): United States, 1977

Rank	Patient's principal reason for visit and NAMCS code ¹	X-ray visits ²		All visits	
		Number in thousands	Percent distribution	Number in thousands	Percent involving X-rays
	Total.....	44,662	100.0	570,052	7.8
1	General medical examination.....X100.0	2,815	6.3	20,659	13.6
2	Back symptoms (excludes injuries).....S905.0	2,194	4.9	10,696	20.5
3	Chest pain and related symptoms (not referable to body system).....S050.0	1,801	4.0	8,388	21.5
4	Cough.....S440.0	1,562	3.5	13,937	11.2
5	Knee symptoms (excludes injuries).....S925.0	1,459	3.3	5,309	27.5
6	Abdominal pain, cramps, spasms.....S550.0	1,425	3.2	8,715	16.4
7	Foot and toe symptoms (excludes injuries).....S935.0	1,239	2.8	3,976	31.2
8	Low back symptoms (excludes injuries).....S910.0	1,020	2.3	4,594	22.2
9	Shoulder symptoms (excludes injuries).....S940.0	944	2.1	4,388	21.5
10	Neck symptoms (excludes injuries).....S900.0	830	1.9	4,915	16.9
11	Blood pressure test.....X320.0	822	1.8	14,990	5.5
12	Hip symptoms (excludes injuries).....S915.0	795	1.8	2,144	37.1
13	Headache.....S210.0	771	1.7	9,458	8.2
14	Leg symptoms (excludes injuries).....S920.0	752	1.7	5,161	14.6
15	Ankle symptoms (excludes injuries).....S930.0	707	1.6	1,873	37.7
	All other reasons.....residual	25,526	57.1	450,839	5.7

¹Based on a classification of patients' reasons for visits developed for use in NAMCS.

²An X-ray visit is any visit involving the use of a single or multiple X-ray examination for diagnostic or screening purposes.

conditions. Table 2 shows the 15 specific diagnoses most commonly assigned to X-ray visits ranked according to the frequency of X-ray visits associated with each diagnosis. The importance of the X-ray as a screening mechanism is again reinforced by the finding that the largest single block of X-ray visits (2,037,000) was associated with preventive examinations. In their chief role of diagnostic mechanism X-rays were, predictably, most often used in association with musculoskeletal disease or injury. Note, for example, that 3 of every 5 visits for fracture of the radius or ulna involved the use of X-rays. Table 3, by gathering all specific diagnoses into diagnostic groups, offers a broader perspective of the use of X-rays throughout the clinical spectrum. The diagnostic groups most commonly associated with X-ray procedures were accidents, poisonings, and violence; diseases of the musculoskeletal system; diseases of the digestive systems; and symptoms and ill-defined conditions.

X-rays are generally applied early in the diagnostic process. This is confirmed by the findings in table 4, which show that most X-ray visits (54

percent) occurred at the *new-condition visit*, that is, when the physician encountered a condition in a patient for the first time. This could be any condition presented by a new patient or any new condition presented by a patient already established as part of the doctor's practice. Evidence for an overall conservatism in the diagnostic use of X-rays lies in the finding that, in the course of 1 year, an average new-condition visit that involved the use of an X-ray or X-rays entailed fewer than 1 (0.9) return visits at which X-rays were used (a rough approximation, obtained by dividing the 20,493,000 return visits involving X-rays by the 24,169,000 new-condition visits involving X-rays).

X-rays were most likely to be applied with new patients referred by other physicians. As table 4 makes evident, the frequency with which X-rays were applied at referred visits—16.2 percent of the total 28,412,000 referred visits—was more than double the average frequency of X-ray use (in 7.8 percent of all visits).

Along the continuum of patient age, the in-

Table 2. Number and percent distribution of X-ray visits; number of all visits and percent involving X-rays, by the 15 leading principal diagnoses assigned by physicians (ranked according to frequency of X-ray visits): United States, 1977

Rank	Principal diagnosis and ICDA code ¹	X-ray visits ²		All visits	
		Number in thousands	Percent distribution	Number in thousands	Percent involving X-rays
	Total.....	44,662	100.0	570,052	7.8
1	Medical or special examination.....Y00	2,037	4.6	41,716	4.9
2	Essential benign hypertension..... 401	1,665	3.7	24,837	6.7
3	Osteoarthritis and allied conditions..... 713	1,431	3.2	5,866	24.4
4	Medical and surgical aftercare.....Y10	1,352	3.0	19,524	6.9
5	Synovitis, bursitis, and tenosynovitis731	1,078	2.4	5,331	20.2
6	Sprains and strains of ankle and foot.....845	1,064	2.4	2,136	49.8
7	Chronic ischemic heart disease.....412	911	2.0	11,943	7.6
8	Sprains and strains of other and unspecified parts of back.....847	862	1.9	4,981	17.3
9	Bronchitis.....490	842	1.9	6,597	12.8
10	Fracture of radius and ulna.....813	726	1.6	1,200	60.5
11	Sprains and strains of sacroiliac region.....846	661	1.5	2,478	26.7
12	Other ill-defined and unknown causes of morbidity and mortality.....796	576	1.3	2,797	20.6
13	Fracture of one or more phalanges of hand.....816	565	1.3	1,056	53.5
14	Other nonarticular rheumatism.....717	557	1.3	4,027	13.8
15	Acute upper respiratory infection.....465	527	1.2	17,925	2.9
	All other principal diagnoses..... residual	29,808	66.7	417,638	7.1

¹Based on *Eighth Revision International Classification of Diseases, Adapted for Use in the United States* (ICDA).

²An X-ray visit is any visit involving the use of a single or multiple X-ray examination for diagnostic or screening purposes.

tensity of X-ray usage showed three conspicuous peaks (table 5). The first is noticeable in the injury-prone period of the teens; X-ray visits composed as much as 8.5 percent of all visits made by patients in this age interval. The second peak—the highest of the three—appears in the 5-year span 55-59 years; here X-ray procedures were applied at 11.1 percent of all visits. A third peak is evident in the interval from 70-74 years. The latter two peaks reflect the onset and X-ray diagnosis of the chronic, musculoskeletal diseases common to advancing years, the second peak being linked in large part to the X-ray diagnosis of rheumatoid arthritis and the third to that of osteoarthritis.

As a group, males were X-rayed at an estimated 9.6 percent of their visits, a proportion half again as high as the proportion of 6.7 percent found among females (table 5). Table 6 and figure 1 reveal that this difference was especially prominent in the age interval 20-50 years;

during this period the frequency with which men were X-rayed (at 11.9 percent of visits) was about twice the frequency found for women (5.8 percent of visits).

In the sheer volume of X-ray procedures that they provided or ordered, the primary-care specialties of general, family, and internal medicine accounted for the majority (56 percent) of all the X-ray visits made to office-based practitioners (table 7). However, in the relative frequency with which they employed X-rays, the most visited specialties are in a different order, more closely related to clinical focus than to primary-care function. From this point of view orthopedic surgeons were by far the most active users of X-ray procedures; they were followed at a respectable distance by internists, cardiovascular specialists, urologists, and general surgeons, each of which exceeded the average tendency to use X-rays (at 7.8 percent of visits).

Table 3. Number of visits to office-based physicians, percent involving X-rays, and number and percent distribution of X-ray visits by diagnostic groups: United States, 1977

Diagnostic group and ICDA codes ¹	All visits		X-ray visits ²	
	Number in thousands	Percent involving X-rays	Number in thousands	Percent distribution
All principal diagnoses.....	570,052	7.8	44,662	100.0
Infective and parasitic diseases.....000-136	22,668	2.8	643	1.4
Neoplasms.....140-239	14,286	6.8	970	2.2
Endocrine, nutritional, and metabolic diseases.....240-279	24,287	4.4	1,065	2.4
Mental disorders.....290-315	24,522	2.4	579	1.3
Diseases of the nervous system and sense organs.....320-389	48,291	2.7	1,295	2.9
Diseases of the circulatory system.....390-458	54,702	7.8	4,275	9.6
Diseases of the respiratory system.....460-519	82,466	5.9	4,879	10.9
Diseases of the digestive system.....520-577	18,451	14.5	2,681	6.0
Diseases of the genitourinary system.....580-629	36,473	5.1	1,864	4.2
Diseases of the musculoskeletal system.....710-738	32,983	20.1	6,633	14.9
Arthritis and rheumatism.....710-718	17,665	16.9	2,982	6.7
Symptoms and ill-defined conditions.....780-796	25,695	13.2	3,393	7.6
Accidents, poisonings, and violence.....800-990	43,761	25.8	11,281	25.3
Fractures.....800-829	8,309	54.1	4,493	10.1
Dislocations and sprains.....830-848	14,044	29.2	4,105	9.2
Special conditions and examinations without sickness.....Y00-Y13	96,009	3.9	3,771	8.4
Other diagnoses and diagnosis "none" or unknown.....residual	45,458	2.9	1,334	3.0

¹Based on *Eighth Revision International Classification of Diseases, Adapted for Use in the United States*, (ICDA).²An X-ray visit is any visit involving the use of a single or multiple X-ray examination for diagnostic or screening purposes.

Table 4. Number of visits to office-based physicians, percent involving X-rays, and number and percent distribution of X-ray visits by patient-condition status and referral status: United States, 1977

Patient-condition status and referral status	All visits		X-ray visits ¹	
	Number in thousands	Percent involving X-rays	Number in thousands	Percent distribution
Total.....	570,052	7.8	44,662	100.0
<u>Condition status</u>				
New patient.....	87,230	13.2	11,551	25.9
Old patient.....	482,822	6.9	33,111	74.2
New condition.....	142,037	8.8	12,618	28.3
Old condition.....	340,785	6.0	20,493	45.9
New-condition visit ²	229,267	10.5	24,169	54.1
Return visit.....	340,785	6.0	20,493	45.9
<u>Whether referred by another physician</u>				
Yes.....	28,412	16.2	4,600	10.3
No.....	541,640	7.4	40,062	89.7

¹An X-ray visit is any visit involving the use of a single or multiple X-ray examination for diagnostic or screening purposes.²Any visit by a new patient, or any visit by an old patient involving a new condition.

Table 5. Number of visits to office-based physicians, percent involving X-rays, and number and percent distribution of X-ray visits by age and sex of patients: United States, 1977

Age and sex	All visits		X-ray visits ¹	
	Number in thousands	Percent involving X-rays	Number in thousands	Percent distribution
Total.....	570,052	7.8	44,662	100.0
<u>Age</u>				
Under 6 years.....	54,913	2.4	1,337	3.0
6-10 years.....	27,266	5.1	1,393	3.1
11-14 years.....	21,578	8.5	1,835	4.1
15-19 years.....	39,507	7.8	3,070	6.9
20-24 years.....	46,254	5.6	2,568	5.7
25-29 years.....	46,808	7.0	3,263	7.3
30-34 years.....	40,185	8.1	3,257	7.3
35-39 years.....	30,653	8.8	2,690	6.0
40-44 years.....	28,683	9.2	2,635	5.9
45-49 years.....	33,280	9.8	3,251	7.3
50-54 years.....	36,744	9.4	3,443	7.7
55-59 years.....	37,910	11.1	4,213	9.4
60-64 years.....	34,229	9.2	3,148	7.0
65-69 years.....	32,136	10.0	3,209	7.2
70-74 years.....	25,515	10.5	2,670	6.0
75-79 years.....	18,385	8.7	1,601	3.6
80 years and over.....	16,007	6.7	1,078	2.4
<u>Sex</u>				
Female.....	345,187	6.7	22,975	51.4
Male.....	224,865	9.6	21,687	48.6

¹An X-ray visit is any visit involving the use of a single or multiple X-ray examination for diagnostic or screening purposes.

Table 6. Number of visits to office-based physicians, percent involving X-rays, and number and percent distribution of X-ray visits by sex and age of patients: United States, 1977

Sex and age	All visits		X-ray visits ¹	
	Number in thousands	Percent involving X-rays	Number in thousands	Percent distribution
Total.....	570,052	7.8	44,662	100.0
<u>Female</u>				
Under 11 years.....	39,599	3.1	1,221	2.7
11-19 years.....	34,350	6.4	2,187	4.9
20-29 years.....	65,436	4.0	2,599	5.8
30-39 years.....	46,369	6.9	3,177	7.1
40-49 years.....	38,530	7.5	2,898	6.5
50-59 years.....	44,312	9.4	4,150	9.3
60-69 years.....	38,515	8.8	3,398	7.6
70-79 years.....	27,787	9.6	2,674	6.0
70-74 years.....	15,945	9.7	1,552	3.5
75-79 years.....	11,842	9.4	1,122	2.5
80 years and over.....	10,289	6.5	672	1.5
<u>Male</u>				
Under 11 years.....	42,579	3.5	1,511	3.4
11-19 years.....	26,735	10.2	2,718	6.1
20-29 years.....	27,626	11.7	3,232	7.2
30-39 years.....	24,470	11.3	2,770	6.2
40-49 years.....	23,434	12.8	2,988	6.7
50-59 years.....	30,341	11.6	3,506	7.9
60-69 years.....	27,851	10.6	2,959	6.6
70-79 years.....	16,112	9.9	1,596	3.6
70-74 years.....	9,570	11.7	1,117	2.5
75-79 years.....	6,542	7.3	*479	*1.1
80 years and over.....	5,718	*7.1	*406	*0.9

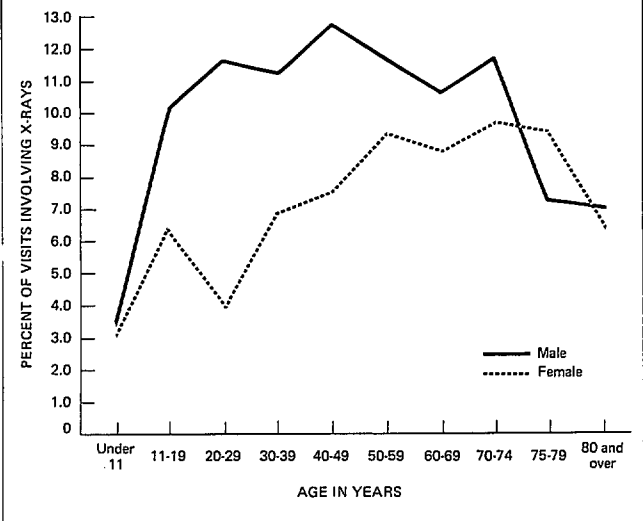
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Table 7. Number of visits to office-based physicians, percent involving X-rays, and number and percent distribution of X-ray visits by physician/specialties: United States, 1977

Physician specialty	All visits		X-ray visits ¹	
	Number in thousands	Percent involving X-rays	Number in thousands	Percent distribution
Total.....	570,052	7.8	44,662	100.0
General and family practice.....	222,919	6.9	15,331	34.3
Internal medicine.....	64,959	14.6	9,486	21.2
Orthopedic surgery.....	20,201	43.2	8,733	19.6
General surgery.....	36,124	9.5	3,443	7.7
Pediatrics.....	54,762	2.5	1,390	3.1
Urology.....	11,205	10.3	1,154	2.6
Obstetrics and gynecology.....	49,273	1.8	882	2.0
Cardiovascular disease..	6,218	12.8	793	1.8
Otolaryngology.....	15,716	4.1	640	1.4
All other specialties.....	88,675	3.2	2,810	6.3

¹An X-ray visit is any visit involving the use of a single or multiple X-ray examination for diagnostic or screening purposes.

Figure 1. PERCENT OF ALL OFFICE VISITS INVOLVING X-RAYS, BY SEX AND AGE OF PATIENTS: UNITED STATES, 1977



TECHNICAL NOTES

SOURCE OF DATA

The information presented in this report is based on data collected by the National Ambulatory Medical Care Survey (NAMCS) from January-December 1977. The target universe of NAMCS is composed of office visits made within the coterminous United States to non-Federal physicians who are principally engaged in office practice and are not in the specialties of anesthesiology, pathology, or radiology. The National Opinion Research Center, under contract to the National Center for Health Statistics, was responsible for the survey's field operation.

SAMPLE DESIGN

NAMCS utilizes a multistage probability design that involves samples of primary sampling units (PSU's), physician practices within PSU's, and patient visits within practices. Each year a

sample of practicing physicians is selected from master files maintained by the American Medical Association and American Osteopathic Association. For 1977 a total of 3,000 physicians were included in the sample. Of those found eligible for the survey, 77.5 percent participated. Characteristics of the physician's practice—for example, primary specialty and type and location of practice—were obtained or confirmed during an induction interview. Participating physicians were requested to complete encounter forms (Patient Records) for a systematic random sample of their office visits during a randomly assigned weekly reporting period. During 1977, 51,044 Patient Records were completed. The Record contained an item to be checked whenever the use of X-rays was included in the diagnostic procedures ordered or provided at the visit. A total of 4,141 Records indicated the use of single or multiple X-ray procedures.

SAMPLING ERRORS

The standard error is primarily a measure of the sampling variability that occurs by chance because only a sample, rather than the entire universe, is surveyed. The relative standard error of an estimate is obtained by dividing the standard error of the estimate by the estimate itself and is expressed as a percentage of the estimate. Relative standard errors of selected aggregate statistics are shown in table I. The standard errors appropriate for estimated percentages of visits are shown in table II.

Table I. Approximate relative standard errors of estimated numbers of office visits, NAMCS 1977

Estimated number of visits in thousands	Relative standard error in percent
500.....	29.0
600.....	26.5
1,000.....	20.7
2,000.....	14.9
5,000.....	9.9
10,000.....	7.6
20,000.....	6.1
50,000.....	4.9
100,000.....	4.5
500,000.....	4.1

Example of use of table: An aggregate estimate of 75,000,000 visits has a relative standard error of 4.7 percent or a standard error of 3,525,000 visits (4.7 percent of 75,000,000).

Table II. Approximate standard errors of percentages of estimated numbers of office visits, NAMCS 1977

Base of percentage (estimated number of visits in thousands)	Estimated percentage					
	1 or 99	5 or 95	10 or 90	20 or 80	30 or 70	50
	Standard error in percentage points					
500.....	2.9	6.3	8.6	11.5	13.2	14.4
600.....	2.6	5.7	7.9	10.5	12.0	13.1
1,000.....	2.0	4.4	6.1	8.1	9.3	10.2
2,000.....	1.4	3.1	4.3	5.7	6.6	7.2
5,000.....	0.9	2.0	2.7	3.6	4.2	4.5
10,000.....	0.6	1.4	1.9	2.6	2.9	3.2
20,000.....	0.5	1.0	1.4	1.8	2.1	2.3
50,000.....	0.3	0.6	0.9	1.1	1.3	1.4
100,000.....	0.2	0.4	0.6	0.8	0.9	1.0
500,000.....	0.1	0.2	0.3	0.4	0.4	0.5

Example of use of table: An estimate of 30 percent based on an aggregate of 15,000,000 visits has a standard error of 2.5 percent. The relative standard error of 30 percent is 8.3 percent (2.5 percent ÷ 30 percent).

ROUNDING OF NUMBERS

Estimates of office visits have been rounded to the nearest thousand. For this reason detailed figures within tables do not always add to totals. Percents were calculated on the basis of original, unrounded figures and will not necessarily agree precisely with percents which might be calculated from rounded data.

DEFINITIONS

Ambulatory patient.—An ambulatory patient is an individual presenting himself for personal health services who is neither bedridden nor currently admitted to any health care institution on the premises.

Office.—An office is a place that the physician identifies as a location for his ambulatory practice. Responsibility over time for patient care and professional services rendered there generally resides with the individual physician rather than an institution.

Physician.—A physician is a duly licensed doctor of medicine (M.D.) or doctor of osteopathy (D.O.).

Visit.—A visit is a direct personal exchange between an ambulatory patient and a physician or a staff member working under the physician's supervision for the purpose of seeking care and rendering health services.

X-ray.—An X-ray is any single or multiple X-ray examination for diagnostic or screening purposes. Radiation therapy is *not* included.

X-ray visit.—An X-ray visit is any office visit where an X-ray is either provided or ordered.

SYMBOLS

Data not available.....	---
Category not applicable.....	...
Quantity zero.....	-
Quantity more than 0 but less than 0.05.....	0.0
Figure does not meet standards of reliability or precision.....	*

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