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CASE STUDY ON COSTS AND EFFICIENCY OF URGENT CARE CENTER DESERT VALLEY MEDICAL GROUP, VICTORVILLE

A Project

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Business Administration

---

by

Hari Mallam Reddy

December 2001

CASE STUDY ON COSTS AND EFFICIENCY OF URGENT CARE CENTER DESERT VALLEY MEDICAL GROUP, VICTORVILLE

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by

Hari Mallam Reddy

December 2001

Approved by:

[redacted]

Nabil Razzouk, Ph.D., Chair, Marketing

11-20-01

Date

[redacted]

Mohamad Vaziri, Ph.D., Accounting & Finance

[redacted]

Victoria Seitz, Ph.D., Marketing

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ABSTRACT

Desert Valley Medical Group is a multi-specialty medical group located in Victorville, California. It employs approximately 85 providers including various specialists and sub-specialists. It also employs about 1200 medical, paramedical and clerical staff to support its operations. Its customers come from about 10 cities, including Victorville, Hesperia, and Apple Valley. It is supported by an 85-bedded hospital-Desert Valley Hospital, located in the same building. It has an Emergency Room, which operates 24 hours a day, 365 days a year. It also has an intensive care unit.

The group was taken over by new management on January 01, 2001. Prior to this, urgent care was operating 12 hours a day, 9AM to 9PM, every day. The new owners drafted an aggressive plan. In order to gain more market share, and to attract new customers, they expanded the hours of operation of urgent care from 7AM to 10PM. To meet these demands, and to decrease the average waiting time for patients, they recruited 1 Registered Nurse, 3 Licensed Vocational Nurses, 6 Medical Assistants, and 4 Patient Service Representatives and implemented the new hours effective March 01, 2001.

After 3 months into operation, the expected increase in patient census did not occur, but the organization continued to incur additional expenditure to meet the operating expenses which includes salaries for the newly recruited staff.

The management sought reasons for failure to achieve the desired business goals. They also had to make decisions whether to continue the present system for some more time, or to revert to the old operating hours and staffing. This project was undertaken to address those issues.

I gathered demographics, trends of population growth, and economic development from the three main cities that utilize the services of the group. I also analyzed the local competitors for the group. I collected data for the months of January through July for the years 2000 and 2001 from the log-in sheets of urgent care, and the patients' medical records. I also collected the information about salaries paid to the staff in the urgent care.

The data was analyzed using Statistical Analysis for Social Sciences (SPSS).

It was recommended that LVNs should be transitioned to other areas in the hospital, as their addition did not contribute to the value of services in urgent care. It was

also recommended to dispense the services of RN. The management should also think of reducing the strength of medical assistants. The services of nurse practitioners and physician assistants should be utilized to the maximum as far as possible to reduce the costs of providers. The management should continue with the present hours of operation in order to meet the increased needs of patients of newly acquired local independent practitioners. It was also recommended that the group should launch a more aggressive and an on-going marketing plan.

It was also felt that the management should undertake a detailed and comprehensive prospective study of various issues to arrive at a good business decision.

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I deeply appreciate the help, guidance and cooperation I received from the following in preparation of this project:

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Department of Marketing
College of Business and Public Administration
California State University, San Bernardino, California

Prof. Mo Vaziri, Chair
Department of Finance and Accounting
College of Business and Public Administration
California State University, San Bernardino, California

Dr. Anthony Frankson, MBBS, MPH
Executive Director
S.E.A.R.C.H Consulting Service
San Bernardino, California

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CHAPTER ONE

BACKGROUND

Introduction

This chapter identifies the purpose of this project, the background of the problem, the anatomy and functioning of the Desert Valley Medical Center, Victorville, the reasons for undertaking this project, the design of the project, the methods employed, and the scope and limitations of the project.

Purpose

The purpose of this research project is to report on a comprehensive organizational audit of the Urgent Care Service of Desert Valley Medical Group in Victorville, California. I studied the present organizational structure and processes, identified areas that may require corrective action, and suggest solutions and methods that might improve the profitability and viability of the organization.

Desert Valley Medical Group

Desert Valley Medical Group (DVMG) is a multi-specialty medical group located in Victorville. It has satellite locations in Victorville, Apple Valley,

Hesperia, Adelanto, Barstow, Lucerne Valley and Silver Lakes.

DVMG employs approximately 85 full time providers including physicians, physician assistants, chiropractors, podiatrists and nurse practitioners. About one half of these providers are primary care providers (general practitioners, family practice physicians, pediatricians and internists). Specialist services include cardiologists, pulmonologists, neurologists, nephrologists, rheumatologists, gastroenterologists, obstetricians, gynecologists, general surgeons, vascular surgeons, urologists, oncologists, hematologists, orthopedic surgeons, anesthesiologists, radiologists, pathologists etc. Support personnel include registered nurses (RN), medical assistants (MA), licensed vocational nurses (LVN), nurse aides (NA), nurse managers, laboratory technicians, X-ray technicians, dietitians, clinical educators, etc. Clerical staff includes patient service representatives (PSR), data entry clerks, billing and coding clerks, referral clerks etc.

Desert Valley Hospital (DVH) is an 85-bedded acute care hospital located in the northern end of DVMG's main building. This headquarters of DVMG is located in Victorville. DVH's emergency room (ER) is located in the

ground floor of the hospital at the other end of the main building, and it functions 24 hours a day 7 days a week.

Urgent care (UC) is located in the southern end of the main building facing the main road in the area. ER and urgent care are connected to each other through the main hallway of the building. If acutely ill or if they are felt to be possible candidates for admission, some patients who are triaged in urgent care are immediately transferred to ER.

New management took over the ownership of the group and the hospital on January 01, 2001. Prior to this date, the urgent care service used to function from 9 AM to 9 PM 7 days a week. With an aim to provide extended services to the present patients and to attract more new patients and increase market share, the new management extended the urgent care hours. The new hours that became effective on March 01, 2001 are 7 AM to 10 PM 7 days a week. In order to meet increased staffing needs, they recruited more staff: two physician assistants, three licensed vocational nurses, four medical assistants, one registered nurse, and four patient service representatives (front office staff).

Medical assistants room the patients, take vital signs like temperature, BP, pulse, respiratory rate, take a brief history, note medication allergies, current

medications, and prepare the patient for examination by doctor. They draw blood for lab tests, wheel patients for X-rays, give intramuscular, intradermal and subcutaneous injections, administer oral medications, change dressings, pull lab reports for doctor's review, apply splints, give discharge instructions to patients, call for medication refills, call patients home with abnormal lab tests etc. LVNs supervise medical assistants. They are also trained to administer IV medications and IV fluids. They recruited three more LVNs with expectation of serving more acute cases in the urgent care, thereby cutting down the number of cases sent down to ER. They did not have LVNs working in the urgent care before.

The management reviewed the results of performance of the urgent care for the months of March and April 2001. The average number of patients seen per day has gone up only marginally, disappointing the managers. Even this nominal increase was because of extended hours, and not a true increase in number of patients seen per hour. Also, only 1 or 2 patients per week utilized the services of a LVN. LVNs get paid $12.00 per hour, whereas medical assistants earn $8.00 per hour on an average.

Statement of the Problem

While working as a physician and having informal interviews with other providers and staff at the Urgent Care of Desert Valley Medical Group, Victorville, I proposed that the following six problems needed to be studied and corrected:

1. Workflow bottlenecks due to inefficient functioning of the staff possibly resulting in prolonged average waiting time from the time of triage to the time of first evaluation by a physician and/or delays in processing lab specimens and getting x-rays done.
   Supporting comment: This is probably resulting in (i) a significant number of patients leaving the waiting room without being seen (LWBS), and (ii) more dissatisfied and unhappy customers.
2. Inefficient functioning of Urgent Care staff and providers resulting in increased number of patients who leave without being seen
3. Providers ordering unnecessary and non-urgent work-up resulting in possible prolonged processing time.
   Supporting comment: This might be generating

more complaints from frustrated patients who waited too long in the examination rooms.

4. Inadequate and non-representative survey and feedback of information regarding patient satisfaction.

   Supporting comment: Presently only patients' complaints, but not their complements, etc., are forwarded to providers for their explanation. Information bias is evident here.

5. Inadequate evaluation of the policy of employing Licensed Vocational Nurses (LVNs) with the goal of minimizing the number of patients sent to Emergency Room.

6. Possible need to decrease the number of providers, newly recruited Registered Nurse (RN), LVNs, Medical Assistants (MAs), and Patient Service Representatives (PSRs).

Design of the Project

For this project, I used an organizational audit designed as a cross-sectional exploration of existing data and information pertaining to the Urgent Care of Desert Valley Medical Group for the first six months of the years 2000 and 2001.

Methods Used

For completing this organizational audit, I used both primary and secondary informational sources.

Primary sources of statistical information were from available urgent care data, and data from the departments of operations, accounting, administration and information services (IS) of Desert Valley Medical Group. Written permission was obtained from the medical group's board of directors prior to beginning of the study (see appendix A).

Secondary sources of information were from journals like Journal of Marketing, Journal of Health Care Marketing, Journal of Consumer Research, Annals of Emergency Medicine, Health Care Financing and Administration (HCFA), Agency for Health Care Research, American Group Management Association. Demographic statistics (including growth trends, population mix) was gathered from the chambers of commerce for Victorville, Apple Valley and Hesperia.

Some of the areas of study included organizational culture, goals, mission statement, procedures, policies, processes, budget allocation, staffing structure, line of control, chain of authority, outcome analysis, cost analysis, comparative analysis (regional and national),

marketing strategies, operational efficiency, job description, sequence of work, employee satisfaction, staff turn over etc.

Scope and Limitations

The scope of this study is limited to the data available to me through the urgent care center, the departments of operations, accounting, administration, and the information services of the Desert Valley Medical Group.

Summary

In this chapter, I examined the structure of DVMG, current operations of urgent care center, identified the problem for which this project was commissioned, stated the design and methods to be used, and the scope and limitations of the project. In chapter 2, literature, dealing with studies on staffing and functioning of Emergency Department/ Urgent Care will be reviewed, demographics of local cities will be examined, trends in the health care industry globally, nationally and locally will be studied.

CHAPTER TWO

REVIEW OF THE LITERATURE

Introduction

This chapter examines the history of emergency medicine and studies that were already done regarding the staffing and functioning of urgent care centers. It also outlines population trends and economy of Apple Valley, Hesperia, and Victorville-the three main cities that utilize the services of DVMG.

Literature Review

In most hospitals/medical centers the urgent care/fast-track service is an extension of the emergency room (ER) while the urgent care stands as a separate center in only a few medical centers. Moorhead and others (1998) have evaluated the workforce in emergency medicine. Also, emergency room (ER) patients length of stay (LOS) and reasons for leaving without being seen (LWBS) have been issues that are well studied (Kyriacou, & et al., 1999).

Reasons for prolonged length of stay (LOS) in the ER include:

- delay in registration,
- problems with insurance authorizations,

- difficulties in reaching primary care providers to obtain prior authorization,
- slow patient processing by inexperienced staff,
- inefficiencies in how physicians and nurses spend their time in the ER dept (Hollingsworth & et al., 1998),
- patients impatience with waiting for results of some ancillary studies (some of which may be unnecessary),
- understaffing in times of higher census.

Patients leave without being seen because of the above listed reasons for prolonged length of stay. Sun and others (2000) also pointed out that dissatisfied patients also do so because of failure of the ER staff in communicating sufficiently/adequately with them as they progress through their pathways of care from provider to diagnostic testing and e.g. receiving of medications at the pharmacy.

Having done an extensive search of the literature, I found no similar studies dealing with this phenomenon in the urgent care service. However, since those patients using ER frequently are usually sicker and also use urgent care services, etc., more frequently (Hansagi & et al., 2001) practitioners tend to also apply these principles

from the ER study findings to the management of urgent care service. Studies are, however, needed to specifically address the reasons why some patients leave the urgent care without being seen.

History of Urgent Care and Emergency Medicine

The history of urgent care is closely intertwined with that of emergency medicine. In 1995, Thompson Bowles and others (1995) reported the following: "During the past 30 years, emergency care of seriously ill and injured patients has become an essential component of US health care system...Within the current health care system, EDs are the only institutional providers mandated by federal law to treat anyone who presents for care.

Providing these services has produced severe overcrowding and serious financial losses for EDs, and although EDs are widely available, they vary considerably in quality and accessibility from region to region and, in many cases, from neighborhood to neighborhood.

In recent decades, as emergency care has become more sophisticated and complex, the new medical specialty of emergency medicine has emerged. It has established standards of competence for physicians who specialize in treating acutely ill and injured patients and has

developed and enforced standards for programs that educate emergency medicine specialists. In 1979, emergency medicine was officially recognized as the 23rd, and now second youngest, medical specialty. Currently, there are 16,000 members of the American College of Emergency Physicians, and 10,500 physicians are certified by the American Board of Emergency Medicine as emergency medicine specialists. In addition, approximately 2,200 physicians are being educated in the 101 accredited emergency medicine residency programs, and each year, these programs graduate about 800 physicians who are eligible to be certified as specialists."

Smith and Abbott (as cited in Nancy, & et al., 1998), in 1995 (The Future of Emergency Medicine: Reimbursement realties and the future of Emergency Medicine pp. 31-35) reported on emerging cost effective and complementary alternatives to emergency services. These include emergency doctors (ED) playing a supervisory role in observational units, home care and long term care, industrial medicine, and ambulatory care or urgent care.

They report that "many hospitals are seeking alternatives to the standard ED approach to providing unscheduled physician services for patients with low-acuity illness or injury. Ambulatory care, or urgent

care centers have been envisioned as a method to provide lower cost services that would appeal to managed care organizations. Emergency physicians have provided clinical staffing and management of these types of facilities.

Emergency physician compensation is based on the requirement to have the skills to evaluate and manage serious illness and injury. By definition, the ambulatory care center does not require a physician with this level of skill. Consequently, the required skill level of the physician or other category of provider is consistent with a primary care office. Physicians with this level of training generally earn 40% less than emergency physicians working in EDs.

Midlevel providers can be hired for salaries below those required for emergency or primary care physicians. Emergency physicians have provided clinical supervision as required by midlevel providers. This combination of emergency physicians and midlevel providers is a potentially successful approach to providing unscheduled care at reasonably competitive prices.

When operated as part of a hospital's health service program, urgent care services may be billed on hospital billing forms. Depending on the organizational structure

of the physician group, the hospital may be able to bill separately for overhead and professional services.

Emergency physicians may have an excellent opportunity to participate in the development of urgent care centers even if they do not directly provide clinical services. These opportunities are related to the design, operation and funding of the center. Administrative skills, clinical reputation with the medical staff, and financial capital are assets that emergency physicians can offer to a hospital considering establishing an urgent care center. During the next five years there may be opportunities for physicians to expand their role in this sector of the medical services market."

Statistics from Local City Chambers of Commerce

Desert Valley Medical Group located in Victorville serves population of three main cities- Victorville, Apple Valley and Hesperia. Other small cities which utilize the services of DVMG include Adelanto, Barstow, Big Bear, Crest Line, Helendale, Lucerne Valley, Oak Hills, Pinon Hills, Silver Lakes and Wrightwood. The demographics, population trends and projected economic growth of the three main cities are outlined below.

Apple Valley

Population Trends and Projections:

The Town's population is expected to increase by 63 percent by the year 2000.

Incorporated in 1988, the Town of Apple Valley has always been known as the premier residential community of the San Bernardino County High Desert Corridor (from the San Bernardino Mountain's Cajon Pass on the south to the City of Barstow on the north). Apple Valley has the largest and best supply of executive housing in the region. But what is different about today's Apple Valley is the recent, major emphasis on commercial and industrial development that allows for balancing the Town's local economy.

As part of its efforts to attract commercial and industrial enterprises, and create new jobs, the Town has created two redevelopment project areas totaling 16,000 acres, revised its development code and general plan, and identified the unmet market needs in both its immediate and extended trade areas. The Town also has made the financing and installation of public infrastructure its number one economic development priority.

Table 1.

Selected Demographic Data

Total Land Area	78 sq. mi.
Town Population (1994)	56,734
High Desert Corridor Regional Population	300,000*
Victor Valley Region Commuters	50,000*
Total Housing Units (1997)	18,857
Occupied Housing Units(1997)	17,631
Average Persons Per Household (1997)	2.986
Elevation	3,000 feet
Prevailing Winds	S/SW at 5 to 10 knots per hour
Median Household Income (1994)	$39,700
Average Household Income (1994)	$49,411
Per Capita Income (1994)	$16,167
Median Age(1990)	31
Median Home Price (1990)	$120,000
Median Monthly Rent (1990)	$534
Owner-Occupied Units (1990)	70%
Population with One or More Years of College (1994)	36.1%
Population with Four or More Years of College (1994)	15.2%

Sources: 1990-U.S. Census. 1994-Commercial Development Plan (Alfred Gobar Associates). 1997-California Department of Finance
*High Desert Regional Economic Development Authority

Hesperia

Population

- Total: 60,300
- Average Age: 33.7
- Percentage of Population by Age:
  - 15-24 yrs 14.9%

- 25-34 yrs 14.1%
- 35-54 yrs 21.1%
- 55+ yrs 25.6%

Ethnic Breakdown

- White 43,323
- Hispanic 9,543
- Black 1,505
- Amer. Ind. 583
- Asian 694
- Other 4,697

Household

- Number of Households 24,203
- Average Size 3.7
- Average Income 42,300

Location

- Ontario 43 Miles
- Los Angeles 90 miles
- Las Vegas 185 miles

Housing Units

- Single-family Units 15,632
- Apartments 2,664
- Mobile Homes 933
- Condominiums/Townhouses 285

- Total No. Housing Units 19,514
- Occupied Housing Units 18,706
- Percent of Vacant Units 4.14%
- Median Housing Prices 113,690

Climate

- Coolest Month-January average low 30F
- Warmest Month-August average high 96F
- Wettest Month-March average rainfall .95"
- Annual Rainfall 5.51"
- Elevation 2,800 to 3,600 ft.

Medical Facilities

- Desert Valley Hospital 241-8000
- St. Mary Desert Valley Hospital 242-2311
- Victor Valley Community Hospital 245-8691
- Veteran's Hospital 909-825-7084

Major Employers & Manufacturers

Company: # Employed

- Hesperia Unified School District: 1,100
- DynCorp: 1,000
- GTE: 965
- St. Mary's Desert Valley Hospital: 900
- Victorville School District: 825
- Yellow Freight: 820

- Santa Fe Railway: 750
- Victor Valley Community Hospital: 670
- Victor Valley Community College: 650
- Apple Valley School District: 600
- CEO Foods: 400
- Roadway Express: 450

Victorville

Overview. Victorville is situated approximately 97 miles northeast of Los Angeles and 35 miles northeast of San Bernardino, just north of the San Bernardino Mountains, at the edge of the Mojave Desert. Interstate 15 and State Highway 18 intersect near the center of Victorville and Highway 95 borders the city on the west. Major trucking and rail routes run through the area and Victorville is about 40 minutes drive from Ontario Airport, which offers passenger and commercial air cargo service to major U.S. cities and overseas. Three airports are located in the Victor Valley itself, including airport facilities in Apple Valley and Hesperia and Southern California Logistics Airport (formerly George Air Force Base) is located in the City of Victorville and offers business air cargo facilities.

Within a 50-mile radius, via use of Interstate 15 (I-15), Victorville provides immediate access to all major

interstate and highways that facilitate the Southern California market.

The City of Victorville has generally been a bedroom community serving the Ontario (San Bernardino County) and San Gabriel Valley (Los Angeles County) employment centers. At the same time, the growth of the area and economic development efforts have increased the number of wage and salary jobs in Victorville itself from just 5,285 jobs in 1980. The number of jobs increased to 14,822 jobs in 1990 and is estimated at nearly 20,000 jobs in 1996.

Victorville residents and businesses are served by an integrated fixed route transit system that provides transportation options between communities and the greater region. Victor Valley Transit offers curb-to-curb bus service throughout Victorville and other High Desert communities and Greyhound provides scheduled bus service to and from the area. Amtrak provides commuter rail service to and from Victor Valley. The Atchison, Topeka & Santa Fe and Union Pacific railway companies provide freight train service.

Demographic Characteristics. The City of Victorville is located in the High Desert area (also known as the Victor Valley) of San Bernardino County. Victorville is accessible via Interstate 15 and Highway 395, linking the

city with all other areas of Southern California and to Las Vegas. The City of Victorville encompasses approximately 67.68 square miles of land.

Victorville has experienced a substantial growth since 1980 with population growing from 14,229 people in 1980 to 40,674 residents in 1990, an increase of almost 19% annually. According to the City of Victorville's Planning Department, the city has reached 60,400 residents as of September 1998, which represents an annual increase of 8.1% since 1990.

The number of households in Victorville grew at a similar pace from, 1980 to 1990, increasing 17% annually from 5,354 to 14,241 households. There are an estimated 20,972 households in the city as of September 1998, a 7.9% annual increase from 1990 levels.

With population growth outpacing household growth, the average household size in the city has steadily increased since 1980. In 1980, there was an average of 2.66 persons per household, compared to 2.86 per household in 1990 and 2.88 persons per household in 1998.

To accommodate the rapid population growth, the number of housing units in the city has also grown significantly since 1980. A total of 6,108 housing units existed in the city in 1980, rising to 15,627 units in

1990, or a 16% annual increase for the decade. As of January 1998, the California Department of Finance estimates the number of housing units to be 23,699 units.

The population of Victorville is becoming more ethnically diverse along with the greater Southern California Region. While white residents continue to represent the largest percentage of the population (currently 55.2%), fast growth is being experienced in the Asian and Hispanic populations.

Three-fourths of the Victorville population 25 years or older have completed high school, with over 45% having some college education as well.

The median household income in Victorville increased from $15,617 in 1980 to $28,699 in 1990. The median household income is estimated at $31,169 in 1998. Per capita income in the City of Victorville has also increased from only $6,425 in 1980 to $13,323 in 1998. The fastest growing income segments in recent years are the middle income $40,000 to $60,000 segments, reflecting residents drawn to the relatively affordable housing opportunities in the Victorville area.

The Victorville population is aging in line with the rest of the nation, with the median age having increased from 29.5 years in 1990 to 31.7 years in 1998. Children

represent the largest percentage of residents (32% of the population is under 18 years of age), indicating the popularity of the city with family households. As is the case in the greater Southern California area, the fastest growing age categories in the City of Victorville are the 35 to 54 age categories, with the "baby boom" generation moving through the population.

A summary of estimated 1998 population, household, and housing unit characteristics for the City of Victorville are as follows:

Population	68,318
Households	20,972
Avg. Household Size	2.88
Housing Units	23,699
Median Household Income	$31,169
Per Capita Income	$13,323
Median Age	31.7

The High Desert City of Victorville offers affordable real estate, a skilled labor force, and industrial and commercial sites convenient to transportation systems. A place where city lights still reflect the beauty of a twinkling star, where community pride infects even the newest resident, and the uniqueness of a Joshua Tree is only surpassed by the magical display of colors painted

across the smog-free desert sky at sunset. Victorville blends the best of both worlds, offering the convenience of city life with the comfort of small town living, truly making it "The Other Southern California."

Population/Ethnicity/Median Income

The population of Victorville is 65,854 (City of Victorville, 11-15-2000).

The median age is 31.7 years*.

Median income is $31,169*.

Ethnicity distribution is as follows: 47% White, 34% Hispanic, 12% African American, 3% Asian, 4% other**.

(* 1998 Estimates - The Meyers Group, **2000 Census-California Department of Finance)

Economic Overview and Community Profile

Courtesy of the Victorville Chamber of Commerce 2001

*Last Updated March 2001

VITAL STATISTICS

Population	65,854
County Population	1, 589,000
School Enrollment	17,452
Number of Dwellings	23,699
Sales Tax Revenue	$11,265,335.94*
Assessed Valuation	$2,343,368,040.00

*City of Victorville Department of Finance, 11-99 thru 11-00

Summary

This chapter examined the studies that were already done in the areas of staffing and functioning of urgent care centers. It has also studied the projected trends in the population growth and economic development of the three major cities of the area. The strengths, weaknesses, opportunities and threats of DVMG will be examined in chapter 3. Statistical analysis of the data obtained from the urgent care center regarding waiting time, and patient flow will be undertaken. Also, cost analysis of urgent care center will be done in chapter three.

CHAPTER THREE

DATA ANALYSES

Introduction

This chapter examines the trends of health care industry. It identifies the strengths, weaknesses, opportunities and threats for DVMG.

Also, data from the log-in sheets of patients, patient flow sheets, patient medical records, daily and monthly reports of urgent care will be analyzed using Statistical Procedures for Social Sciences and conclusions drawn as to the more efficient functioning of the business. Costs of running urgent care will also be analyzed.

Changing Landscape of the Health Care Industry in the High Desert

In 1998, Kaiser Permanente, Fontana opened a center in Victorville with a staff of about 8 primary care providers including some mid-level providers. This was done in order to capture a part of the market share and later establish a full-fledged hospital within one year. So far their growth has been slow. If their plans materialize, it could be a considerable threat to the existing medical groups.

Trends of the High Desert's Health Care Industry

Before 1995, mostly independent physicians cared for patients. This has changed significantly since then to a trend of physicians caring for patients through practice groups and presently, only a few independent physicians still remain in solo practice.

Desert Valley Hospital was the third hospital to be established in the high desert. It was established in 1995 and Victorville Community Hospital and St. Mary Regional Medical Center were the two in existence prior to this. Even with these three hospitals, there is acute shortage of hospital beds especially during fall and winter seasons and since no other hospitals have yet been built, this shortage still persists. Present national trends in the managed care cost containment policies have contributed to this reluctance on the part of entrepreneurs to build more hospitals.

The manner by which urgent care services have been established and administered in the high desert has been a pluralistic one. For some hospitals and collaborating medical groups, the urgent care services have been an outgrowth of the emergency department. For others, they

are established and run by separate groups that own no emergency services or hospital.

Strengths/Weaknesses/ Opportunities/Threats

Strengths

DVMG Urgent Care Center is centrally located for the three main cities (Apple Valley, Victorville, Hesperia), and is easily accessible by the main roads, and is highly visible.

DVMG Urgent Care Center is accessible 15 hours a day, 7 days a week (7 AM to 10 PM). This is the time most patients find it convenient to visit the urgent care.

DVMG Urgent Care Center is situated in close proximity to the Emergency Department in the same building of the hospital.

DVMG Urgent Care Center is always fully staffed, during the hours of operation, with doctors (including mid level providers), medical assistants, receptionists and other support personnel.

There are about 30 primary care providers in the medical group of DVMG. The patients of these doctors and patients of other private doctors and small medical groups in the area use the urgent care services during after

hours, during week ends and when they cannot get to see their doctors even during regular office hours.

DVMG Urgent Care Center has been fully accredited by the Joint Commission for Accreditation of Health Care Organizations (JCAHCO).

Weaknesses

It would not be cost effective if kept opened from 10PM to 7AM.

DVMG's Urgent Care Center is somewhat overstaffed with medical assistants.

Presently, marketing is too sporadic for DVMG Urgent Care Center.

Opportunities

Residents newly moving into the high desert area from counties of Los Angeles, Riverside, Orange etc. are receptive to marketing through newspapers, radio etc.

Several local successful IPA doctors can be recruited to join the DVMG group and this would result in more patients utilizing the urgent care services of DVMG.

Threats

Five other local medical groups have competing hospitals and may lure DVMG's doctors to join their groups.

A significant percent of patients seen at the urgent care center of DVMG are those who have recently lost their jobs or have recently moved from other areas to the high desert and do not have insurance coverage. These people are therefore finding it difficult to reimburse DVMG for services rendered at the urgent care center.

Processing Time Study Report

For this project, quantitative analysis on data collected by a systematic sample of patient records from Desert Valley Medical Center's Urgent Care Center was done using the Statistical Package for the Social Sciences (SPSS, version 10.0-graduate package). Given this project's available time for completion, the investigator sampled 103 patient records. Fifty-two of these patient records were for January to June of year 2000 and 51 for similar months of year 2001.

The investigator did descriptive statistics on the available variables thought pertinent to patients processing time. The variables studied included gender of patient, age of patient, severity of illness, and the time it took for an urgent care patient to be processed and exit the urgent care service (processing time). In this retrospective record review, detailed data on urgent care

patients waiting time from clinic station to station while being completely processed was not available. The descriptive statistics on available variables of interest are reported on in this section along with inferential statistical analysis results. The inferential statistical results reported on below deal with the amount by which processing time differs statistically significantly at various levels of the other variables studied.

Demographics

The gender proportions and mean age of patients whose records were sampled were quite close for year 2000 compared to year 2001. The average age of the 52 sampled patients seen in the year 2000 was 35 years old. It was 34 years old for the 51sampled from year 2001 and was not statistically significantly different from that for year 2000 (independent groups t-test, $p >> 0.05$). The sub-sample for year 2000 had 23 males (44.2%) and 29 females (55.8%) while year 2001's sub-sample had 22 males (43.1%) and 29 (56.9%) females. This represented a statistically and practically homogeneous sample overall (chi-squared test, $p >> 0.05$) regarding gender of the patients then visiting Desert Valley Medical Center's Urgent Care Center.

Type of Urgent Care Provider verses Patient Processing Time

The type of provider seen by the patients sampled was not significantly related to the year in which they were seen (chi-squared test of independence, $p > 0.05$). In year 2000 the mean processing time for patients seen by medical doctors (MD) or Doctors of Osteopathy (DO) was 1 hour and 52 minutes ($\pm$ 56 minutes). Patient processing time with MD/DO professionals ranged in year 2000 from 38 minutes to 5 hours and 13 minutes while it ranged from 33 minutes to 4 hours and 7 minutes in year 2001. The mean processing time for patients seen by MD/DO practitioners in year 2001 was 1 hour and 33 minutes. In year 2000, the mean processing time for patients seen by physician assistant (PA) professionals was 1 hour and 53 minutes ($\pm$ 41 minutes). Processing time when patients were seen by PAs ranged in year 2000 from 58 minutes to 2 hours and 56 minutes while it ranged from 13 minutes to 4 hours in year 2001. In year 2001 the mean processing time for patients seen by PAs was 1 hour and 41 minutes ($\pm$ 1 hour and 7 minutes). The sample only identified patients seen by nurse practitioners (NP) for year 2000. NPs mean patient processing time for year 2000 was 1 hour and 55 minutes

(± 39 minutes) and was as short as 1 hour and 16 minutes to as long as 3 hours and 8 minutes.

Complexity of Presenting Illnesses verses Patient Processing Time

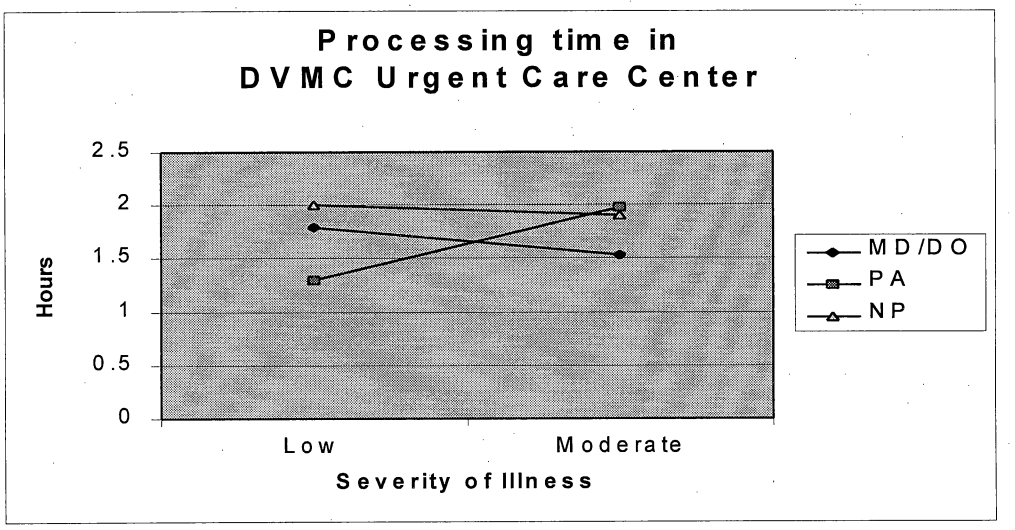
Upon the investigator reviewing the 103 patients studied, he classified the illnesses with which they were presenting to the urgent care center as of low, moderate, or high complexity. Overall, those patients with illnesses classified as of low complexity (n = 35) had a mean processing time of 1 hr. and 40 minutes (± 41 minutes), the shortest being 33 minutes and the longest 3 hrs. and 12 minutes. Those whose illnesses were classified as of moderate complexity (n = 61) had a mean processing time of 1 hr. and 42 minutes (± 56 minutes), the shortest being 13 minutes while the longest was 5 hrs. and 12 minutes. Patients whose illnesses were classified as highly complex (n = 7) experienced a mean processing time of 2 hrs. and 29 minutes (± 1 hr. and 8 minutes), the shortest being 58 minutes and the longest 4 hrs.

Some statistically significant differences in processing time were found in relation to level of complexity of illness. Using an analysis of variance (ANOVA) test, those classified as presenting with highly complex illnesses were found to have processing times of

about 49 minutes longer (ANOVA's Least Significant Difference t-test, $p = 0.025$) than those with illnesses of low complexity. Those with illnesses of high complexity also had statistically significantly longer (ANOVA's Least Significant Difference t-test, $p = 0.028$) processing times (47 minutes more) than that for patients whose illnesses were classified as moderately complex. No other significant differences were identified. Statistically, variances associated with processing time were found to be homogenous (Levine test, $p > 0.05$) and that data was normally distributed (K-S test of normality, $p >> 0.05$). By the untransformed processing time data meeting these two assumptions (normality and homogeneity of variances) this made the use in an ANOVA test of differences among the three levels of severity of illness an appropriate one.

Figure 1.

Processing Time



Using the ANOVA test, the investigator found a statistically significant interaction effect in processing time among levels of the variables type of provider and level of complexity of illness ($p = 0.049$). Otherwise, this general linear model provided no other unique statistically significant information ($p=0.052$) as neither variable (type of provider or level of complexity of illness) separately had statistically significant differences in processing time in this model with the interaction identified. A chart graphing the patterns of the interaction identified with this statistical model is shown below.

The statistical significance of this interaction effect was, however, lost when year of patient visits was concurrently considered. In that case the significant interaction was between complexity of illness and year of patient visits. The explanation for this interaction was that a few more patients with highly complex illnesses were sampled in one year studied and probably served as undue influencers of the model. Since these were only a relatively few patients the investigator chose to emphasize the first model and chart presented above. Additionally, these few patients conditions did not noticeably influence the overall processing time for either year studied as the year 2000 and year 2001 groups mean processing time was not statistically significantly different by year (ANOVA and a separate independent groups t-test, $p > 0.05$). The mean processing time for January to June 2000 was 1 hr. and 53 minutes ($\pm$ 48 minutes), the shortest being 38 minutes and the longest being 5 hrs. and 13 minutes. In that period of year 2001 the mean processing time was 1 hr. and 36 minutes ($\pm$ 57 minutes), the shortest being 13 minutes and the longest 4 hrs. and 45 minutes.

Conclusion from the Statistical Analyses

- Physicians should be handling a greater proportion of the more complex patients while NPs and PAs should take up the slack with patients of lower complexity.
- It tends to take about 34 minutes more to process female patients than male patients.
- As long as legal requirements are met, it seems to be more cost-effective to employ more PAs and NPs while reducing the number of MD/DO providers.
- A more detailed prospective study of these issues is warranted at DVMC for more concrete policies to be implemented/instituted.
- Therefore, I recommend that a more detailed pilot project with a prospective study of all relevant issues including waiting times (not simply overall processing time per patient), and human resource allocation cost-effectiveness analysis be undertaken annually at DVMC.

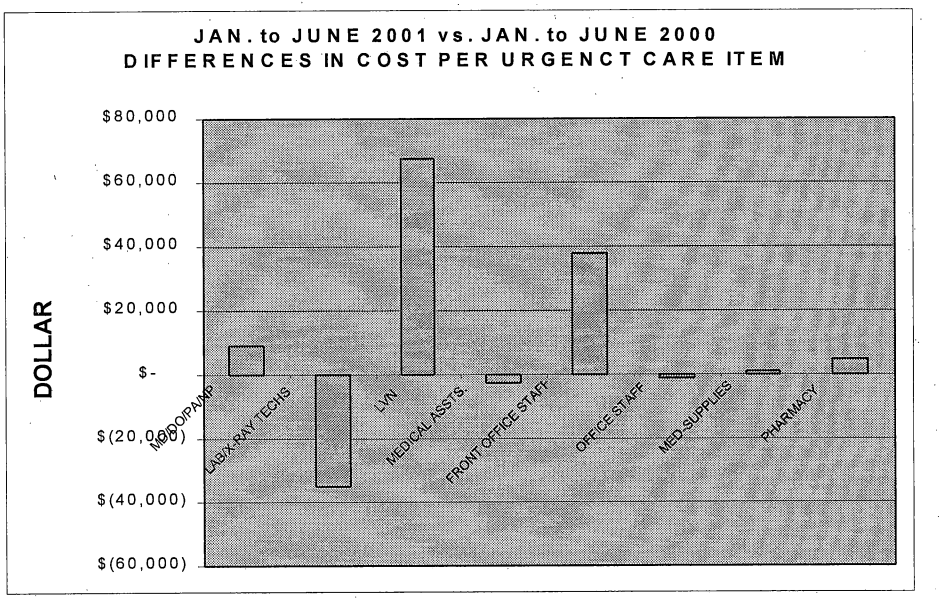
Urgent Care Costs

The researcher obtained permission from the Chief Executive Officer of Desert Valley Medical Group to

procure the report of costs of urgent care center services for January to June of the years 2000 and 2001. These costs are shown in the following figure 2 and table 2.

Figure 2.

Differences in Cost Per Urgent Care Item



In the year 2001, expenses rose disproportionately for the three LVNs recently employed (compared to patients seen). There were no LVNs in the year 2000 in the Urgent Care Center. LVNs were introduced in March 2001. This was because the Medical Center adopted a policy to have LVNs assist in treating subacute patients requiring IV fluids etc. in the Urgent Care Center. The reason for this was to reduce the patient load and long waiting times in the

Table 2.

Cost Per Year

Item	Jan-July Costs year 2000	Jan-July Costs year 2001	Jan-July Year 2001 Year 2000 DIFFERENCE
Salaries:			
MD/DO/PA/NP	$185,633	$194,714	$9,081
Lab/x-ray techs	$65,162	$29,904	$(35,258)
LVN	$ 0	$67,375	$67,375
Medical assts.	$105,368	$102,728	$(2,640)
Front office staff	$33,540	$71,395	$37,855
Office staff	$17,915	$16,612	$(1,303)
Supplies:			
Med-supplies	$32,045	$33,002	$957
Pharmacy	$17,606	$22,320	$4,714
Total:	$457,269	$538,050	$80,781

emergency room. The LVNs have, in actuality, been setting up IVs on an average of once a week, and have gravitated to assuming a supervisory role over medical assistants (MAs) on duty. The LVNs have never been needed for the supervisory role that they assumed and should be transitioned to the areas where they are actually needed. Supervision of the MAs is already the responsibility of the physicians on duty and the transitioning of the LVNs will, therefore, not set back the functioning of the Urgent Care Center. To ensure this functioning, DVMG could also employ one or two additional MAs after transferring the LVNs.

The other area that showed significant cost increase was that for front office Patient Service Representative (PSR) personnel. This was because an additional person per 8-hour shift was employed as a PSR making it possible to have three front office staff members on duty at any time since January 2001. This increase in cost may seem unwarranted since the front office functioned efficiently prior to this with only two PSRs at any time. However, DVMG is presently increasing the market share of patients served by acquiring the practices of at least seven local independent practitioners and the anticipated increase in clients seeking urgent care services should prove to justify the present number of PSRs employed.

The apparent decrease in salaries for lab/x-ray technicians in year 2001 compared to year 2000 was probably because a part of the cost was assigned to another department in the year 2001.

The following table gives the percentages of patients who visited the urgent care center at DVMG, but left without being seen. The clients did so for a variety of reasons, one of which was prolonged waiting time after being registered for care. This prolonged waiting time was possibly due to inefficient functioning of staff and providers on duty. A client satisfaction survey was not

included in the practice management of the urgent care service during January to June of years 2000 or 2001. Data (from such a survey) on client attitude about their waiting time experience in the urgent care at DVMG could be very helpful in validating this hypothesis.

The available percentages on patients leaving without being seen for each month have systematically increased from year 2000 to year 2001 (Paired t-test: $p < 0.00063$). However, no trend was visible from month to month within a given year.

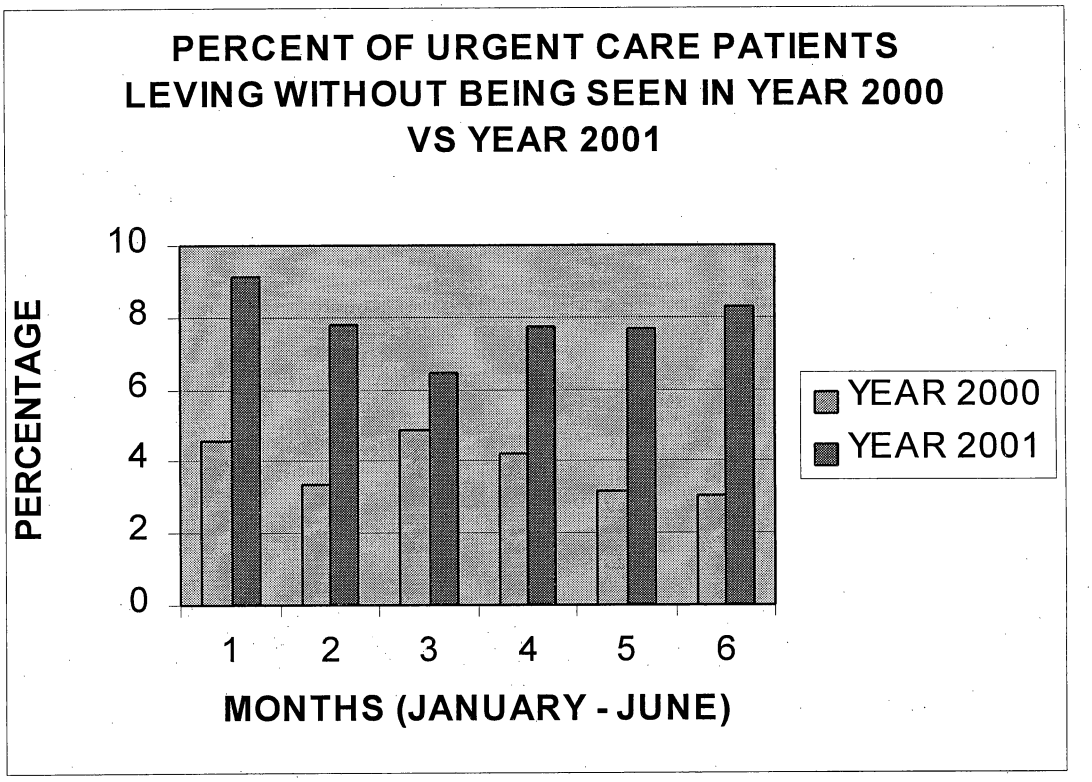
Table 3.

Left Without Being Seen

	Jan	Feb	Mar	Apr	May	Jun
Year 2000	4.585	3.352	4.898	4.185	3.198	3.075
Year 2001	9.165	7.780	6.477	7.753	7.670	8.279

Figure 3.

Percentage of Urgent Care Patients



Summary

In this chapter, trends of health care industry nationally and locally were studied, analysis of patient waiting time using data from urgent care was made, costs of operating urgent care was studied, and conclusions were drawn. In chapter four, specific recommendations as to more efficient and cost-effective operation of urgent care will be submitted to the management.

CHAPTER FOUR

CONCLUSIONS AND RECOMMENDATIONS

Introduction

In this chapter, conclusions will be drawn from the analysis of data and specific recommendations as to more efficient and profitable operation of urgent care will be made to the management.

Conclusions

After spending at least five years as a medical doctor serving in the DVMG urgent care center I, as an MBA student, hypothesized several deficiencies as being prevalent. These included workflow bottle necks and inefficiencies (including providers too often ordering "unnecessary" lab tests/x-rays) resulting in prolonged average waiting time for patients; significant numbers of patients leaving without being seen; too many LVNs on staff; and poor feedback from patients about their satisfaction with urgent care services received. Very little research on these matters in the urgent care setting has been documented in the literature.

Through this project, I have begun to study available data in the urgent care setting at DVMG on associated human resources and service costs, patient processing time

and possible factors affecting efficient services. A client satisfaction survey was not included in the practice management of the urgent care service during January to June of years 2000 or 2001. I discovered that the urgent care setting was overstaffed with LVNs and their salaries accounted for the highest cost increase in recent times. Further, MAs on duty were carrying out the actual work of these LVNs. The LVNs were never assigned to supervise the MAs and although they assumed this responsibility, they failed to enrich the supervising of these MAs. Further, they missed the opportunity to document and positively affect patient waiting time. Instead, only patients' initial time of registration and final time of discharge was being documented. Consequently, only total patient processing time could be objectively ascertained with a view to reducing the bottlenecking in patient care flow. He also discovered that MD/DOs in the urgent care service processed moderate and highly complex patients significantly more efficiently than physician assistants and nurse practitioners. Although MD/DOs supervise these two types of providers in the urgent care setting, typically patients are seen by any provider based on their order of arrival and registration. Therefore MD/DOs are not presently

addressing the problem of PAs and NPs taking a disproportionately longer time to care for more challenging patients.

Recommendations

- LVNs should be transitioned out of urgent care to other areas of patient care services until their specific role in the urgent care services can be justified.
- Physicians should be handling a greater proportion of the more complex patients while NPs and PAs should take up the slack with patients of lower complexity.
- It is more cost-effective to employ more PAs and NPs while reducing the number of MD/DO providers.
- A more detailed prospective study of these issues is warranted at DVMC for more concrete policies to be implemented/instituted.
- Therefore, I recommend that a more detailed pilot project with a prospective study of all relevant issues including waiting times (not simply overall processing time per patient), and

human resource allocation cost-effectiveness analysis be undertaken annually at DVMC.

- Client satisfaction survey data on client recommendations, experience, and attitudes about their waiting time experience in the urgent care at DVMG could be very helpful.

Summary

This project sought to evaluate the current practices and operations of Desert Valley Medical Group urgent care center. The analysis and recommendations provided should be of assistance to the management of the group in implementing a more efficient program.

APPENDIX A

LETTER OF CONSENT

Hari Reddy, MD
Desert Valley Medical Group
16850 Bear Valley Road, Ste. 101
Victorville, CA 92392

May 9, 2001

Lex Reddy
President & CEO
Desert Valley Medical Group

Dear Sir,

As a part of my MBA final project, I am conducting a research study on " Ways to reduce waiting time in Urgent Care and optimize staff scheduling".

I request that I may be granted permission to use the statistics of our Urgent Care for this study. This study will also help the medical group. I greatly appreciate your cooperation in this matter.

Thanking You,

Sincerely,

(HARI REDDY)

cc: Prem Reddy, MD
Chairman, Board of Directors
Panch Jayakumar, MD
Medical Director

APPENDIX B

DATA ANALYSIS

Frequencies: Overall re: severity of illness

Statistics

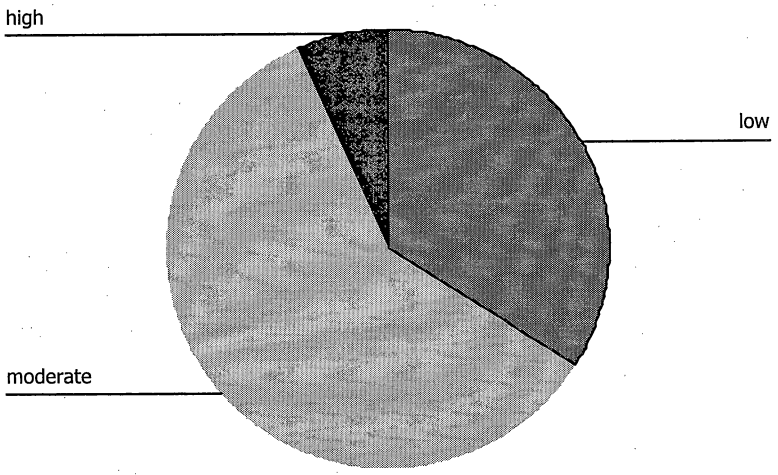
Severity of Illness

N	Valid	103
	Missing	0
Mean		1.73
Median		2.00
Mode		2
Range		2
Minimum		1
Maximum		3
Percentiles	25	1.00
	50	2.00
	75	2.00

Severity of Illness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	low	35	34.0	34.0	34.0
	moderate	61	59.2	59.2	93.2
	high	7	6.8	6.8	100.0
	Total	103	100.0	100.0	

Severity of Illness



Frequencies: Year 2000 only

Statistics

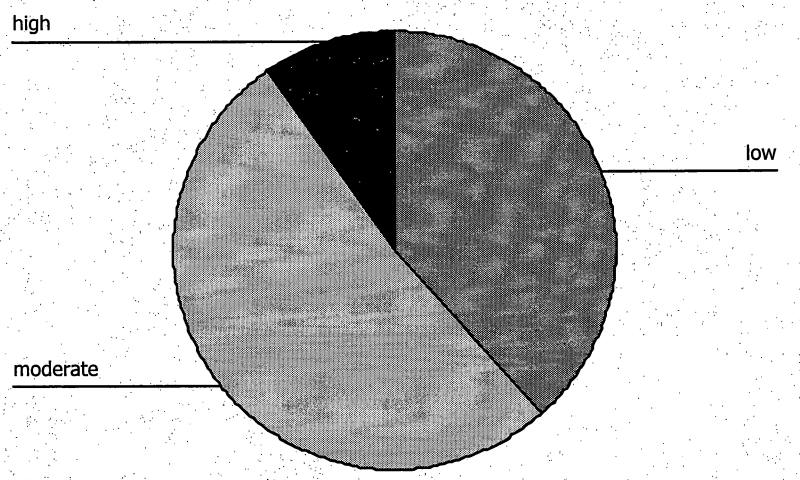
Severity of Illness

N	Valid	52
	Missing	0
Mean		1.71
Median		2.00
Mode		2
Range		2
Minimum		1
Maximum		3
Percentiles	25	1.00
	50	2.00
	75	2.00

Severity of Illness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	low	20	38.5	38.5	38.5
	moderate	27	51.9	51.9	90.4
	high	5	9.6	9.6	100.0
	Total	52	100.0	100.0	

Severity of Illness



Frequencies: Year 2001 only

Statistics

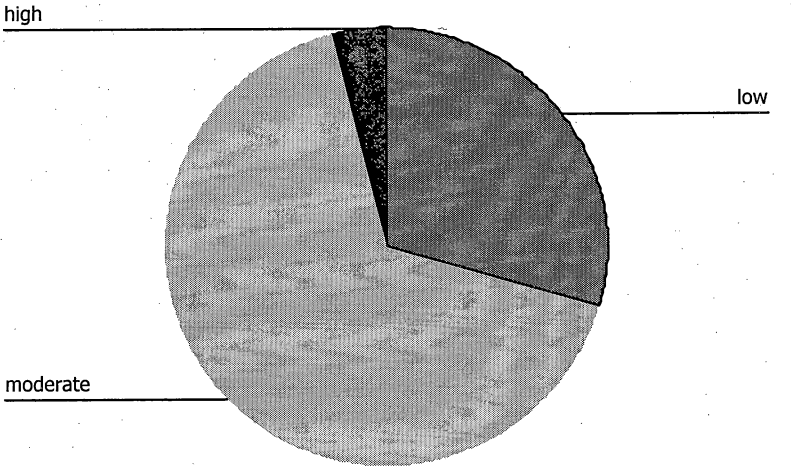
Severity of Illness

N	Valid	51
	Missing	0
Mean		1.75
Median		2.00
Mode		2
Range		2
Minimum		1
Maximum		3
Percentiles	25	1.00
	50	2.00
	75	2.00

Severity of Illness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	low	15	29.4	29.4	29.4
	moderate	34	66.7	66.7	96.1
	high	2	3.9	3.9	100.0
	Total	51	100.0	100.0	

Severity of Illness



NPar Tests: Years 2000 & 2001 re: severity of illnesses seen in urgent care

Mann-Whitney Test

Ranks

	Year patient was seen	N	Mean Rank	Sum of Ranks
Severity of Illness	Year 2000 (January to June)	52	50.81	2642.00
	Year 2001 (January to June)	51	53.22	2714.00
	Total	103		

Test Statistics[a]

	Severity of Illness
Mann-Whitney U	1264.000
Wilcoxon W	2642.000
Z	-.471
Asymp. Sig. (2-tailed)	.637

a. Grouping Variable: Year patient was seen

Crosstabs: Overall levels of severity by gender

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Severity of Illness * Gender/sex of patient	103	100.0%	0	.0%	103	100.0%

Severity of Illness * Sex of patient Crosstabulation

			Gender/sex of patient		
			Male	Female	Total
Severity of Illness	low	Count	11	24	35
		% within Severity of Illness	31.4%	68.6%	100.0%
		% within Gender/sex of patient	24.4%	41.4%	34.0%
	moderate	Count	32	29	61
		% within Severity of Illness	52.5%	47.5%	100.0%
		% within Gender/sex of patient	71.1%	50.0%	59.2%
	high	Count	2	5	7
		% within Severity of Illness	28.6%	71.4%	100.0%
		% within Gender/sex of patient	4.4%	8.6%	6.8%
Total		Count	45	58	103
		% within Severity of Illness	43.7%	56.3%	100.0%
		% within Gender/sex of patient	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.696[a]	2	.096
Likelihood Ratio	4.777	2	.092
Linear-by-Linear Association	1.223	1	.269
N of Valid Cases	103		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 3.06.

Crosstabs: Overall levels of severity by gender ***broken down by year***

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Severity of Illness * Sex of patient * Year patient was seen	103	100.0%	0	.0%	103	100.0%

Severity of Illness * Sex of patient * Year patient was seen Crosstabulation

Year patient was seen				Sex of patient		Total
				Male	Female	
Year 2000 (January to June)	Severity of Illness	low	Count	6	14	20
			% within Severity of Illness	30.0%	70.0%	100.0%
			% within Sex of patient	26.1%	48.3%	38.5%
		moderate	Count	16	11	27
			% within Severity of Illness	59.3%	40.7%	100.0%
			% within Sex of patient	69.6%	37.9%	51.9%
		high	Count	1	4	5
			% within Severity of Illness	20.0%	80.0%	100.0%
			% within Sex of patient	4.3%	13.8%	9.6%
	Total		Count	23	29	52
			% within Severity of Illness	44.2%	55.8%	100.0%
			% within Sex of patient	100.0%	100.0%	100.0%
Year 2001 (January to June)	Severity of Illness	low	Count	5	10	15
			% within Severity of Illness	33.3%	66.7%	100.0%
			% within Sex of patient	22.7%	34.5%	29.4%
		moderate	Count	16	18	34
			% within Severity of Illness	47.1%	52.9%	100.0%
			% within Sex of patient	72.7%	62.1%	66.7%
		high	Count	1	1	2
			% within Severity of Illness	50.0%	50.0%	100.0%
			% within Sex of patient	4.5%	3.4%	3.9%
	Total		Count	22	29	51
			% within Severity of Illness	43.1%	56.9%	100.0%
			% within Sex of patient	100.0%	100.0%	100.0%

Chi-Square Tests

Year patient was seen		Value	df	Asymp. Sig. (2-sided)
Year 2000 (January to June)	Pearson Chi-Square	5.304[a]	2	.071
	Likelihood Ratio	5.456	2	.065
	Linear-by-Linear Association	.514	1	.473
	N of Valid Cases	52		
Year 2001 (January to June)	Pearson Chi-Square	.839[b]	2	.657
	Likelihood Ratio	.853	2	.653
	Linear-by-Linear Association	.755	1	.385
	N of Valid Cases	51		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 2.21.

b. 2 cells (33.3%) have expected count less than 5. The minimum expected count is .86.

Crosstabs: Overall levels of severity by lab test (ordered or not)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Severity of Illness * Lab was ordered:	103	100.0%	0	.0%	103	100.0%
Severity of Illness * X-Ray was ordered;	103	100.0%	0	.0%	103	100.0%
Severity of Illness * Given special medication (e.g. asthmatic Medneb Rx) in Urgent Care	103	100.0%	0	.0%	103	100.0%

Severity of Illness * Lab was ordered:

Crosstab

			Lab was ordered:		
			No	Yes	Total
Severity of Illness	low	Count	30	5	35
		% within Severity of Illness	85.7%	14.3%	100.0%
		% within Lab was ordered:	32.6%	45.5%	34.0%
	moderate	Count	55	6	61
		% within Severity of Illness	90.2%	9.8%	100.0%
		% within Lab was ordered:	59.8%	54.5%	59.2%
	high	Count	7		7
		% within Severity of Illness	100.0%		100.0%
		% within Lab was ordered:	7.6%		6.8%
Total		Count	92	11	103
		% within Severity of Illness	89.3%	10.7%	100.0%
		% within Lab was ordered:	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.360[a]	2	.507
Likelihood Ratio	2.064	2	.356
Linear-by-Linear Association	1.219	1	.269
N of Valid Cases	103		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is .75.

Crosstabs: Overall levels of severity by X-ray (ordered or not)

Crosstab

			X-Ray was ordered;		
			No	Yes	Total
Severity of Illness	low	Count	34	1	35
		% within Severity of Illness	97.1%	2.9%	100.0%
		% within X-Ray was ordered;	37.4%	8.3%	34.0%
	moderate	Count	52	9	61
		% within Severity of Illness	85.2%	14.8%	100.0%
		% within X-Ray was ordered;	57.1%	75.0%	59.2%
	high	Count	5	2	7
		% within Severity of Illness	71.4%	28.6%	100.0%
		% within X-Ray was ordered;	5.5%	16.7%	6.8%
Total		Count	91	12	103
		% within Severity of Illness	88.3%	11.7%	100.0%
		% within X-Ray was ordered;	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.147[a]	2	.076
Likelihood Ratio	5.635	2	.060
Linear-by-Linear Association	5.082	1	.024
N of Valid Cases	103		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is .82.

Severity of Illness * Given special medication (e.g. asthmatic Medneb Rx) in Urgent Care

Crosstab

			Given special medication (e.g. asthmatic Medneb Rx) in Urgent Care		
			No	Yes	Total
Severity of Illness	low	Count	28	7	35
		% within Severity of Illness	80.0%	20.0%	100.0%
		% within Given special medication (e.g. asthmatic Medneb Rx) in Urgent Care	32.6%	41.2%	34.0%
	moderate	Count	52	9	61
		% within Severity of Illness	85.2%	14.8%	100.0%
		% within Given special medication (e.g. asthmatic Medneb Rx) in Urgent Care	60.5%	52.9%	59.2%
	high	Count	6	1	7
		% within Severity of Illness	85.7%	14.3%	100.0%
		% within Given special medication (e.g. asthmatic Medneb Rx) in Urgent Care	7.0%	5.9%	6.8%
Total		Count	86	17	103
		% within Severity of Illness	83.5%	16.5%	100.0%
		% within Given special medication (e.g. asthmatic Medneb Rx) in Urgent Care	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.471[a]	2	.790
Likelihood Ratio	.460	2	.794
Linear-by-Linear Association	.397	1	.529
N of Valid Cases	103		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 1.16.

Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Year patient was seen * Gender/sex of patient	103	100.0%	0	.0%	103	100.0%

Year patient was seen * Gender/sex of patient Crosstabulation

			Gender/sex of patient		Total
			Male	Female	
Year patient was seen	Year 2000 (January to June)	Count	23	29	52
		% within Year patient was seen	44.2%	55.8%	100.0%
		% within Gender/sex of patient	51.1%	50.0%	50.5%
	Year 2001 (January to June)	Count	22	29	51
		% within Year patient was seen	43.1%	56.9%	100.0%
		% within Gender/sex of patient	48.9%	50.0%	49.5%
Total		Count	45	58	103
		% within Year patient was seen	43.7%	56.3%	100.0%
		% within Gender/sex of patient	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.013[b]	1	.911		
Continuity Correction[a]	.000	1	1.000		
Likelihood Ratio	.013	1	.911		
Fisher's Exact Test				1.000	.535
Linear-by-Linear Association	.012	1	.911		
N of Valid Cases	103				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 22.28.

Frequencies: PERCENTAGES OF PATIENTS WHO LWBS

Statistics

		Y2000	Y2001	LWBSDIFF
N	Valid	6	6	6
	Missing	0	0	0
Mean		3.8822	7.8540	-3.9718
Std. Error of Mean		.3172	.3580	.5239
Median		3.7685	7.7665	-4.4500
Mode		3.08[a]	6.48[a]	-5.20[a]
Std. Deviation		.7770	.8769	1.2834
Variance		.6037	.7690	1.6470
Skewness		.274	-.128	1.625
Std. Error of Skewness		.845	.845	.845
Kurtosis		-2.332	1.543	2.874
Std. Error of Kurtosis		1.741	1.741	1.741
Range		1.82	2.69	3.62
Minimum		3.08	6.48	-5.20
Maximum		4.90	9.16	-1.58
Sum		23.29	47.12	-23.83

a. Multiple modes exist. The smallest value is shown

Frequency Table

Y2000

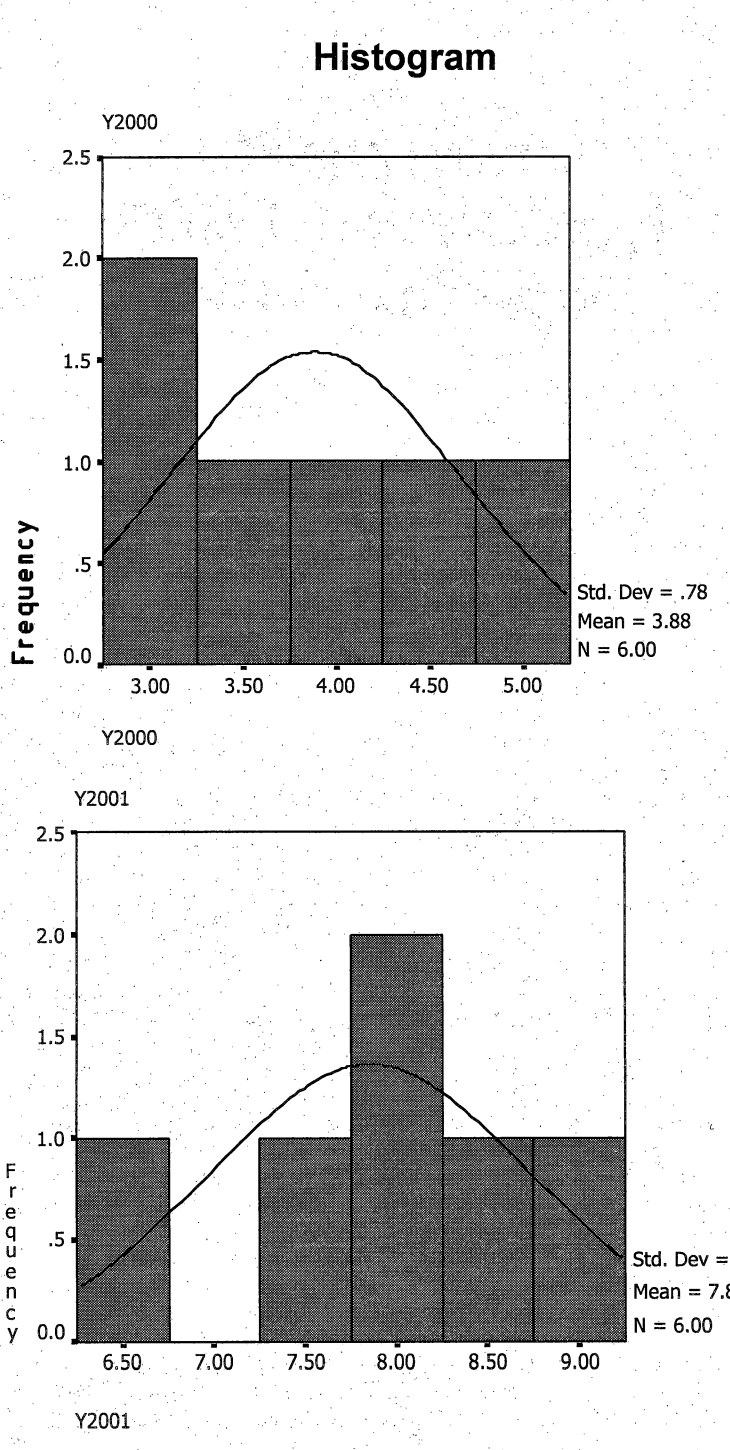
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3.08	1	16.7	16.7	16.7
	3.20	1	16.7	16.7	33.3
	3.35	1	16.7	16.7	50.0
	4.18	1	16.7	16.7	66.7
	4.59	1	16.7	16.7	83.3
	4.90	1	16.7	16.7	100.0
	Total	6	100.0	100.0	

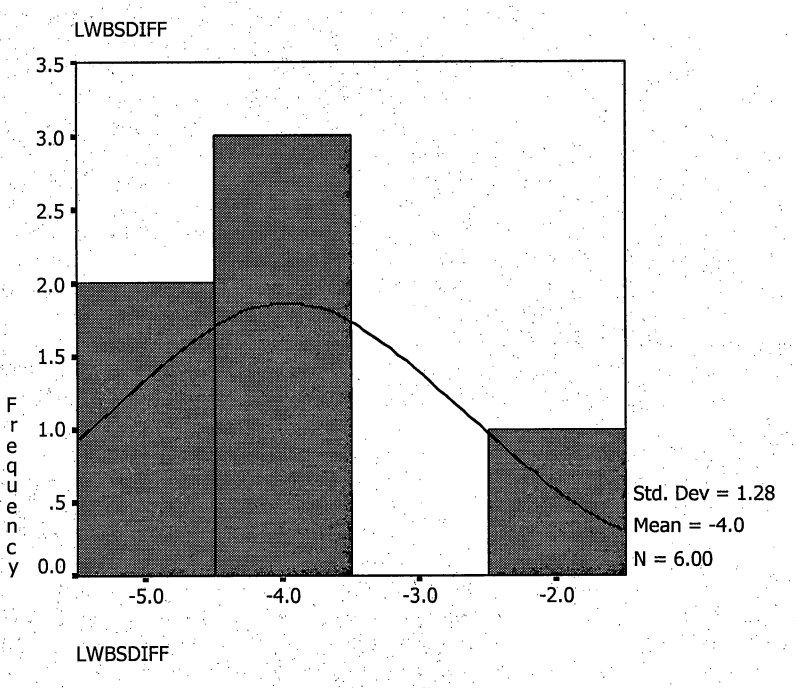
Y2001

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6.48	1	16.7	16.7	16.7
	7.67	1	16.7	16.7	33.3
	7.75	1	16.7	16.7	50.0
	7.78	1	16.7	16.7	66.7
	8.28	1	16.7	16.7	83.3
	9.16	1	16.7	16.7	100.0
	Total	6	100.0	100.0	

LWBSDIFF

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-5.20	1	16.7	16.7	16.7
	-4.58	1	16.7	16.7	33.3
	-4.47	1	16.7	16.7	50.0
	-4.43	1	16.7	16.7	66.7
	-3.57	1	16.7	16.7	83.3
	-1.58	1	16.7	16.7	100.0
	Total	6	100.0	100.0	


Histogram
Y2000
2.5
2.0
1.5
1.0
.5
0.0
Frequency
3.00
3.50
4.00
4.50
5.00
Y2000
Std. Dev = .78
Mean = 3.88
N = 6.00
Y2001
2.5
2.0
1.5
1.0
.5
0.0
Frequency
6.50
7.00
7.50
8.00
8.50
9.00
Y2001
Std. Dev = .88
Mean = 7.85
N = 6.00



NPar Tests

One-Sample Kolmogorov-Smirnov Test

		LWBSDIFF
N		6
Normal Parameters [a,b]	Mean	-3.9718
	Std. Deviation	1.2834
Most Extreme Differences	Absolute	.306
	Positive	.306
	Negative	-.169
Kolmogorov-Smirnov Z		.748
Asymp. Sig. (2-tailed)		.630

a. Test distribution is Normal.

b. Calculated from data.

T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Y2000	3.8822	6	.7770	.3172
	Y2001	7.8540	6	.8769	.3580

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Y2000 & Y2001	6	-.201	.702

NPar Tests

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Y2000	6	3.8822	.7770	3.08	4.90
Y2001	6	7.8540	.8769	6.48	9.16

Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
Y2001 - Y2000	Negative Ranks	0[a]	.00	.00
	Positive Ranks	6[b]	3.50	21.00
	Ties	0[c]		
	Total	6		

a. Y2001 < Y2000

b. Y2001 > Y2000

c. Y2000 = Y2001

Test Statistics[b]

	Y2001 - Y2000
Z	-2.201[a]
Asymp. Sig. (2-tailed)	.028

a. Based on negative ranks.

b. Wilcoxon Signed Ranks Test

Crosstabs: Overall

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Severity of Illness * Type of provider	103	100.0%	0	.0%	103	100.0%

Severity of Illness * Type of provider Crosstabulation

			Type of provider			Total
			MD/DO	PA	NP	
Severity of Illness	low	Count	18	12	5	35
		% within Severity of Illness	51.4%	34.3%	14.3%	100.0%
		% within Type of provider	31.0%	34.3%	50.0%	34.0%
	moderate	Count	36	21	4	61
		% within Severity of Illness	59.0%	34.4%	6.6%	100.0%
		% within Type of provider	62.1%	60.0%	40.0%	59.2%
	high	Count	4	2	1	7
		% within Severity of Illness	57.1%	28.6%	14.3%	100.0%
		% within Type of provider	6.9%	5.7%	10.0%	6.8%
Total		Count	58	35	10	103
		% within Severity of Illness	56.3%	34.0%	9.7%	100.0%
		% within Type of provider	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.823[a]	4	.768
Likelihood Ratio	1.795	4	.773
Linear-by-Linear Association	.604	1	.437
N of Valid Cases	103		

a. 4 cells (44.4%) have expected count less than 5. The minimum expected count is .68.

Crosstabs: Broken out by year

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Severity of Illness * Type of provider * Year patient was seen	103	100.0%	0	.0%	103	100.0%

Severity of Illness * Type of provider * Year patient was seen Crosstabulation

Year patient was seen				Type of provider			Total
				MD/DO	PA	NP	
Year 2000 (January to June)	Severity of Illness	low	Count	11	4	5	20
			% within Severity of Illness	55.0%	20.0%	25.0%	100.0%
			% within Type of provider	37.9%	30.8%	50.0%	38.5%
		moderate	Count	15	8	4	27
			% within Severity of Illness	55.6%	29.6%	14.8%	100.0%
			% within Type of provider	51.7%	61.5%	40.0%	51.9%
		high	Count	3	1	1	5
			% within Severity of Illness	60.0%	20.0%	20.0%	100.0%
			% within Type of provider	10.3%	7.7%	10.0%	9.6%
	Total		Count	29	13	10	52
			% within Severity of Illness	55.8%	25.0%	19.2%	100.0%
			% within Type of provider	100.0%	100.0%	100.0%	100.0%
Year 2001 (January to June)	Severity of Illness	low	Count	7	8		15
			% within Severity of Illness	46.7%	53.3%		100.0%
			% within Type of provider	24.1%	36.4%		29.4%
		moderate	Count	21	13		34
			% within Severity of Illness	61.8%	38.2%		100.0%
			% within Type of provider	72.4%	59.1%		66.7%
		high	Count	1	1		2
			% within Severity of Illness	50.0%	50.0%		100.0%
			% within Type of provider	3.4%	4.5%		3.9%
	Total		Count	29	22		51
			% within Severity of Illness	56.9%	43.1%		100.0%
			% within Type of provider	100.0%	100.0%		100.0%

Chi-Square Tests

Year patient was seen		Value	df	Asymp. Sig. (2-sided)
Year 2000 (January to June)	Pearson Chi-Square	1.121[a]	4	.891
	Likelihood Ratio	1.120	4	.891
	Linear-by-Linear Association	.169	1	.681
	N of Valid Cases	52		
Year 2001 (January to June)	Pearson Chi-Square	1.007[b]	2	.604
	Likelihood Ratio	1.003	2	.606
	Linear-by-Linear Association	.566	1	.452
	N of Valid Cases	51		

a. 4 cells (44.4%) have expected count less than 5. The minimum expected count is .96.

b. 2 cells (33.3%) have expected count less than 5. The minimum expected count is .86.

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Type of provider	1	MD/DO	58
	2	PA	35
	3	NP	10
Severity of Illness	1	low	35
	2	moderate	61
	3	high	7

Tests of Between-Subjects Effects

Dependent Variable: Patients processing time (from time in to time out)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	11.774[a]	8	1.472	2.023	.052
Intercept	119.941	1	119.941	164.879	.000
PROVIDER	.696	2	.348	.479	.621
SEVILLNS	.831	2	.416	.571	.567
PROVIDER * SEVILLNS	7.241	4	1.810	2.489	.049
Error	68.380	94	.727		
Total	392.885	103			
Corrected Total	80.154	102			

a. R Squared = .147 (Adjusted R Squared = .074)

Post Hoc Tests

Type of provider

Multiple Comparisons

Dependent Variable: Patients processing time (from time in to time out)

LSD

(I) Type of provider	(J) Type of provider	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
MD/DO	PA	-6.023E-02	.182555	.742	-.422701	.302233
	NP	-.219282	.292039	.455	-.799132	.360569
PA	MD/DO	6.023E-02	.182555	.742	-.302233	.422701
	NP	-.159048	.305825	.604	-.766270	.448175
NP	MD/DO	.219282	.292039	.455	-.360569	.799132
	PA	.159048	.305825	.604	-.448175	.766270

Based on observed means.

Severity of Illness

Multiple Comparisons

Dependent Variable: Patients processing time (from time in to time out)

LSD

(I) Severity of Illness	(J) Severity of Illness	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
low	moderate	-4.258E-02	.180858	.814	-.401679	.316516
	high	-.819381*	.353136	.022	-1.520541	-.118221
moderate	low	4.258E-02	.180858	.814	-.316516	.401679
	high	-.776799*	.340362	.025	-1.452596	-.101003
high	low	.819381*	.353136	.022	.118221	1.520541
	moderate	.776799*	.340362	.025	.101003	1.452596

Based on observed means.

*. The mean difference is significant at the .05 level.

Oneway

Descriptives

Patients processing time (from time in to time out)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
low	35	1.661571	.681697	.115228	1.427400	1.895743	.5500	3.2000
moderate	61	1.704153	.935258	.119748	1.464622	1.943684	.2167	5.2167
high	7	2.480952	1.135432	.429153	1.430853	3.531052	.9667	4.0000
Total	103	1.742476	.886467	8.73E-02	1.569225	1.915726	.2167	5.2167

Test of Homogeneity of Variances

Patients processing time (from time in to time out)

Levene Statistic	df1	df2	Sig.
1.829	2	100	.166

ANOVA

Patients processing time (from time in to time out)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.136	2	2.068	2.720	.071
Within Groups	76.018	100	.760		
Total	80.154	102			

Post Hoc Tests

Multiple Comparisons

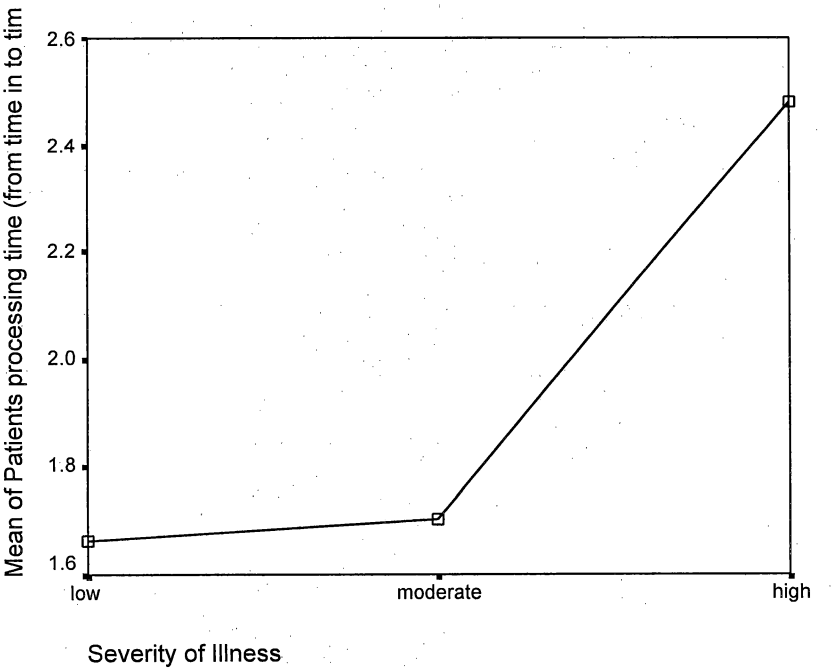
Dependent Variable: Patients processing time (from time in to time out)

LSD

(I) Severity of Illness	(J) Severity of Illness	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
low	moderate	-4.258E-02	.184882	.818	-.409382	.324219
	high	-.819381*	.360994	.025	-1.535582	-.103180
moderate	low	4.258E-02	.184882	.818	-.324219	.409382
	high	-.776799*	.347935	.028	-1.467093	-8.6506E-02
high	low	.819381*	.360994	.025	.103180	1.535582
	moderate	.776799*	.347935	.028	8.65059E-02	1.467093

*. The mean difference is significant at the .05 level.

Means Plots

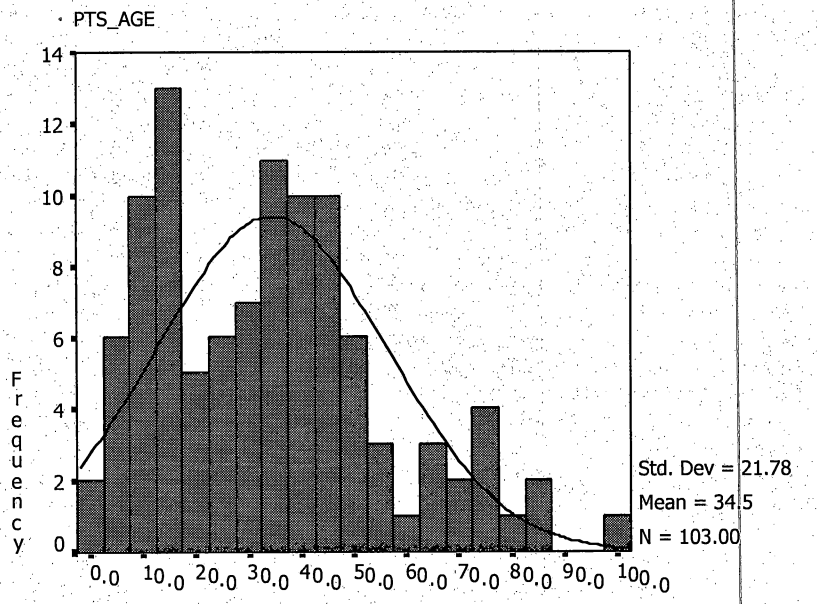


Case Processing Summary

		Cases					
		Valid		Missing		Total	
	Severity of Illness	N	Percent	N	Percent	N	Percent
Patients processing time (from time in to time out)	low	20	100.0%	0	.0%	20	100.0%
	moderate	27	100.0%	0	.0%	27	100.0%
	high	5	100.0%	0	.0%	5	100.0%

Descriptives

	Severity of Illness			Statistic	Std. Error
Patients processing time (from time in to time out)	low	Mean		1.795250	.144040
		95% Confidence Interval for Mean	Lower Bound	1.493772	
			Upper Bound	2.096728	
		5% Trimmed Mean		1.785185	
		Median		1.658333	
		Variance		.415	
		Std. Deviation		.644165	
		Minimum		.6383	
		Maximum		3.1333	
		Range		2.4950	
		Interquartile Range		.950000	
		Skewness		.320	.512
		Kurtosis		-.451	.992
	moderate	Mean		1.923580	.180564
		95% Confidence Interval for Mean	Lower Bound	1.552427	
			Upper Bound	2.294734	
		5% Trimmed Mean		1.842867	
		Median		1.750000	
		Variance		.880	
		Std. Deviation		.938236	
		Minimum		.6667	
		Maximum		5.2167	
		Range		4.5500	
		Interquartile Range		1.200000	
		Skewness		1.584	.448
		Kurtosis		4.671	.872
	high	Mean		1.946667	.365544
		95% Confidence Interval for Mean	Lower Bound	.931755	
			Upper Bound	2.961579	
		5% Trimmed Mean		1.942593	
		Median		2.133333	
		Variance		.668	
		Std. Deviation		.817381	
		Minimum		.9667	
		Maximum		3.0000	
		Range		2.0333	
		Interquartile Range		1.533333	
		Skewness		.016	.913
		Kurtosis		-1.414	2.000



Group Statistics

	Year patient was seen	N	Mean	Std. Deviation	Std. Error Mean
PTS_AGE	Year 2000 (January to June)	52	34.7416	21.2866	2.9519
	Year 2001 (January to June)	51	34.2538	22.4854	3.1486

Descriptives

Patients processing time (from time in to time out)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
low	12	1.295833	.488976	.141155	.985153	1.606514	.5500	2.1667
moderate	21	1.975397	1.042868	.227572	1.500689	2.450104	.2167	4.7500
high	2	2.300000	1.885618	1.333333	-14.641606	19.241606	.9667	3.6333
Total	35	1.760952	.971354	.164189	1.427281	2.094624	.2167	4.7500

Test of Homogeneity of Variances

Patients processing time (from time in to time out)

Levene Statistic	df1	df2	Sig.
4.098	2	32	.026

ANOVA

Patients processing time (from time in to time out)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.143	2	2.071	2.373	.109
Within Groups	27.937	32	.873		
Total	32.080	34			

Post Hoc Tests

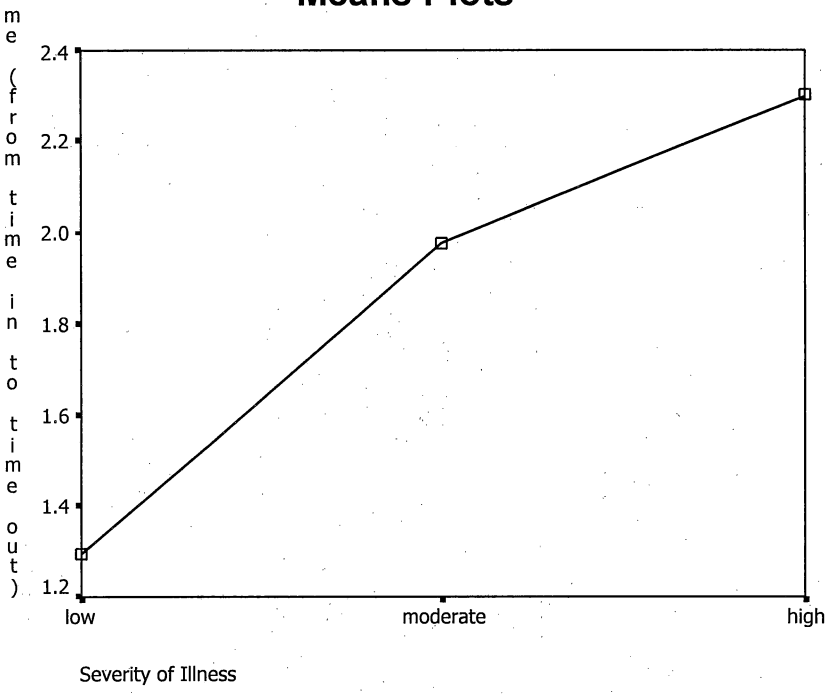
Multiple Comparisons

Dependent Variable: Patients processing time (from time in to time out)

LSD

(I) Severity of Illness	(J) Severity of Illness	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
low	moderate	-.679563	.338121	.053	-1.368294	9.16656E-03
	high	-1.004167	.713631	.169	-2.457786	.449453
moderate	low	.679563	.338121	.053	-9.1666E-03	1.368294
	high	-.324603	.691440	.642	-1.733021	1.083815
high	low	1.004167	.713631	.169	-.449453	2.457786
	moderate	.324603	.691440	.642	-1.083815	1.733021

Means Plots



Oneway: NPs only (processing time by severity of illness)

Warnings

Post hoc tests are not performed for Patients processing time (from time in to time out) because at least one group has fewer than two cases.

Descriptives

Patients processing time (from time in to time out)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
low	5	2.060000	.661291	.295738	1.238899	2.881101	1.4167	3.1333
moderate	4	1.900000	.706583	.353291	.775669	3.024331	1.2667	2.6667
high	1	1.300000	.	.	.	.	1.3000	1.3000
Total	10	1.920000	.643860	.203606	1.459410	2.380590	1.2667	3.1333

Test of Homogeneity of Variances

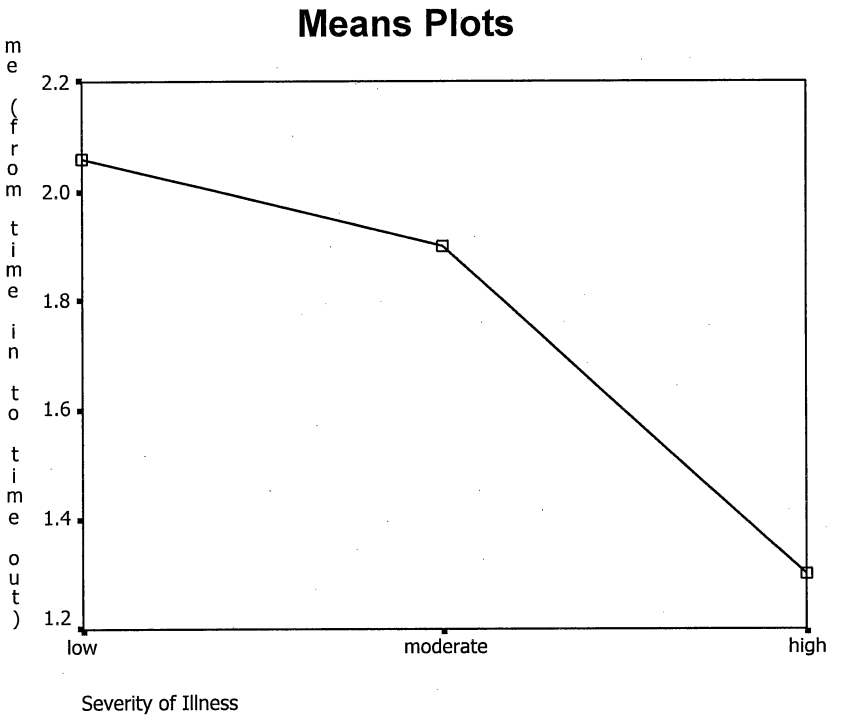
Patients processing time (from time in to time out)

Levene Statistic	df1	df2	Sig.
1.211	2	7	.354

ANOVA

Patients processing time (from time in to time out)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.484	2	.242	.522	.615
Within Groups	3.247	7	.464		
Total	3.731	9			



Oneway

Descriptives

Patients processing time (from time in to time out)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
MD/DO	58	1.700718	.877744	.115253	1.469927	1.931509	.5500	5.2167
PA	35	1.760952	.971354	.164189	1.427281	2.094624	.2167	4.7500
NP	10	1.920000	.643860	.203606	1.459410	2.380590	1.2667	3.1333
Total	103	1.742476	.886467	8.73E-02	1.569225	1.915726	.2167	5.2167

Test of Homogeneity of Variances

Patients processing time (from time in to time out)

Levene Statistic	df1	df2	Sig.
.880	2	100	.418

ANOVA

Patients processing time (from time in to time out)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.428	2	.214	.269	.765
Within Groups	79.726	100	.797		
Total	80.154	102			

Post Hoc Tests

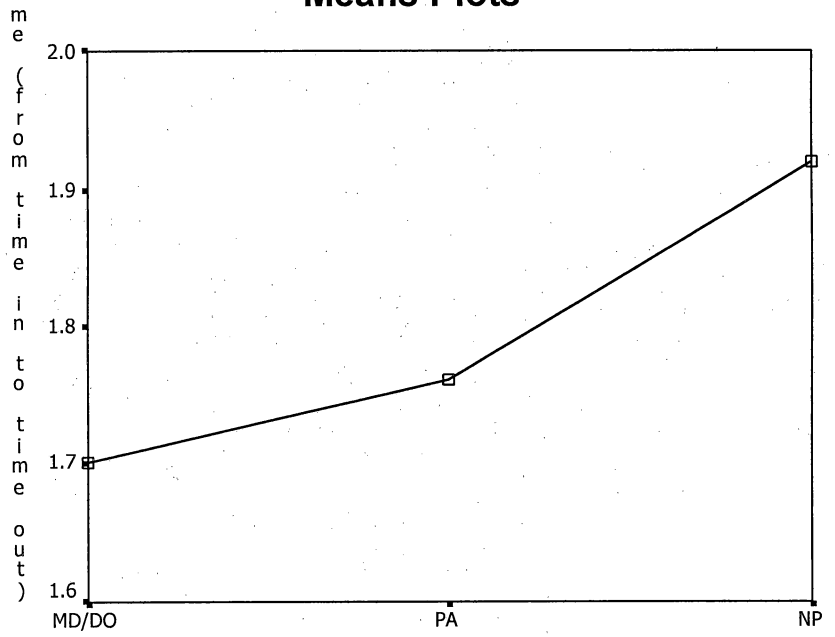
Multiple Comparisons

Dependent Variable: Patients processing time (from time in to time out)

LSD

(I) Type of provider	(J) Type of provider	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
MD/DO	PA	-6.023E-02	.191114	.753	-.439399	.318931
	NP	-.219282	.305731	.475	-.825844	.387280
PA	MD/DO	6.023E-02	.191114	.753	-.318931	.439399
	NP	-.159048	.320163	.620	-.794242	.476147
NP	MD/DO	.219282	.305731	.475	-.387280	.825844
	PA	.159048	.320163	.620	-.476147	.794242

Means Plots



Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Type of provider	1	MD/DO	58
	2	PA	35
	3	NP	10
Year patient was seen	0	Year 2000 (January to June)	52
	1	Year 2001 (January to June)	51

Tests of Between-Subjects Effects

Dependent Variable: Patients processing time (from time in to time out)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2.183[a]	4	.546	.686	.603
Intercept	238.996	1	238.996	300.389	.000
PROVIDER	.188	2	9.415E-02	.118	.889
YEAR	1.354	1	1.354	1.702	.195
PROVIDER * YEAR	8.000E-02	1	8.000E-02	.101	.752
Error	77.971	98	.796		
Total	392.885	103			
Corrected Total	80.154	102			

a. R Squared = .027 (Adjusted R Squared = -.012)

Oneway: Year 2000

Descriptives

Patients processing time (from time in to time out)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
MD/DO	29	1.858908	.926757	.172095	1.506388	2.211428	.6383	5.2167
PA	13	1.882051	.698360	.193690	1.460037	2.304066	.9667	2.9333
NP	10	1.920000	.643860	.203606	1.459410	2.380590	1.2667	3.1333
Total	52	1.876442	.812409	.112661	1.650266	2.102618	.6383	5.2167

Test of Homogeneity of Variances

Patients processing time (from time in to time out)

Levene Statistic	df1	df2	Sig.
.343	2	49	.711

ANOVA

Patients processing time (from time in to time out)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.830E-02	2	1.415E-02	.021	.980
Within Groups	33.632	49	.686		
Total	33.660	51			

Post Hoc Tests

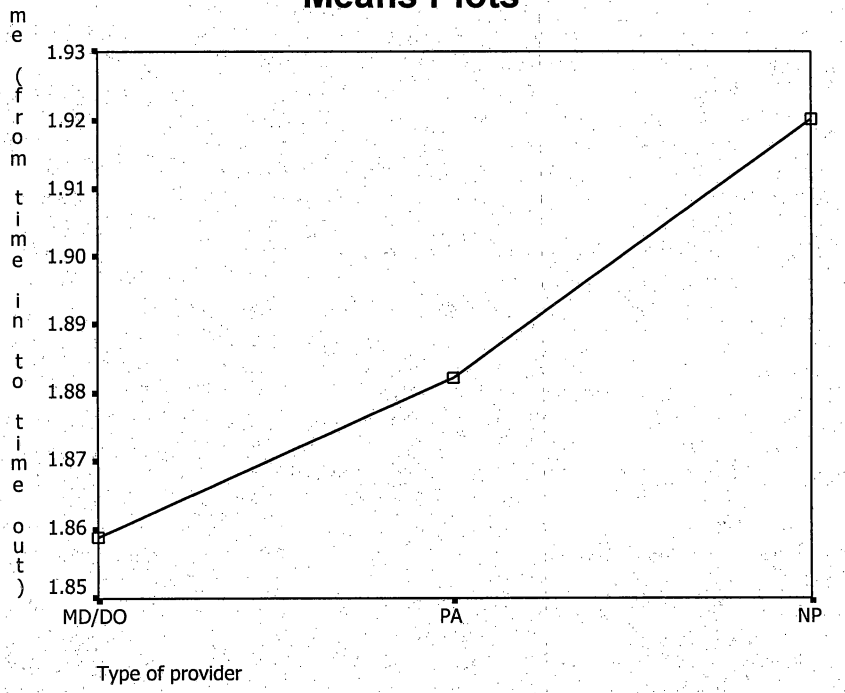
Multiple Comparisons

Dependent Variable: Patients processing time (from time in to time out)

LSD

(I) Type of provider	(J) Type of provider	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
MD/DO	PA	-2.314E-02	.276524	.934	-.578839	.532553
	NP	-6.109E-02	.303817	.841	-.671635	.549451
PA	MD/DO	2.314E-02	.276524	.934	-.532553	.578839
	NP	-3.795E-02	.348475	.914	-.738235	.662337
NP	MD/DO	6.109E-02	.303817	.841	-.549451	.671635
	PA	3.795E-02	.348475	.914	-.662337	.738235

Means Plots



Oneway: Year 2001

Warnings

Post hoc tests are not performed for Patients processing time (from time in to time out) because there are fewer than three groups.

Descriptives

Patients processing time (from time in to time out)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
MD/DO	29	1.542529	.810969	.150593	1.234053	1.851005	.5500	4.0000
PA	22	1.689394	1.111074	.236882	1.196771	2.182017	.2167	4.7500
Total	51	1.605882	.944551	.132264	1.340223	1.871541	.2167	4.7500

Test of Homogeneity of Variances

Patients processing time (from time in to time out)

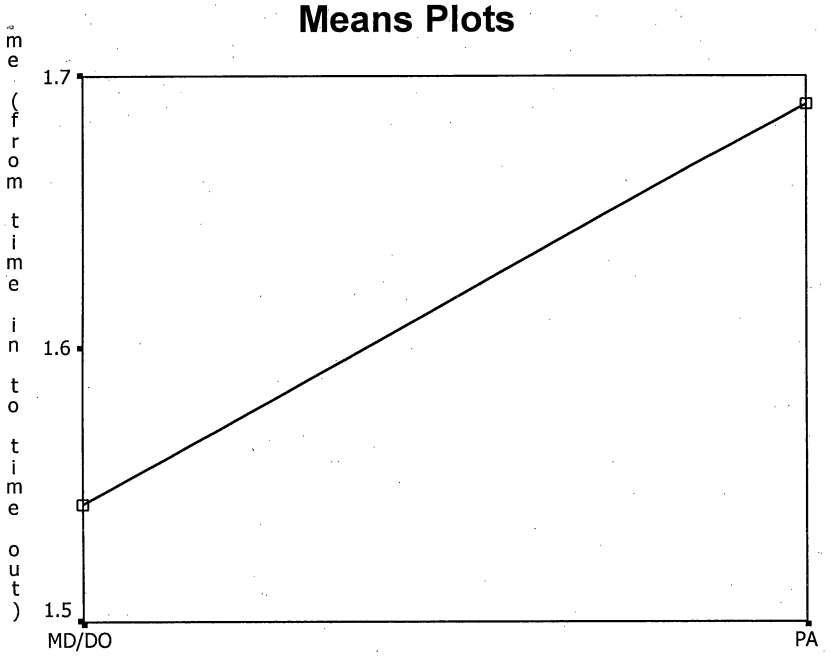
Levene Statistic	df1	df2	Sig.
2.144	1	49	.150

ANOVA

Patients processing time (from time in to time out)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.270	1	.270	.298	.587
Within Groups	44.339	49	.905		
Total	44.609	50			

Means Plots



APPENDIX C

ANNALS OF EMERGENCY MEDICINE

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Original Contributions

Frequent use of the hospital emergency department is indicative of high use of other health care services

Helen Hansagi, PhD* [MEDLINE LOOKUP]
Mariann Olsson, PhD‡ [MEDLINE LOOKUP]
Stefan Sjöberg, MD, PhD§ [MEDLINE LOOKUP]
Ylva Tomson, MD, PhD‖ [MEDLINE LOOKUP]
Sara Göransson, BA* [MEDLINE LOOKUP]

Sections

Abstract

TOP

Study objective: We sought to determine the proportion of emergency department patients who frequently use the ED and to compare their frequency of use of other health care services at non-ED sites.
Methods: A computerized patient database covering all ambulatory visits and hospital admissions at all care facilities in the county of Stockholm, Sweden, was used. Frequent ED patients were defined as those making 4 or more visits in a 12-month period.
Results: Frequent users comprised 4% of total ED patients, accounting for 18% of the ED visits. The ED was the only source of ambulatory care for 13% of frequent versus 27% of rare ED users (1 ED visit). Primary care visits were made by 72% of frequent ED users versus 57% by rare ED visitors. The corresponding figures for hospital admission were 80% and 36%, respectively. Frequent ED visitors were also more likely to use other care facilities repeatedly:

their odds ratio (adjusted for age and sex) was 3.43 (95% confidence interval [CI] 3.10 to 3.78) for 5 or more primary care visits and 29.98 (95% CI 26.33 to 34.15) for 5 or more hospital admissions. In addition, heavy users had an elevated mortality (standardized mortality ratio 1.55; 95% CI 1.26 to 1.90).
Conclusion: High ED use patients are also high users of other health care services, presumably because they are sicker than average. A further indication of serious ill health is their higher than expected mortality. This knowledge might be helpful for care providers in their endeavors to find appropriate ways of meeting the needs of this vulnerable patient category.
[Hansagi H, Olsson M, Sjöberg S, Tomson Y, Göransson S. Frequent use of the hospital emergency department is indicative of high use of other health care services. *Ann Emerg Med.* June 2001;37:561-567.]

See editorial, p. 627.

Introduction

TOP

Hospital emergency departments are designed to provide highly professional medical treatment, with immediate availability of special resources to those in need of urgent or emergency care at any time of day or night. However, regardless of how health care systems are organized, the function of the ED has gradually changed during the last decades.[1-4] Studies from several Western countries have demonstrated that patients also often rely on the ED for health problems other than emergencies.[5-7] A subgroup of patients use the ED frequently and constitute a considerable proportion of the total number of visits.[8-11] Many of these visits by heavy ED users are for conditions that medical personnel view as nonurgent and that therefore could be more adequately managed in primary care settings.[12,13] It has been suggested that the reasons for overreliance on the ED—aside from the around-the-clock availability, high-technology equipment, convenience, and socioeconomics among others—may be that patients lack a regular source of ambulatory care[14,15] or that they identify the ED as their regular source of care.[16,17]

Whether the ED is the only source of care for heavy ED users or whether they also use additional health care facilities has not previously been studied. Such knowledge should be of importance for both the medical treatment of the individual patient and for health care planning. Studies that have attempted to assess ED patients' use of other care sites usually encompassed short time periods before or after the current ED visit; moreover, these studies relied on patients' own accounts.[14-17] The aim of our study was to determine the number of individual users of a hospital ED during a 1-year period, to ascertain the proportion of frequent ED users, and then to relate use of health care services at other sites to frequency of ED visits. A computerized patient database covering all public health care services enabled us to conduct this investigation.

Materials and methods

TOP

We conducted our study at Huddinge University Hospital, 1 of 10 public hospitals in Stockholm County, Sweden, and located in a suburban area of Stockholm city. This hospital ED has an average census of 70,000 visits per year.

Health care delivery in Sweden has traditionally been the concern of public authorities, namely the county councils, and all residents are covered by the national health insurance system, which is financed primarily by taxes. All physicians, including the majority of those who are in private practice, are attached to the national health insurance system. All fees are regulated by law and are only slightly higher in private practice than in the public health care sector. As a result, less than 1% of the health care sector is genuinely privately financed. Furthermore, health care has been more hospital-oriented than in most other countries, including the United States. During the past 2 decades, the primary health care system has expanded greatly, and primary care is now organized in health care centers, each serving the population of a certain geographic area, but also with freedom for the individual to list himself or herself with a general practitioner in any other area (similar to the British system). Although patients are encouraged to consult their local health care center first in case of sickness or minor injuries, they are free to visit an ED.

There is a copayment for visits to all types of public health care facilities, and during the past few years, this copayment has been differentiated with the intent of directing the patient flow away from hospitals. Currently, the copayment at a hospital ED or any other hospital outpatient department is double the copayment for consulting a general practitioner (approximately $24 versus $12). However, the insurance system places an upper limit on the patient's out-of-pocket expenses per year for ambulatory health care: no one need pay more than 900 Swedish Crowns (SEK; US$90) per year (dentistry excluded). For example, if a patient made a number of medical visits between May and the end of September 1999 at a total cost of 900 SEK, then she or he is entitled to free ambulatory health care from October 1999 through April 2000. Information on whether a patient has reached the upper limit for payment is available from the computerized patient database at each care site in the county.

Any individual who visited the Huddinge Hospital ED between January 1 and December 31, 1996, was eligible for the study. Observations of these individuals' total use of public health care facilities in the county during this period were compiled retrospectively from the patient database. The database contains patient information (name, sex, age, and domicile), as well as information about each resident's health care visits and hospitalizations at all public health care facilities (date of visit, admission, discharge, care site, and death). The unique patient identifier in the register is the personal identification number (date of birth plus 4 digits). For this study, however, each patient was assigned a separate code number, which allowed us to trace each person's use of different health care facilities without revealing the patient's identity (but with information on, for example, age, sex, and domicile). This system can be used by researchers and administrators. The key to the code system is held and safeguarded by those responsible for the patient database and is surrounded by rigorous security regulations. The study was approved by the hospital's human subjects committee, and because the patients were anonymous and otherwise unidentifiable by the researchers, the committee exempted it from the need for informed consent from the subjects.

Patients were categorized into ED classes on the basis of their number of ED visits during the year (ED class A=1 ED visit, rare visitors; class B=2 ED visits; class C=3 ED visits; and class D=4 or more ED visits, frequent visitors). The patients in these ED classes comprised the units of analysis. We used ^{2} tests to determine the statistical significance of differences between ED

classes with regard to sex and age groups (birth to 14, 15 to 44, 45 to 64, or 65 years). Health care use was determined by the number of individuals in each ED class who made any physician visits at care sites other than at the Huddinge Hospital ED or were admitted for in-hospital care, as well as by the number of visits and admissions per ED class. To test trends of use through ED classes, the Cochran-Armitage test for trend was used.[18] Multiple logistic regression analyses were performed to test the likelihood of high use of care sites other than the ED. The dependent variable, designating high use, was dichotomized as follows: 5 or more physician visits in primary health care; 5 or more hospital outpatient visits; 5 or more hospital admissions; and 30 or more hospital days. Independent variables were ED class, sex, and age (10-year intervals). ED class A (rare visitors) was used as the reference class, and odds ratios were computed with 95% confidence intervals (CIs). Likelihood-ratio tests for the overall models and Hosmer-Lemeshow model goodness-of-fit analyses were performed.[19] For easier interpretation, odds ratios were converted to relative risks (RRs).[20,21]

Diagnoses are registered for less than 30% of ED visits in the database, and therefore we compiled only the top 100 frequent ED visitors' diagnoses (the first diagnosis for each individual connected with an ED visit). They were coded according to the *International Classification of Diseases, 9th revision (ICD-9).* Mortality in ED classes was determined by comparing the observed numbers of deaths in each ED class with the corresponding expected numbers on the basis of the total study population's sex- and age-specific death rate (10-year intervals). Standardized mortality ratios (SMRs) were obtained by dividing the number of observed deaths by the number of expected deaths, and 95% CIs were calculated. Test for trend in SMR was obtained by fitting Poisson regression models with the logarithm of the expected number of deaths, as offset in the GENMOD procedure.

The statistical package SPSS/PC for Windows (version 9.0; SPSS Inc, Chicago, IL) was used for all statistical analyses, except for test for trend in SMR, in which SAS (version 6.1; SAS Institute, Inc., Cary, NC) was used.

Results

TOP

During the study period, 47,349 individuals made a total of 70,700 visits to the hospital ED. The majority of the patients (74%) sought care at the ED once during the year (ED class A). Frequent ED users (4 visits, mean=6.0, ED class D) comprised only 4% of total patients but accounted for 18% of all the visits to the ED (Table 1).

Table 1. Patient characteristics by ED class.

	ED Class (No. of ED Visits per Patient)				
Characteristic	**A (1) No. (%) 34,881 (74)**	**B (2) No. (%) 7,963 (17)**	**C (3) No. (%) 2,358 (5)**	**D (4+) No. (%) 2,147 (4)**	**Total No. (%) 47,349 (100)**
Age (y)					
0–14	6,629 (19)	1,406 (18)	378 (16)	313 (14)	8,726 (18)
15–44	14,498 (42)	3,086 (39)	790 (33)	671 (31)	19,045 (40)

45–64	7,270 (21)	1,553 (20)	466 (20)	485 (23)	9,774 (21)
65*	6,484 (18)	1,918 (24)	724 (31)	678 (32)	9,804 (21)
Sex					
Male	16,961 (49)	3,783 (47)	1,063 (45)	1,050 (49)	22,863 (48)
Female	17,908 (51)	4,177 (53)	1,295 (55)	1,097 (51)	24,486 (52)
ED visits	34,881 (49)	15,926 (23)	7,074 (10)	12,819 (18)	70,700 (100)

*Cochran-Armitage test for trend through ED classes, $P<.001$.

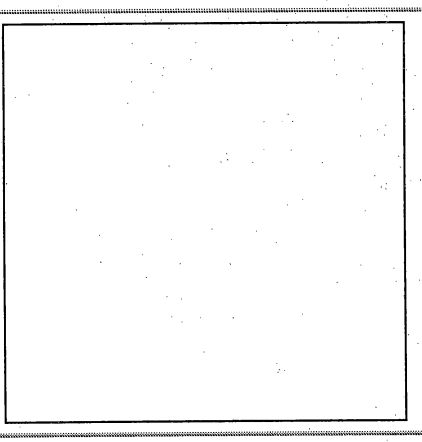
The top 100 patients visited the ED 12 to 74 times each, averaging 19.5 visits. Within ED class D, the proportion of women was insignificantly higher than that of men (51% versus 49%, $^2=1.029$, $P=.310$). The proportion of elderly patients (65 years) was significantly higher, the higher the ED class (Cochran-Armitage test for trend, $P<.001$; Table 1□).

In addition to their visits to our hospital ED, the patients made at least one visit to other hospital EDs in the county as well: 13% of patients in ED class A; 15% in class B; 18% in class C; and 26% in class D (test for trend, $P<.001$). Including these visits, the average number of ED visits would be 1.3 in ED class A, 2.4 in class B, 3.4 in class C, and 7.1 in class D.

Visits to physicians in primary care in the county were made by 57% of patients in ED class A, 62% in class B, 69% in class C, and 72% in class D (test for trend, $P<.001$). Visits to hospital outpatient departments were made by 43% of patients in class A, 49% in class B, 57% in class C, and 59% in class D (test for trend, $P<.001$). The ED was the only source of ambulatory care for 27% of patients in class A, 23% in class B, 17% in class C, and 13% in class D (test for trend, $P<.001$). Admitted one or more times to in-hospital care were 36% of patients in class A, 53% in class B, 71% in class C, and 80% in class D (test for trend, $P<.001$).

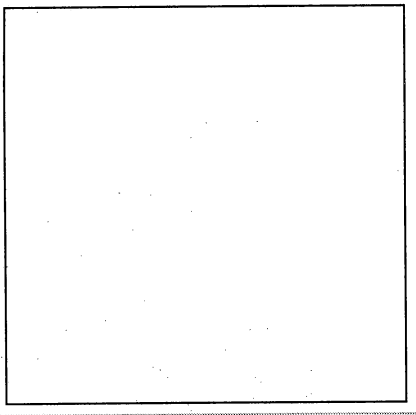
The number of ambulatory visits and hospital admissions increased with increasing frequency of ED visits within the age groups as well, as shown in Figures 1 and 2.

Fig. 1. Average number of physician visits in primary health care and at hospitals by age group and ED class.



Click on Image to view full size

Fig. 2. Average number of hospital admissions by age group and ED class.



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The frequent ED users' propensity to make high use of other care sites as well was also evidenced in a logistic regression model adjusted for age and sex (Table 2).

Table 2. Logistic regression models for high use of care sites other than the ED by ED class (No. of ED visits per patient) adjusted for age (10-year intervals) and sex.

	Primary Care* (5 Visits)				Hospital Outpatient Department† (5 Visits)			
ED Class	**No. of Patients**	**OR**	**95% CI**	***P* Value**	**No. of Patients**	**OR**	**95% CI**	***P* Value**
A (1)	4,001	1.0	—	—	2,169	1.0	—	—
B (2)	1,445	1.62	1.51–1.73	<.001	607	1.23	1.12–1.35	<.001
C (3)	571	2.15	1.93–2.38	<.001	237	1.64	1.43–1.89	<.001
D (4)	716	3.43	3.10–3.78	<.001	223	1.69	1.46–1.95	<.001

ED Class	**In-Hospital Care ‡ (5 Admissions)**	**In-Hospital Care § (30 d)**
A (1)		

	No. of Patients	OR	95% CI	*P* Value	No. of Patients	OR	95% CI	*P* Value
B (2)	533	1.0	—	—	1,067	1.0	—	—
C (3)	336	2.58	2.24–2.97	<.001	568	2.22	1.99–2.47	<.001
D (4)	262	6.67	5.69–7.82	<.001	353	4.64	4.06–5.31	<.001
	714	29.98	26.33–34.15	<.001	567	9.96	8.83–11.22	<.001

OR, Odds ratio.
*Likelihood ratio test for model: ^{2}=3,061.20, *P*<.0001; Hosmer-Lemeshow goodness of fit: ^{2}=76.22, *P*<.0001.
†Likelihood ratio test for model: ^{2}=135.18, *P*<.0001; Hosmer-Lemeshow goodness of fit: ^{2}=35.50, *P*<.0001.
‡Likelihood ratio test for model: ^{2}=4,005.32, *P*<.0001; Hosmer-Lemeshow goodness of fit: ^{2}=8.98, *P*=.254.
§Likelihood ratio test for model: ^{2}=3,369.66, *P*<.0001; Hosmer-Lemeshow goodness of fit: ^{2}=11.74, *P*=.110.

Converted to RRs (Table 3), the frequent ED users' RR was 1.89 (95% CI 1.71 to 2.09) to make 5 or more visits to primary care physicians and 1.58 (1.36 to 1.82) to make 5 or more visits to hospital outpatient departments.

Table 3. Odds ratios from the logistic regression models in Table 2 converted to RRs.

	Primary Care (5 Visits)				Hospital OutpatientDepartment (5 Visits)				In-Hospital Care (5 Admissions)			
ED Class	No. of Patients	RR	95% CI	*P* Value	No. of Patients	RR	95% CI	*P* Value	No. of Patients	RR	95% CI	*P* Value
A (1)	4,001	1.0	—	—	2,169	1.0	—	—	533	1.0	—	—

B (2)	1,445	1.46	1.36–1.56	<.001	607	1.21	1.10–1.33	<.001	336	2.42	2.10–2.78	<.001
C (3)	571	1.68	1.51–1.86	<.001	237	1.54	1.34–1.78	<.001	262	4.09	3.49–4.80	<.001
D (4)	716	1.89	1.71–2.09	<.001	223	1.58	1.36–1.82	<.001	714	2.81	2.48–3.21	<.001

Table 3. Odds ratios from the logistic regression models in Table 2 ▫ converted to RRs.

		In-Hospital Care (30 d)		
ED Class	**No. of Patients**	**RR**	**95% CI**	***P* Value**
A (1)	1,067	1.0	—	—
B (2)	568	2.04	1.83–2.27	<.001
C (3)	353	3.00	2.63–3.44	<.001
D (4)	567	2.96	2.62–3.33	<.001

In addition, frequent ED users were more likely to have been admitted 5 or more times to in-hospital care (RR 2.81; 95% CI 2.48 to 3.21) and to have had 30 or more hospital days (RR 2.96; 95% CI 2.62 to 3.33).

Of the 100 most frequent ED users, a diagnosis code connected with an ED visit was registered for 71 patients. Respiratory diseases (*ICD-9* codes 460-519) accounted for 23 patients, of whom 9 were diagnosed with asthma (code 493). Mental diseases (codes 290-319) were present for 7 patients, 4 of whom evidenced alcohol-drug dependence (codes 303-305). Symptoms and ill-defined conditions (codes 780-799) were registered for 23 patients, and the remaining 18 were given other codes. Only 2 patients were registered as having chronic diabetes (code 250), and 1 as having circulatory disease (410-456).

A total of 873 (1.8%) patients died during the year. The SMR was higher, the higher the ED class: 0.88 (95% CI 0.81 to 0.96) in ED class A; 1.10 (95% CI 0.95 to 1.27) in class B; 1.35 (95% CI 1.09 to 1.68) in class C; and 1.55 (95% CI 1.26 to 1.90) in class D (test for trend, $P<.0001$).

Discussion

TOP

The computerized patient database provided valid data on overall health care use by ED patients. Studies with similar aims undertaken before the data era were, of necessity, restricted to interviewing patients, a method that is subject to the inherent weaknesses of self-reports, such as memory bias or unwillingness to answer. In the present study the compilation of data concerning use of different health care sources was unproblematic because of a unique patient

identifier. Because the private health care sector that is not attached to the health insurance system is very small in Sweden, the coverage of the county database is at minimum 95%. One limitation to the study is that because the county councils' patient databases are not shared, we have no data on our patients' use of health care sites outside of the county. However, there is no reason to believe that information on such additional use should weaken the associations found.

One weakness of the database is that diagnoses concerning ambulatory visits are not compulsory. Therefore, we could only quantify the care use of the ED and of other ambulatory care settings but not analyze the reasons for the patients' visits. On the other hand, categorization of frequent ED users by diagnosis may not be practical because patients may have different reasons for each visit and also obtain different diagnoses. Because we assumed that the more ED visits patients made, the greater the chance that a diagnosis would be registered, we compiled the diagnoses of the top 100 frequent ED users. However, even for these very frequent ED visitors, the proportion of symptoms and ill-defined conditions or missing data was roughly 50%. Respiratory diseases, including asthma, were the single most frequently registered diagnoses for these high ED users. It should be noted that we do not know whether these were definite diagnoses or suspected conditions on the basis of the patient's presenting complaints. These findings regarding diagnoses should therefore be considered with great caution. An accurate study of the presenting complaints and diagnoses set at the ED would have required a review of clinical records, an approach that was not possible to apply because the patients in the database were anonymous. In studies in which clinical records were reviewed, frequent ED users showed high rates of multiple chronic medical conditions, often in combination with psychiatric diagnoses, including alcohol and substance abuse.[8,22-24]

In conformity with other studies from Western countries,[8-10,23] analysis of the data suggests that a small number of patients accounts for a disproportionately large proportion of the total number of ED visits, although no US study, to our knowledge, has made an exact assessment on the basis of a total ED patient population. The finding that 4% of the patients at a hospital ED accounted for 18% of the ED visits can be compared with a study from Ireland,[9] in which 3% of patients were found to have made 12% of the visits, with the definition in both cases being 4 or more visits per patient per year. In our study, these frequent visitors made additional use of other EDs as well. However, although patients in our study relied heavily on the ED, with up to 74 visits per patient per year, only about 10% of frequent ED users received all their ambulatory care from the ED. This finding contrasted with an American study[23] in which a sample of frequent ED users received most of their ambulatory care at the ED. Increasing frequency of ED visits was not only associated in our study with increasing percentages of patients who used other health care services besides the ED, but it was also associated with increasing amounts of care at other sites. Because we controlled for age and sex in the analyses, the associations cannot be explained by the fact that elderly patients were more likely to be both frequent ED users and to use other health care facilities. For example, compared with rare ED users, frequent ED users were nearly twice as likely to be frequent users of primary care as well (5 visits), whereas patients with 2 or 3 ED visits took a middle position regarding primary care use. High ED use patients also received large amounts of in-hospital care; however, patients with 3 ED visits surpassed them with regard to the likelihood of being admitted 5 or more times. The relative risk of having had 30 or more hospital days was threefold both for frequent ED users and for those with 3 ED visits. The dichotomization limits (5 visits and 30 hospital days, respectively) can, of course, be criticized for being somewhat arbitrary. Our intention was to find cutting points where the differences between ED classes appeared obvious.

In several studies, frequent ED users are defined as those making 4 or more ED visits per year.[8,10,11,24] However, other studies use 2 or more ED visits[13,16] or other classifications.[22,23] Our grouping of patients into 4 ED classes makes comparisons with other studies possible; moreover, it brings out the gradual increase of alternative health care use with an increasing number of ED visits.

The most natural explanation for the extensive health care use by heavy ED users would, of course, be that these patients are seriously ill and are therefore in great need of medical care. Several studies have indeed shown heavy ED users to be a medically and psychosocially vulnerable group.[8,10,11,13-17,22,23] The high rates of hospital admissions in particular, which were found in the present study, and a higher than expected mortality, similar to that found in other studies,[8,24] suggest a severity of medical conditions. There is general agreement that patients who seek care at EDs have health care needs that deserve some kind of medical attention,[6-17] although it is occasionally argued that this should be done at care sites more appropriate than the ED.[9,12,25] Still others argue that these patients' access to the ED should not be limited because high ED use may be an indicator that the health care needs have not been met in other care settings.[11,26]

Patients who repeatedly seek care at busy EDs for complaints judged by the staff to be nonurgent are, by necessity, given low priority. Apart from the risk of overlooking true health hazards, the consequences may be long waiting times, occasionally dissatisfied patients,[27,28] and even patients who leave without being seen by a physician.[12,29] In addition, large quantities of professional health care do not necessarily equate with adequate high-quality care. Treatment, medications, and advice from different care sources might even be contradictory, which may have adverse effects. This risk is particularly obvious in the Swedish system, where hospital-based care and primary care are largely separate from each other. The risk might be smaller in countries where general practitioners or family physicians have continuing contact with the ED and other hospital departments concerning the treatment of their patients. General practitioners visiting their patients in the hospital, which seems to occur in the United States, is, for example, an unknown phenomenon in Sweden. Another difference between health care systems may be financial, that is, whether it is less expensive for the patient to seek care at the ED than at other care settings. In the Swedish case, financial barriers are unlikely to underlie the high use of the ED in combination with other care sites because the fee for ED care is higher before the upper limit for copayment is reached, and after the limit is reached, ambulatory care is free at any site.

The results of the study can probably be generalized to other populations where patients have similar freedom to choose their caregivers, for example, nonindigent populations who have good health insurance policies in the United States. An important implication of our finding that frequent ED users also make extensive use of other care sources is that it might not be sufficient simply to divert patients to primary care settings because these patients may already be receiving care there. Although there is a widely held belief that access to primary care services would significantly reduce the use of the ED, our results rather support the findings of those studies that suggest that availability of a primary care physician does not alter ED use.[11,15]

In summary, frequent ED use is indicative of high use of other health care services as well. What lies behind this high use cannot be determined on the basis of this patient database study. It is, however, reasonable to assume that it reflects care needs because of serious ill health, a conclusion that is supported by the higher than expected mortality. Because

availability and access to primary care services alone do not reduce ED use, it is important that care providers find alternative ways of meeting the needs of this vulnerable group of patients.

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Publishing and Reprint Information

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- *From the Department of Clinical Neuroscience, Karolinska Hospital, Stockholm, Sweden*; and the Department of Medicine,‡ the Department of Medicine and Emergency Department,§ and the Department of Clinical Sciences, Family Medicine,‖ Huddinge University Hospital, Stockholm, Sweden. All authors are affiliated with Karolinska Institute, Stockholm.*

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- *Address for reprints: Helen Hansagi, PhD, Department of Clinical Neuroscience, Karolinska Hospital M4:04, S-171 76 Stockholm, Sweden; +46 8 5177 16 54, fax +46 8 5177 66 15; E-mail mailto:helen.hansagi@cspo.sll.se*

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Articles with References to this Article

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A 5-Year Time Study Analysis of Emergency Department Patient Care Efficiency

Demetrios N Kyriacou, MD, PhD [MEDLINE LOOKUP]
Vena Ricketts, MD [MEDLINE LOOKUP]
Pamela L Dyne, MD [MEDLINE LOOKUP]
Maureen D McCollough, MD, MPH [MEDLINE LOOKUP]
David A Talan, MD [MEDLINE LOOKUP]

Sections

Abstract

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Study objectives: We conducted a 5-year time study analysis of emergency department patient care efficiency. Our specific aims were (1) to calculate the main ED patient care time intervals to identify areas of inefficiency, (2) to measure the effect of ED and inpatient bed availability on patient flow, (3) to quantitatively assess the effects of administrative interventions aimed at improving efficiency, and (4) to evaluate the relationship between waiting times to see a physician and the number of patients who leave without being seen (LWBS) by a physician.
Methods: Seven 1-week ED patient flow time studies were conducted from September 1993 to July 1998 using identical study design and methodology. Patients presenting with complaints of chest pain, abdominal pain, vaginal bleeding, and extremity injury were included to represent the level of severity of patient conditions seen in our Los Angeles County hospital ED. The calculated time intervals representing the main phases of evaluation and treatment

were (1) triage presentation to completion of registration, (2) completion of registration to ED treatment area entry, (3) ED treatment area entry to initial medical assessment, (4) triage presentation to initial medical assessment, (5) initial medical assessment to disposition order, and (6) disposition order to patient discharge from the ED. Total ED lengths of stay (LOS) were also calculated as overall measures of efficiency. Time intervals were compared depending on the availability of ED and hospital inpatient beds. The effects of administrative interventions on the specific time intervals were assessed. The relationship between the median waiting time to see a physician and the number of LWBS patients was evaluated. Administrative interventions were implemented by a special interdepartmental continuous quality improvement committee. Interventions were aimed at specific sources of delay and inefficiency identified by the time studies.

Results: Eight hundred twenty-six patients were included in the 7 time studies. The unavailability of ED and inpatient beds was associated with significant delays. There was a significant reduction of the median total ED LOS from 6.8 hours to 4.6 hours over the first 5 periods, presumably resulting from the administrative interventions. Median total ED LOS, however, increased from 4.6 hours to 6.0 hours during the last 2 periods, possibly as a result of an increase in our ED patient census and reductions in both nursing and physician staffing imposed by the recent Los Angeles County fiscal crisis. The number of LWBS patients was closely correlated to waiting time to see a physician (r =0.79, =5.20, P =.033).

Conclusion: Time studies are an effective method of identifying areas of patient care delay. In our ED, targeted administrative interventions apparently reduced the total ED LOS and improved overall efficiency. Despite initial decreases in ED LOS, efficiency appeared to be adversely affected by reductions in nursing and physician staffing and increases in our patient census. The strength of the relationship between waiting times to see a physician and the number of LWBS patients suggests that decreasing waiting times may reduce the number of LWBS patients. [Kyriacou DN, Ricketts V, Dyne PL, McCollough MD, Talan DA: A 5-year time study analysis of emergency department patient care efficiency. *Ann Emerg Med* September 1999;34:326-335.]

See related articles, p. 321 and p. 368 .

INTRODUCTION

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Over the past several years, changing social, economic, and public health forces have significantly increased the number of patients seeking medical care in emergency departments. In 1993, the US General Accounting Office released a report documenting the increasing delivery of primary and acute medical care in the nation's EDs. [1] From 1985 to 1990, ED patient visits rose from 84 to 100 million per year. This growth was attributed, in large part, to the rising number of people without insurance and patients with serious illnesses. An important consequence of the increased use of emergency medical services (EMS) has been ED overcrowding and the resultant decrease in the quality of medical care provided in many EDs nationwide. [2-4] This problem is particularly evident in public hospitals, affecting access to medical care for many poor and uninsured patients. [3,5-8]

As the demand for EMS increases, overcrowded EDs are compelled to become more efficient

at providing patient care. One means for assessing efficiency has been the use of time studies to evaluate the process of ED patient flow and to identify areas of patient care delay. [9] Previous investigators have shown that time studies can improve ED patient care efficiency. [10-14] In one specific example, ED-based time studies, within the application of continuous quality improvement (CQI) techniques, identified major sources of patient care delay and documented the effectiveness of administrative actions that improved efficiency. [15,16]

Patient satisfaction is another important consideration that is closely related to patient care efficiency. Several studies have identified prolonged waiting times as the main factor of patient dissatisfaction and the most frequent reason patients leave before medical evaluation. [6,17-20] For example, using logistic regression modeling to simultaneously evaluate multiple factors at 30 Los Angeles County public and private hospitals, Stock et al [21] identified ED waiting times as the factor most closely related to patients leaving before medical evaluation. In another study, Fernandes et al [22] found a significant decrease in patients leaving without being seen (LWBS) by a physician after a reduction in the ED length of stay (LOS) through administrative interventions.

In August 1993, our ED created a special interdepartmental CQI committee (known as the ED Patient Care Efficiency Committee) to identify and decrease delays in patient care, enhance overall patient care efficiency, and improve patient satisfaction. The CQI committee was headed by the ED chief of staff and included all full-time ED attending physicians, the ED head and charge nurses, and representatives from the departments of radiology, laboratory, and patient financial resources. An essential task of this committee was to quantitatively assess ED patient care efficiency. To accomplish this task, the committee undertook a series of time studies to evaluate the process of ED patient flow and to analyze efficiency. Findings of each successive time study were used to develop and monitor the effects of the interventions aimed at improving efficiency. The time studies were also used to evaluate the relationship between patient care efficiency and satisfaction by correlating waiting times to see a physician with the number of LWBS patients.

We present a 5-year time study analysis of ED patient care efficiency. Unlike previous ED time studies, [10-16,23] our analysis used several sampling episodes over many years. This feature permitted the long-term assessment of administrative interventions and the effects of extrinsic factors such as increases in our patient census and reductions in nursing and physician staffing. The specific aims of our analysis were (1) to calculate the main ED patient care time intervals to identify areas of inefficiency, (2) to measure the effect of ED and inpatient bed availability on patient flow, (3) to quantitatively assess the effects of administrative interventions aimed at improving efficiency, and (4) to evaluate the relationship between waiting times to see a physician and the daily number of LWBS patients.

METHODS

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From September 1993 through July 1998, 7 ED patient flow time studies were conducted. Our ED serves predominantly a lower socioeconomic Hispanic and white population and has a yearly census of approximately 41,000 patients. Our ED is medically staffed at all times by 1 attending physician, 2 or 3 emergency medicine residents, and 1 or 2 internal medicine residents. In addition, 2 pediatric residents assist with providing medical care to pediatric patients during the evening, night, and weekend shifts. In the past, moonlighting physicians

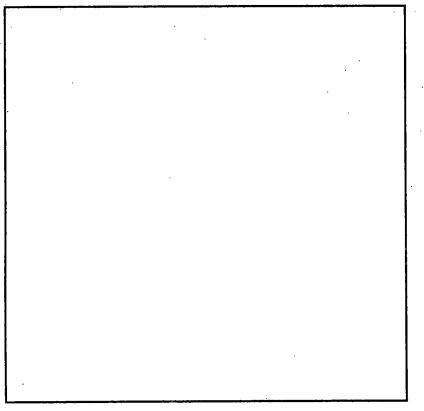
also assisted with providing medical care. Daily patient census, nurse staffing, and moonlighting physician staffing were also measured during the study periods.

The time studies were conducted during 1-week periods using identical study design and methodology. The periods of data collection were arbitrarily selected by the CQI committee based on the desire to evaluate current waiting times and overall LOS in the ED. This analysis concerned only quality improvement, did not involve information obtained through patient interviews or review of medical records, and did not change our patients' medical care in any way. Therefore, this study was exempt from review by our human subjects protection committee.

Convenience samples of patients presenting with 1 of 4 complaints (chest pain, vaginal bleeding, abdominal pain, and extremity injury) were selected and tracked continuously during their ED visit. These 4 complaints were chosen to represent the level of severity of conditions in patients seen in our ED. Main ED patient care encounter point times were recorded on a data collection instrument (attached to the subjects' charts) by nursing, medical, and support personnel. A similar method for studying patient flow has been recommended by the American College of Emergency Physicians. [9]

For each study period, time intervals were estimated by calculating the time difference between earlier and later encounter points. Six time intervals representing the main phases of patient evaluation and treatment were calculated to analyze the process of patient flow in the ED: (1) triage presentation to completion of registration, (2) completion of registration to ED treatment area entry, (3) ED treatment area entry to initial medical assessment, (4) triage presentation to initial medical assessment, (5) initial medical assessment to disposition order, and (6) disposition order to patient discharge from the ED. The fourth time interval represents the cumulative measure of the first 3 time intervals. A simplified flow diagram of the main ED encounter points and time intervals is provided in Figure 1.

Fig. 1. Simplified flow diagram of main encounter points and time intervals of ED patient care.



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Patients arriving by ambulance and potentially critical patients presenting at triage with 1 of the 4 presenting complaints were also included, but were immediately brought into the ED treatment area where registration was completed. The total ED LOS was also estimated as an overall measure of ED patient care efficiency. This time interval was calculated as the time

from triage presentation to patient discharge from the ED.

We also investigated the relationship between ED and hospital inpatient bed availability and ED patient flow. We first examined the association between the time interval of completion of registration to ED treatment area entry and the availability of ED beds. We then examined the association between the time interval of admission order to patient discharge from ED and the availability of inpatient beds. To determine the effect of bed availability, we estimated the frequency of when ED and hospital inpatient beds were not available.

Bed availability was determined by the ED charge nurse for both patients waiting for treatment area entry (at the time of completion of registration) and for patients admitted to hospital inpatient beds (at the time of admission order by the physician). This variable was documented on the data collection instrument by the ED charge nurse.

Administrative interventions were implemented by the CQI committee with the overall goal of improving efficiency and reducing overcrowding in the ED. The interventions were aimed at specific sources of delay and inefficiency of ED patient care identified by the time studies. These interventions were recorded and classified chronologically in relation to the time studies (Table 1).

Table 1. Chronologic summary of the major administrative interventions aimed at improving ED patient care efficiency.

Time Period	Major Administrative Interventions
September 1993 to February 1994	• Automatic ordering of old medical records by ED clerk
	•Nursing attendants assigned to take specimens to the laboratory
	• Printer installed in ED to print laboratory results
	• New beeper system for the major consultation services
	• "Fast-track" system instituted for returning patients
February 1994 to January 1995	• Radiology technicians transport patients to and from radiology suite
	• Pneumatic tube system installed for transporting laboratory specimens
	• Development of new discharge instructions
January 1995 to December 1995	• One-step triage system instituted
	• Physicians primarily responsible for giving patients their discharge instructions
	• Radiography films brought to ED for "wet film" reading by emergency physician

December 1995 to January 1997	• Development and implementation of ED laboratory panels
	• ED attending physician vested with final decision for hospital admission
January 1997 to September 1997	• Installation of additional phone lines in ED
September 1997 to July 1998	• Institution of rapid registration (limited information) policy

Most of the interventions were intradepartmental, but many also involved (directly or indirectly) other departments within the medical center.

We also assessed the relationship between the waiting times to see a physician and the daily number of LWBS patients in our ED. Patients were designated as LWBS if they failed to respond to at least 3 calls to be brought into the ED evaluation and treatment area. This designation was made by the ED charge nurse. Information concerning the total number of LWBS patients was routinely monitored and quantified each month by a separate hospital quality assurance committee and was only available for monthly periods. The average daily number of LWBS patients per day for each time period was calculated by dividing the total number of LWBS patients for the month by the number of days in the month. In addition to representing potentially ill patients who may have required immediate care, the number of LWBS patients also represents an indirect measure of patient dissatisfaction. [17-20]

Data were compiled and time intervals were calculated using the Epi-Info data management software program. [24] Statistical analyses were performed using Stata Statistical Software (release 5.0. College Station, TX: Stata Corporation; 1997). Median time intervals (as opposed to mean time intervals) were selected for comparisons because the calculated time intervals did not exhibit normal distributions and the estimated mean time intervals were subject to wide fluctuations resulting from outliers. Median time intervals were also considered to more accurately represent the ED time periods experienced by most patients.

Kruskal-Wallis analyses by ranks were used to assess the differences between the time intervals for the 7 study periods and to assess time interval differences depending on bed availability. Linear regression and correlation analyses were conducted to evaluate the relationship between the median time interval from triage presentation to initial medical assessment (independent variable) and the average daily number of LWBS patients (dependent variable) for the 7 study periods. A scatterplot was also developed to assess this relationship.

RESULTS

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Eight hundred twenty-six patients were included in the 7 time study sampling periods. Patient census, nursing staff, moonlighting physician staff, sample size, percentage of patients discharged home, and study population demographics for the 7 time study sampling periods are presented in Table 2.

Table 2. Comparison of patient census, nursing staff, moonlighting physician hours, patients leaving without being seen (LWBS) by physician, sample size, and patient demographics for the 7 study periods (total sample size N=826).

	Time Interval						
Variable	**September 1993**	**February 1994**	**January 1995**	**December 1995**	**January 1997**	**September 1997**	**July 1998**
Average No. of patients per day	89.3	89.9	89.0	87.3	92.6	104.6	105.9
Average No. of nursing staff personnel per day	23.9	24.1	21.3	19.6	21.4	18.9	19.3
No. of moonlighting physician hours per month	330	231	379	194	74	0	0
Average No. of LWBS patients per day	7.03	6.18	6.55	2.65	3.97	4.57	7.00
Sample size	127	119	110	113	106	127	124
Percentage female	60	65	67	59	61	61	60
Average age	36.4	36.9	37.1	35.9	36.2	37.2	36.4

The sample sizes per time study ranged from 101 to 129. There was a 19% reduction in ED nursing personnel hours and a 100% reduction in the number of physician moonlighting hours over the 5-year study period imposed by the recent Los Angeles County fiscal crisis. The study population demographics (ie, percentage female and average age) were relatively similar for the 7 study periods. In addition, the proportions of patients with the 4 presenting complaints did not vary significantly over the 7 study periods (^{2} = 24.29, P =.146).

Patient census remained relatively stable from September 1993 through January 1997. In the spring of 1997, however, the evening, night, and weekend shifts of the hospital's 24-hour pediatric clinic were closed and pediatric patient care during these periods was transferred to the ED. This administrative action was made on the basis of fiscal considerations and resulted in an increase in the overall ED patient census by 14%.

The major administrative interventions implemented to reduce waiting times and improve patient care efficiency in the ED are presented in Table 1 □. The interventions are listed

chronologically. Comparisons of median time intervals for the seven sampling periods are presented in Table 3.

Table 3. Median ED time interval comparisons for the 7 study periods.

Variable	Time Interval							Kruskal-Wallis *P* Value
	September 1993	February 1994	January 1995	December 1995	January 1997	September 1997	July 1998	
1. Triage presentation to completion of registration (min)	60	44	51	54	44	47	36	<.001
2. Completion of registration to ED treatment area entry (min)	51	34	43	28	47	50	73	.323
3. ED treatment area entry to initial medical assessment (min)	24	20	15	15	20	15	25	<.001
4. Triage presentation to initial medical assessment (h)	2.6	2.1	2.6	1.9	2.3	2.2	2.5	.086
5. Initial medical assessment to disposition order* (h)	2.3 (2.3)	2.3 (3.2)	1.7 (1.5)	2.3 (2.3)	1.8 (1.8)	2.3 (2.2)	2.2 (2.0)	.539
6. Disposition order to patient	30 (25)	25 (22)	25 (15)	15 (6)	5 (5)	5 (1)	5 (0)	<.001

discharge from the ED* (min)

*Values within parentheses refer to patients discharged home.

The numbers in parentheses for intervals 5 and 6 represent only patients who were discharged home from the ED. Significant decreasing trends over the 5-year study period were noted for time intervals 1 and 6.

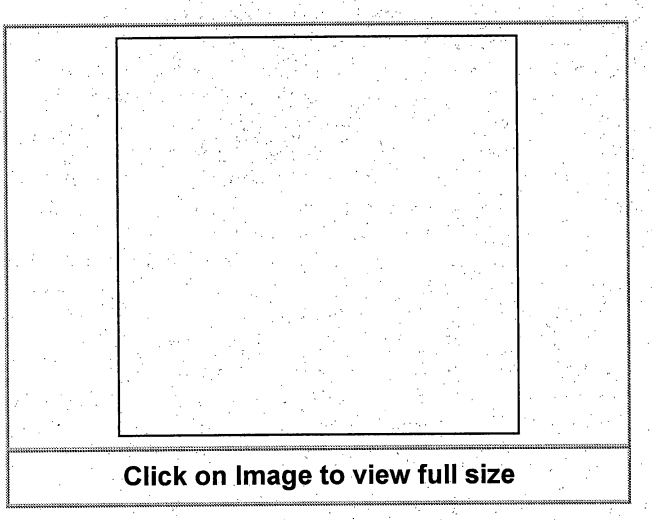
Although the effect of each intervention was not measured specifically, comparisons between Tables 1 and 3 illustrate a few examples where a particular intervention may have had a significant effect on a targeted time interval delay. For example, after the implementation of a revised discharge policy in the spring of 1995, a profound decrease was noted in the median time interval of disposition order to patient discharge from the ED. This was especially evident for patients who were discharged home. This decrease was attributed to having physicians, instead of nurses, provide the written discharge instructions to the patients, thus eliminating redundant discharge instructions from the nursing staff and markedly decreasing the time patients waited for their instructions before leaving the ED. In another example, a revised financial assessment procedure reduced the median time interval of triage presentation to completion of registration between the sixth and seventh study periods.

Depending on the availability of open beds in the ED, a significant difference was found in the median time interval of completion of registration to ED treatment area entry (29 minutes when ED beds were immediately available versus 65 minutes when ED beds were not available; Kruskal-Wallis test, $P < .001$). Our analysis also demonstrated that the median time of triage presentation to initial medical assessment was significantly less if an ED bed was immediately available (1.9 hours when ED beds were available versus 2.8 hours when ED beds were not available; Kruskal-Wallis test, $P < .001$). ED beds were not immediately available for 30% of the ED study patients.

Depending on the availability of hospital inpatient beds, a significant difference was found in the median time interval of disposition order to ED discharge for patients admitted to the hospital (95 minutes when inpatient beds were immediately available versus 220 minutes when inpatient beds were not available; Kruskal-Wallis test, $P < .001$). Hospital inpatient beds were not immediately available for 51% of the admitted study patients.

The apparent cumulative effect of the administrative interventions was a continuous reduction of the total ED LOS over the first 5 time study periods. This 32% reduction is shown in Figure 2.

Fig. 2. Median total ED LOS for the 7 study periods.



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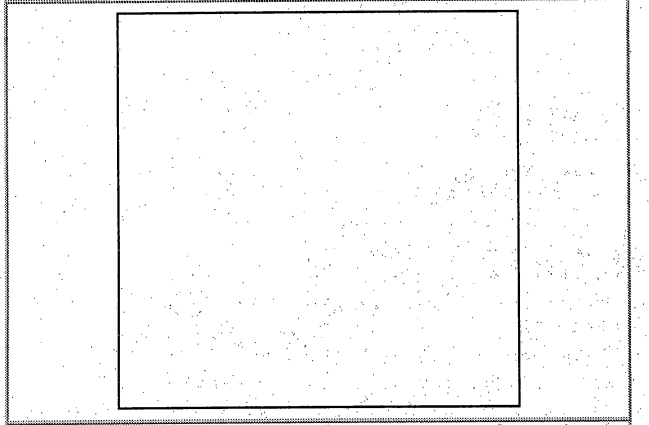
An increase in total ED LOS over the last 2 study periods was found corresponding to a significant increase in the patient census and reductions in nursing and moonlighting physician staffing imposed by the recent Los Angeles County fiscal crisis.

Regarding the relationship between waiting time to see a physician and leaving before medical evaluation, there was a significant correlation between the median time interval of triage presentation to initial medical assessment and the average daily number of LWBS patients. A scatterplot is presented in Figure 3 to illustrate this relationship.

Fig. 3. Relationship between median time from triage presentation to initial medical assessment and the average number of LWBS patients per day.



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Univariate linear regression analysis estimated a correlation coefficient of 0.79 and a regression coefficient of 5.20 (P =.033) for this relationship.

DISCUSSION

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Notwithstanding the increasing numbers of patients using EDs for medical care, several other factors contribute to ED overcrowding and delays in patient care. These factors include the unpredictability of ED censuses, shortages of ED space and beds, shortages of acute care inpatient beds, lack of nursing and support staff, delays in registration and chart generation, delays in laboratory and radiographic studies, and admission delays. [2,5,8-10] Numerous solutions have been proposed to improve ED efficiency and alleviate overcrowding, [2,9,25-28] but not all EDs have the same inefficiency problems. The implementation of effective solutions, therefore, requires careful analysis of where and how delays in specific EDs occur.

Several EDs have used time studies to identify specific causes of patient care delay. [10-16] Our analysis corroborates the findings of prior studies that show administrative interventions can reduce waiting times and ED LOS. Although not every time interval showed reduction in our analysis, the apparent cumulative effect of the interventions was a decrease in the total ED LOS over the first 5 study periods representing an improvement in patient care efficiency. Despite these initial decreases in total ED LOS, patient care efficiency appeared to be adversely affected during the last 2 study periods by reductions in nursing and physician staffing and increases in our patient census.

The effect of bed availability on patient flow in our ED was apparent for both patients waiting to be seen in the ED and patients waiting to be admitted to a hospital inpatient bed. Thirty percent of our study subjects were not immediately brought into the ED treatment area because of lack of bed space. These delays resulted in an overall increase in the waiting time for patients to be seen by a physician. In addition, the lack of bed space occasionally resulted in the diversion of ambulances and transferring patients from other hospitals. To counter this problem, our department frequently used hallway beds, triage stations, and chairs to evaluate and manage patients.

In addition, approximately half of our patient admissions were delayed because of the lack of immediately available hospital inpatient beds. These patients (especially those waiting for intensive care beds) frequently expended much of the physician, nursing, and support staff manpower while they were waiting for inpatient beds. Although we did not measure the direct effects of bed unavailability on the care of other ED patients, we believe the resultant effects were (1) delays in the care of treat-and-release patients in the ED treatment area, and (2) delays in the intake of new patients from the waiting area. In addition, we did not measure the possible adverse effects of these delays on patient outcomes.

A persistent problem of many EDs is that a small, but important, proportion of patients leave before medical evaluation. This proportion has been documented by several different EDs to range from 1% to 15%. [7,17,19,21] Public hospitals, not surprisingly, have much higher proportions of LWBS patients. [7,21] A survey of Los Angeles County hospitals found that 7.3% of ED patients in public hospitals left before medical evaluation compared with 2.4% of private hospitals. [21] Although a few prior studies have suggested that only a small proportion of LWBS patients are seriously ill, [19,29,30] a 1990 study conducted at Harbor–UCLA Medical Center (another Los Angeles County facility) found that 46% of LWBS patients were judged to need immediate medical attention and 11% were hospitalized within the following week. [7] This study concluded that overcrowding in this public hospital's ED restricted access to medical care for the poor and uninsured.

LWBS patients also accounted for a small proportion of all patients that presented to our ED. The number of LWBS patients from our ED was usually lower when waiting times to see a

physician were reduced. Despite the limited number of observation points, these 2 variables were significantly correlated. The strength of this relationship (represented by the correlation and regression coefficients) indicates that reductions in waiting times may decrease the number of LWBS patients.

The principal limitation of this investigation was our inability to definitively specify cause-and-effect relationships between the administrative interventions and improved efficiency. Although many of these relationships may seen intuitive, they were not conclusively proved. There were 3 main reasons for this limitation. First, most of the interventions overlapped, making the distinction of which was effective very difficult. To enhance our ED's efficiency as rapidly as possible, the interventions were implemented in groups rather than individually. Second, we could not isolate potentially confounding variables to remove their influence. Third, it is likely that there were several intangible factors (eg, a general overall effort by our residents to decrease unnecessary laboratory tests) that may have influenced efficiency but could not be measured.

Another important limitation was that the interventions often appeared to be short-lived or inconsistent. A possible reason was the transitory effects of some of the interventions that frequently appeared to initially be effective but subsequently became ineffective after a period of time. Another possible reason for the inconsistent effects of the interventions was the variability of external factors affecting patient flow such as changes in the patient census, reductions in nursing and physician staffing, and reductions in hospital personnel outside of the ED (eg, inpatient nursing staff and radiology technicians).

There were also concerns that the validity of the findings could have been affected by inaccurate recording of times or enhanced performance by our ED personnel during the study periods resulting from awareness of being part of a study (ie, the Hawthorne effect). [31] Although it was possible that our ED personnel purposefully misrecorded encounter times or the availability of beds, there was little motivation for this since no record was kept of individual performances and there was no implied or perceived retribution for poor performance. In addition, if a Hawthorne effect had influenced our findings, then the absolute time interval estimates may have been inaccurate but the relative differences between the successive time studies would not have been affected because the Hawthorne effect was likely to be consistent for each of the study periods.

Another limitation was the incomplete method of sampling our patients. Because data were logged using a collection instrument for each patient, the sample size of each time study period was limited in terms of feasibility. Thus, not all of our patients could be followed. In addition, the study periods had to encompass a certain length of time (1 week in this investigation) in order to be representative, but could not be so long as to be infeasible. Future assessments of efficiency can be facilitated with the use of computerized logging of patients in the ED. With a computerized system, exact time intervals for all patients, not just samples, can be calculated in a rapid manner. In addition, inaccurate time recordings and missing values would be limited. Moreover, factors that influence efficiency (eg, patient census, staffing, and levels of severity) can be easily accounted for in a time flow analysis.

There were also limitations with regard to the correlation between waiting times to see a physician and the number of LWBS patients. This type of group-level (ie, ecological) analysis is subject to potential pitfalls. [32] We did not specifically measure the time each LWBS patient waited to see a physician before leaving and their potentially confounding covariates. Thus, there may have been other factors that influenced both waiting times to see a physician and

the number or LWBS patients that accounted for the relationship between these two variables but were not considered in our analyses. In addition, although our department uses the number of LWBS patients to assess patient dissatisfaction, this can only be considered a crude (albeit important) measure. Direct surveying of patients would likely reveal a more definitive and complete representation of patient satisfaction in our ED.

The last limitation of this study concerns the generalizability of our findings to other EDs. Our investigation was conducted at a county facility that provides care to a specific sociodemographic population that is different from many other EDs. In addition, management and financial reimbursement strategies vary considerably among various public, private, university-affiliated, and health maintenance organization EDs. These external and internal factors are likely to vary in the way they influence patient care efficiency in the different types of EDs. Therefore, the generalization and application of our findings to other EDs should be done within the context of other factors influencing patient care efficiency.

In the current social, political, and economic environment of limited resources for health care, the desire to improve quality presupposes the need to enhance efficiency. The importance of efficiency in the ED health care setting is not only to improve patient satisfaction, but to allow limited resources to be used most efficiently toward improving the quality of care that is rendered. Despite the intuitive relationship between efficiency and quality, their association in the ED has only been evaluated in a limited manner. [14-16]

Continuous improvement of ED efficiency and quality depends on the application of effective administrative interventions. The many limitations noted above indicate the difficulties of evaluating these interventions and the possible confounding factors. Industrial quality management techniques developed in engineering and manufacturing can be used to counter the limitations of the assessment of patient care efficiency and quality in health care settings. [33-35] Before assessment can begin, efficiency and quality must be clearly and explicitly defined. To validly and reliably analyze efficiency and quality, detailed information is needed about the causal linkages among the structural attributes, processes of care, and the outcomes. Both the factors that predict the outcome, and the outcome itself, must be accurately measured. This includes potential confounding factors such as demographics and severity of illness.

From the ED perspective, strategies for implementing valid and feasible health care outcome and quality of care measures have been recently proposed. [36] To adequately assess ED efficiency and quality, measures will be needed for use of emergency care, impact of care, identification of at-risk groups, patient satisfaction, quality of life, and cost-effectiveness. A research agenda needs to be established for investigating those components of ED care that will improve the outcome of patients who present to the ED. This research will need to focus on appropriateness and effectiveness of services provided in the ED, as well as on the optimal organization of emergency care and its relationship to care provided in other settings. [37,38]

Time studies are an effective method of identifying areas of ED patient care delays and inefficiencies. With targeted administrative interventions, our ED's CQI committee significantly reduced the total ED LOS and improved patient care efficiency. This improvement, however, was apparently adversely affected by reductions in nursing and physician staffing and increases in patient census. However, through the use of our time study analysis, our department was able to secure additional resources (eg, increases in nursing staff and an ED-dedicated social worker) that have partially alleviated the effects of the cutbacks. We also found a reduction in the number of LWBS patients with decreased waiting times to see a physician. Because significant delays still occur, further improvements in patient care efficiency

will require additional reductions in patient care delays. New methodologies derived from industrial quality management science may be useful for defining factors that affect efficiency and ultimately influence quality of care in the ED.

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Original Contributions

Determinants of Patient Satisfaction and Willingness to Return With Emergency Care

Benjamin C. Sun, AB[#] [MEDLINE LOOKUP]
James Adams, MD[*] [MEDLINE LOOKUP]
E. John Orav, PhD[‡¶] [MEDLINE LOOKUP]
Donald W. Rucker, MD[**] [MEDLINE LOOKUP]
Troyen A. Brennan, MD, JD[‡§‖] [MEDLINE LOOKUP]
Helen R. Burstin, MD, MPH[‡§] [MEDLINE LOOKUP]

Sections

Abstract

Study objective: To identify emergency department process of care measures that are significantly associated with satisfaction and willingness to return.
Methods: Patient satisfaction and willingness to return at 5 urban, teaching hospital EDs were assessed. Baseline questionnaire, chart review, and 10-day follow-up telephone interviews were performed, and 38 process of care measures and 30 patient characteristic were collected for each respondent. Overall satisfaction was modeled with ordinal logistic regression. Willingness to return was modeled with logistic regression.
Results: During a 1-month study period, 2,899 (84% of eligible) on-site questionnaires were completed. Telephone interviews were completed by 2,333 patients (80% of patients who completed a questionnaire). Patient-reported problems that were highly correlated with satisfaction included help not received when needed (odds ratio [OR] 0.345; 95% confidence interval [CI] 0.261 to 0.456), poor explanation of causes of problem (OR 0.434; 95% CI 0.345

to 0.546), not told about potential wait time (OR 0.479; 95% CI 0.399 to 0.577), not told when to resume normal activities (OR 0.691; 95% CI 0.531 to 0.901), poor explanation of test results (OR 0.647; 95% CI 0.495 to 0.845), and not told when to return to the ED (OR 0.656; 95% CI 0.494 to 0.871). Other process of care measures correlated with satisfaction include nonacute triage status (OR 0.701, 95% CI 0.578 to 0.851) and number of treatments in the ED (OR 1.164 per treatment; 95% CI 1.073 to 1.263). Patient characteristics that significantly predicted less satisfaction included younger age and black race. Determinants of willingness to return include poor explanation of causes of problem (OR 0.328; 95% CI 0.217 to 0.495), unable to leave a message for family (OR 0.391; 95% CI 0.226 to 0.677), not told about potential wait time (OR 0.561; 95% CI 0.381 to 0.825), poor explanation of test results (OR 0.541; 95% CI 0.347 to 0.846), and help not received when needed (OR 0.537; 95% CI 0.340 to 0.846). Patients with a chief complaint of hand laceration were less willing to return compared with a reference population of patients with abdominal pain. Willingness to return is strongly predicted by overall satisfaction (OR 2.601; 95% CI 2.292 to 2.951).
Conclusion: These data identify specific process of care measures that are determinants of patient satisfaction and willingness to return. Efforts to increase patient satisfaction and willingness to return should focus on improving ED performance on these identified process measures. [Sun BC, Adams J, Orav EJ, Rucker DW, Brennan TA, Burstin HR. Determinants of patient satisfaction and willingness to return with emergency care. *Ann Emerg Med.* May 2000;35:426-434.]

See editorial, p. 499.

Introduction

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With the rise of medical consumerism, evaluation of patient satisfaction has become increasingly important for health care institutions. Satisfaction is one measure of health care quality and captures subjective dimensions of patients' experiences. In addition, patient satisfaction in the ambulatory setting is correlated with other important outcomes, including higher medical compliance, decreased utilization of medical services, less malpractice litigation, and greater willingness to return.[1-5] Faced with pressures to improve patient experiences and expand patient volume, health care institutions and administrators are developing instruments to study the determinants of patient satisfaction.[6-8]

A large body of research examines patient satisfaction in the inpatient and ambulatory settings.[1-14] Process of care measures that influence patient satisfaction include subjective and technical components of a medical interaction. Actual and perceived wait times,[15,16] ratings of nurse and physician empathy,[6] and how perceptions of technical care[15] affect patient satisfaction. Patient characteristics that influence satisfaction include demographic variables and health status. Elderly and high-income patients tend to have higher levels of satisfaction, whereas black, Hispanic, and non–English-speaking patients are reportedly less satisfied with their care.[19] Furthermore, patients with good baseline health[2,11,13] and regular access to medical care[2] tend to be satisfied.

Satisfaction with emergency care is critical because of the high volume of patients seen in

emergency departments.[3] ED satisfaction is complicated by queues, wide variations in patient complaints and baseline health, and complexities of acute care. Unfortunately, essential determinants of patient satisfaction with emergency care are incompletely understood. The majority of the relevant literature has focused on the effects of individual variables, such as complaints, patient education, waiting times, and perceptions of technical competence, on patient satisfaction.[3,15-20] These studies fail to adjust for the effects of patient characteristics and process of care measures on satisfaction. One prior study identified various process of care ratings as potential determinants of emergency care satisfaction.[17] These findings, however, are limited by a small sample size and modest response rate.

Furthermore, little research has studied the effects of patient-reported problems on satisfaction. Most of the satisfaction literature has focused on the relationship between satisfaction and ratings of various aspects of care. Ratings measure patients' evaluations of a process of care, whereas patient reports reflect perceptions of what occurred during a medical encounter. Patient reports have the advantage of providing information about discrete elements of care, and this information is important for targeted quality improvement efforts.[21] Reports can also measure patients' perception of whether or not an action occurred. This is different from ratings because a patient can only indirectly indicate the lack of a desired event by assigning a low score.

Finally, the predictors of willingness to return and the relationship between patient satisfaction and willingness to return to the ED have not been previously studied. The association between these 2 variables is ambiguous for emergency care, since factors such as location, preexisting relationships with the hospital, severity of illness, constraints placed by health insurance, and hospital reputation may have equal or greater importance than satisfaction.

This study examines the effects of process of care measures and patient characteristics on satisfaction and willingness to return with emergency care. It also studies the relationship between satisfaction and willingness to return. The findings of this research are being used to develop quality improvement programs at participating emergency departments.

Materials and methods

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This study was conducted at 5 urban teaching hospital EDs in the same metropolitan area.[22,23] All EDs were staffed by resident physicians with attending physician supervision. None of the EDs had an emergency medicine training program at the time of the study. The ED directors, or their designates, served on the research team. This investigation was approved by the human subjects committees at each institution.

Data were collected from February through June 1995. During a 1-month study period in each ED, patients who came to the adult EDs with selected problems were eligible for the study. Selected chief complaints were abdominal pain, asthma, chest pain, hand laceration, head trauma, and vaginal bleeding. These complaints were chosen because of their prevalence in emergency care and their potential for medical injury in EDs.

On-site questionnaires were distributed to eligible patients during study hours. For logistical reasons, research assistants generally enrolled patients between 10 AM and midnight. These hours were selected after a pilot study determined that these hours captured the highest

proportion of eligible patients. However, research assistants enrolled patients 24 hours per day on every third day of the study. Patients were excluded if they were confused, intoxicated, nonpregnant minors, or incapacitated by medical illness. Other exclusion criteria included past participation in the study and leaving the ED without being seen by a physician.

Eligible patients were approached by research assistants who obtained informed consent for the survey portion of the study. Participating patients completed an on-site questionnaire and agreed to complete telephone follow-up interviews. The baseline questionnaire was self-administered in English or Spanish. A bilingual assistant was available to assist Spanish-speaking patients. A follow-up telephone interview occurred at approximately 10 days (range 7 to 12 days) after the ED visit. There were up to 15 telephone attempts to reach each patient in follow-up. The baseline and follow-up questionnaires were professionally translated in Spanish and then back-translated into English. Patients who reported their primary language to be neither English nor Spanish completed the English language form with the assistance of relatives, friends, or hospital translators for their primary language.

The on-site questionnaire collected information about 29 patient characteristics. Nine sociodemographic variables included age, gender, race, marital status, education, primary language, household income, health insurance status, and access to a regular physician. Respondents were asked to indicate if they had any of 15 comorbid conditions, including anemia, asthma, arthritis, back pain, cancer, depression, diabetes, digestive problems, heart trouble, high blood pressure, HIV or AIDS, kidney disease, liver problems, stroke, and other major health problems. Three health status scores were generated for overall health, physical function, and mental function from patient reports on their health. Self-report of health status was assessed using a modified version of the Medical Outcome Study Short Form (MOS-SF) general health survey,[24] which has been previously validated in the emergency care setting. The presence of pain and the patient's chief complaint at the ED were noted.

Medical chart reviews provided information on 18 process of care measures and 1 patient characteristic. These included hospital site, mode of transport, triage status, wait time to be seen by physician, total time spent in the ED, and final disposition. Presence of a resident physician's note, presence of an attending physician's note, and contradictions between the resident and attending physician note were identified. Performance of any diagnostic tests in the ED, the number of diagnostic tests in the ED, performance of any medical treatments in the ED, the number of medical treatments in the ED, repeat physical examinations, specialty consultations, documented discharge instructions, documented instructions for returning to the ED, and treatment of pain were recorded. Interventions that were coded as treatments for each chief complaint are provided in Table 1.

Table 1. Treatments in the ED.

Chief Complaint	Intervention
Abdominal pain	Pain medications
	Intravenous hydration
	Antibiotics
	Antiemetics

	H_2-blockers
	Nasogastric tube
Asthma/COPD	Bronchodilators*
	Steroids
	Antibiotics
Chest pain	Oxygen
	Nitrates
	Morphine
	Aspirin
	-blockers
	Heparin
	Thrombolytic agents
	Antacids
	H_2-blockers
	NSAIDs
Hand laceration	Tetanus shot
	Antibiotics
	Laceration sutured
Head trauma	[None]
Vaginal bleeding	Rh_o(D) immune globulin (Rhogam)

COPD, Chronic obstructive pulmonary disease; **NSAIDs**, nonsteroidal anti-inflammatory drugs.
*Bronchodilator administration was considered a single treatment, regardless of how many nebulizers were given.

Finally, each patient was assigned an urgency score based on severity and length of symptoms, and need for diagnostic and therapeutic interventions. The urgency scale is a modified version of the UCLA Triage Classification and has been previously described.[23,25] This scale has 4 levels ranging from evaluation of a stable medical condition to the need for immediate evaluation of a life-threatening condition.

The follow-up telephone interview at 10 days after the initial visit assessed overall patient satisfaction with emergency care on a 5-point Likert scale and willingness to return to the same ED on a yes/no binary scale. Responses available on the Likert scale were designated as follows: 1=poor, 2=fair, 3=good, 4=very good, and 5=excellent. Patients also rated on the same 5-point Likert scale their satisfaction with 5 specific aspects of care, including staff courtesy, completeness of care, explanation, waiting time, and discharge instructions. Patients were asked if they had encountered any of 19 problems related to their ED visit (Figure).

Figure. Follow-up telephone interview items.

Satisfaction

Overall, how would you rate the care received in the ED? (1–5; 1=poor, 5=excellent)

Willingness to Return

If you had another problem requiring emergency care, would you return to the same ED?

Patient-Reported Problems

1. Did someone from the ED help you get a message to a friend or family member while you were in the ED?
2. Did someone from the ED staff let you know how long you would have to wait to be seen by someone in the ED?
3. Were there times when you needed help, while in the ED, but didn't receive it?
4. Were you able to identify the nurse or doctor who took care of you in the ED?
5. Were you given discharge instructions?
6. Were you told under what circumstances to return to the ED?
7. Were you told what danger signs about your illness or injury to watch out for when you got home?
8. Were you told when and how to take advised medications?
9. Were the possible side effects of medications clearly explained to you?
10. Did anyone ask you whether you would be able to pay for the medications that were advised for you during your ED visit?
11. Did you get these medications after your ED visit?
12. Were you able to take all the medications as advised?
13. Did someone explain why tests were being done?
14. Did someone explain the results of the tests in a way that you could understand?
15. Do you feel that the possible causes of your problem were explained sufficiently?
16. Were you told when you could resume your normal daily activities?
17. If you were working prior to your ED visit, did someone tell you when you could return to work?
18. Have you needed to return to any ED for the same problem?
19. Was a follow-up appointment made for you?

These problems were selected from the Picker-Commonwealth Study of patient care, modified for ED care.[13] An additional variable was generated to indicate whether patients had encountered one or more of the 19 selected problems.

A total of 38 process of care measures and 30 patient characteristics were collected for each

respondent.

Internal consistency of the 6 questions assessing satisfaction with care was assessed. A high consistency was noted for these 6 ratings, with a Cronbach's of .88 for the English version and .85 for the Spanish version. Only overall satisfaction with care was further assessed in subsequent univariate and multivariate analyses.

The univariate relationship of each predictor to ratings of overall care was determined. Continuous and ordinal variables were tested with the Spearman rank sum test, binary variables with the Mantel-Haenszel trend test, and categorical variables with ^{2} analysis. Variables significantly correlated with ratings of overall care at a threshold of *P* values less than .25 were used in subsequent model building as recommended by Hosmer and Lemeshow.[26]

An ordinal logistic regression model using the proportional odds assumption was constructed.[27] For variables absent in more than 25% of patients, dummy variables were created to adjust for the missing data. The forward-selection procedure retained predictors with Wald test scores at values of *P* less than .15.[26] Variables considered to be significant were ones that met a predetermined threshold of *P* values less than .01. The significance threshold was set lower than usual because of the large numbers of variables being studied (68), as well as the desire to focus on factors with the strongest statistical correlation with satisfaction. Odds ratios (ORs) and 95% confidence intervals (CIs) for significant predictors were calculated. The likelihood ratio test for the overall model was performed. Potential confounding effects were tested by adding back unselected variables to the model and observing the effects on coefficients and standard errors of the selected predictors. Unselected variables that changed the coefficient(s) of one or more selected variables by 10% or greater were considered confounders and retained in the model.

A logistic regression model of willingness to return was constructed from process of care measures and patient characteristics. A second logistic regression model of willingness to return was generated with ratings of overall care and patient characteristics. A forward-selection procedure retained predictors with a score test at values of *P* less than .15.[26] Predictors were considered significant if they met the predetermined threshold of *P* values less than .01. Confounder, likelihood-ratio test for the overall model, and Hosmer-Lemeshow model goodness-of-fit analyses were performed.

A bootstrap procedure for internal validation of all models was performed by randomly creating hypothetical populations from the actual sample. Each hypothetical population was the same size as the actual sample, with 2,333 patients. Coefficients and *P* values of model variables were estimated for each hypothetical cohort. This procedure was repeated 500 times, and mean coefficients and SEs were derived for model variables.

Finally, residual analyses of all models was performed by examining deviance residuals of greater than 4 or less than –4. These data points were checked for miscoding. They were also removed from the overall data set to determine whether the models changed significantly.

The SAS package (version 6.12, SAS Institute, Inc, Cary, NC) was used for all statistical analyses and data management.

Results

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During study hours, 3,455 eligible patients presented to the EDs, and 2,899 patients completed baseline questionnaires (84% of eligible population). Patients who left against medical advice represented 27 of all 6,005 patients who presented during the study periods. These patients did not have a medical chart review or a telephone follow-up interview performed. They were not analyzed further because of the small sample size and the lack of data. There were no significant differences in age, gender, or treating hospital among patients who completed baseline questionnaires and those who declined to participate. Patients with head trauma were less likely to complete the baseline questionnaire. Uninsured and Medicaid patients were less likely to complete the baseline questionnaire and more likely to leave the ED without being seen. Patients in the highest severity group and patients admitted to the hospital from the ED were more likely to complete the baseline questionnaire.[9]

Interviews with 2,333 patients were completed at follow-up (80% of patients who completed the baseline questionnaire). Patients who could not be reached at follow-up were more likely to be uninsured or have head trauma as their chief complaint at the time of the ED visit.[28] Patient characteristics of those who completed the questionnaire and follow-up interview are presented in Table 2.

Table 2. Patient characteristics.

Demographic Variable	No.	%	Demographic Variable	No.	%
Age (y)			**Current marital status**		
<19	72	3.1	Single/never married	848	36.3
20–29	515	22.0	Married	2,738	41.8
30–39	491	21.0	Divorced/separated	2,590	11.1
40–49	339	14.5	Widowed	251	10.8
50–59	272	11.6	**Currently have health insurance**		
60–69	240	10.3	Yes	1,599	68.5
70–79	217	9.3	No	734	31.5
80–89	140	6.0	**ED visit variable**		
>90	34	1.5	**Chief complaint**		
Sex			Abdominal pain	713	30.6
Male	983	42.2	Asthma	333	14.3
Female	1,349	57.8	Chest pain	518	22.2
Race/ethnicity			Hand laceration	259	11.1
White	1,632	70.0	Head trauma	420	18.0
Black	372	16.0	Vaginal bleeding	88	3.8

Hispanic	228	9.8	**Triage status**		
Other	100	4.2	Acute	1,018	43.6
Language			Nonacute	876	37.5
English	2,017	86.5	Other	148	6.3
Spanish	161	6.9	**Severity Score**		
Other	155	6.7	1: Stable condition	383	16.4
Education			2: Mild condition	480	20.6
Did not complete high school	368	15.8	3: Moderate condition	466	20.0
Completed high school	850	36.5	4: Severe condition	729	31.2
College degree or higher	1,110	47.7	**Mode of transport**		
Annual household income ($)			Self	1,634	70.0
<14,999	918	42.0	Ambulance	390	16.7
15,000–29,999	490	22.4	Other	33	1.4
30,000–49,999	350	16.0			
>50,000	426	19.5			
Currently have a primary medical physician					
Yes	1,805	77.4			
No	527	22.6			

N=2,333; total sum of counts for each variable may differ slightly due to missing data; percentages calculated as a fraction of total data set.

The distributions of ratings of overall care and willingness to return are provided in Table 3.

Table 3. Distributions of rating of overall care and willingness to return.

Variable	No.	%
Rating of overall care		
1 (lowest)	74	3.1
2	146	6.3
3	533	22.9
4	662	28.4
5 (highest)	917	39.3
Willingness to return		

Yes	2,083	89.4
No	246	10.6

A high proportion of patients were satisfied with their care, and ratings of overall care fall into a nonnormal distribution.

An ordinal logistic regression model for ratings of overall care is included in Table 4.

Table 4. Ordinal logistic regression model for rating of overall care.

Variable	OR	OR 95% CI	*P* Value
Black race*	**0.631**	**0.496–0.803**	**.0002**
Age (per year)	**1.009**	**1.003–1.015**	**.0016**
Hispanic*	0.673	0.495–0.916	.0119
Income (by rank category; see Table 2□)	1.101	1.016–1.194	.0197
Presence of anemia	0.715	0.536–0.953	.0221
Patient widowed†	1.304	0.921–1.846	.135
Presence of pain	0.932	0.870–0.999	.135
No. of treatments given in ED	**1.164‡**	**1.073–1.263**	**.0003**
Nonacute triage status§	**0.701**	**0.578–0.851**	**.0003**
Subsequent return to ED	0.647	0.460–0.908	.0118
Repeat physical examination performed	1.126	0.939–1.351	.201
No. of laboratory tests performed in ED	1.042	0.939–1.156	.4406
Attending note present in chart	1.055	0.880–1.264	.5642
Specific patient-reported problem			
Help not received when needed	**0.345**	**0.261–0.456**	**<.0001**
Poor explanation of potential causes of problem	**0.434**	**0.345–0.546**	**<.0001**
Not told about potential wait time	**0.479**	**0.399–0.577**	**<.0001**
Not told when to resume normal activity‖	**0.691**	**0.531–0.901**	**.0003**
Poor explanation of test results	**0.647**	**0.495–0.845**	**.0014**
Not told when to return to ED¶	**0.656**	**0.494–0.871**	**.0036**
Unable to leave a message for family	0.652	0.462–0.921	.0151
Unable to identify nurse or doctor	0.801	0.618–1.038	.0934
Not told when to return to work	0.800	0.6140–1.050	.108
Not told why tests were being performed	1.042	0.939–1.156	.6768

Likelihood ratio test for model: ^{2}=531.643; *P*<.0001.
Bold-face items indicate significance at *P*<.01.
*Reference group: white race.
†Reference group: married.
‡Effect per treatment/test.
§Reference group: acute triage status.
‖Bootstrapped *P*=.0140.
¶Bootstrapped *P*=.0159.

This statistical technique estimates the effects of independent variables on the probability that ratings of overall care will be higher rather than lower at all thresholds (ie, the possible values of ratings of overall care, 1 to 5). This method is well suited for analyzing ordinal values with a nonnormal distribution.

Significant process of care measures associated with overall satisfaction included nonacute triage status, number of treatments in the ED, and 6 specific patient reported problems. These were help not received when needed, poor explanation of causes of problem, not told about potential wait time, not told when to resume normal activities, poor explanation of test results, and not told when to return to the ED. Increasing the number of treatments in the ED raised satisfaction, whereas presence of the other significant process of care measures decreased satisfaction. Significant patient characteristics include age and black race. Older patients tended to be more satisfied, whereas black patients had lower ratings of overall care. These process of care measures and patient characteristics were significantly associated with satisfaction at a predetermined threshold of *P* less than .01.

Significant predictors of patient willingness to return were identified by logistic regression. Logistic regression estimates the effect of independent variables on the probability that patients are willing to return for care. The model adjusted for the effects of patient characteristics, and it identified 5 patient-reported problems as significantly correlated with willingness to return (Table 5).

Table 5. Logistic regression model for willingness to return.

Variable	OR	OR 95% CI	*P* Value
Chief complaint of hand laceration*	**0.396**	**0.220–0.713**	**.002**
Baseline physical function score	1.007	1.001–1.014	.0189
Presence of hypertension	1.607	0.959–2.695	.0719
Female	0.713	0.475–1.070	.1021
Presence of other, not specifically listed illness	1.808	0.868–3.767	.1137
Specific patient-reported problems			
Poor explanation of potential causes of problem	**0.328**	**0.217–0.495**	**<.0001**
Unable to leave a message for family	**0.391**	**0.226–0.677**	**.0008**
Not told about potential wait time	**0.561**	**0.381–0.825**	**.0033**
Poor explanation of test results	**0.541**	**0.347–0.846**	**.007**

Help not received when needed†	**0.537**	**0.340–0.846**	**.0074**
Not told about danger signs	0.588	0.371–0.932	.0238
Not told when to resume normal activity	0.586	0.368–0.932	.0241
No follow-up appointment made	0.696	0.421–1.148	.1558

Likelihood ratio test for model: ^{2}=177.761; *P*<.0001. Hosmer-Lemeshow goodness-of-fit statistic=9.1849; *P*=.3269.
Bold-face items indicate significance at *P*<.01.
*Reference group: chief complaint of abdominal pain.
†Bootstrapped *P*=.0255.

These included poor explanation of causes of problem, unable to leave a message for family, not told about potential wait time, poor explanation of test results, and help not received when needed. Patients with a chief complaint of hand laceration were found to be less satisfied than the reference group of patients with abdominal pain.

In a separate logistic regression model of willingness to return controlling for patient characteristics, ratings of overall care were found to be highly significant, with an OR of 2.601, 95% CI for odds ratio of 2.292 to 2.951, and *P* value less than .0001.

The results of bootstrapping validation procedure are listed in the footnotes of Tables 4□ and 5. Only variables whose *P* value increased above .01 after the bootstrap procedures are noted. The results suggest a high degree of internal validity for the models of satisfaction and willingness to return. None of the models were found to have unduly influential data points on residual analysis.

The performance of study site EDs in process of care measures important for satisfaction and willingness to return is presented in Table 6.

Table 6. Hospital performance on predictors of satisfaction and willingness to return.

Process of Care	Frequency (%)
Help not received when needed	11.5
Poor explanation of potential causes of problem	20.8
Not told about potential wait time	41.4
Not told when to resume normal activity	33.8
Poor explanation of test results	22.9
Not told when to return to ED	19.4
Unable to leave a message for family	19.3

Study sites were perceived by patients to have failed in these aspects of communication and education in 6.9% to 41.4% of all visits.

Discussion

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We identified discrete process of care measures that significantly affect patient satisfaction and willingness to return with emergency care. This research differs from prior ED satisfaction studies because of the focus on specific problems with care, the large sample size, high response rate of the survey, and the use of appropriate statistical methodology for analyzing ratings of overall care and willingness to return. To our knowledge, we are also the first to study the determinants of willingness to return and the relationship between patient satisfaction and willingness to return in the ED setting.

Our findings suggest a conceptual model for understanding patients' subjective evaluations of emergency care. We identified modifiable patient-reported problems that demonstrate the importance of patient communication to satisfaction and willingness to return. Other process of care measures associated with satisfaction suggest the key role of patient expectations and the need for appropriate ED management of those expectations. Finally, interfacility comparisons must account for differences in patient characteristics significantly associated with satisfaction.

Patient satisfaction and willingness to return are subjective evaluations that depend on many factors. Our analysis focused on patient-reported problems and other specific process measures rather than ratings of various aspects of care for 2 reasons. First, ratings can be biased by an "acquiescence response" in which survey respondents tend to agree with every item. This phenomenon has been documented in prior studies and falsely inflates the importance of ratings variables to satisfaction.

Second, patient ratings combine and obscure the effects of important, discrete elements of care. Although our data suggest that ratings of overall care are highly correlated with ratings of courtesy, discharge instructions, completeness of care, wait time, and explanations (analysis not shown), these findings do not give specific guidance for quality improvement efforts. For example, ratings of "staff courtesy and helpfulness" may combine patient experiences with physicians, nurses, and administrative workers into a single variable, and this measure provides only vague guidance for action. In contrast, patient-reported problems provide information on specific aspects of care. Thus, patient reports about receiving help when needed or receiving clear explanations of test results describe discrete elements of "staff courtesy and helpfulness," and they provide targeted guidance for quality improvement efforts.

Our findings suggest that patient communication and education are critical to satisfaction and willingness to return. For satisfaction with ED care, we identified 6 patient-reported problems as significant determinants. All are specific and modifiable components of patient communication and education, and these were perceived not to have been performed properly in 12% to 41% of patient visits. These findings suggest that the study sites could improve their performance in these processes to increase satisfaction.

Patient communication is also important in patients' willingness to return. Five patient-reported problems were identified as determinants of willingness to return, and 4 of those problems are also significantly associated with patient satisfaction. These 5 process measures were

perceived not to have been performed properly in 12% to 41% of patient visits. Not surprisingly, ratings of overall care were found to be a powerful predictor of patients' willingness to return.

Other process of care measures suggest that management of patient expectations is fundamental to satisfaction. Patients with a nonacute triage status were less satisfied than acute triage patients. This may be due to perceptions by nonacute patients that they are receiving a lower level of attention from the ED staff compared with acute patients. This finding is consistent with a prior study that suggests dissatisfaction increases as patients' triage statuses are changed from immediate to urgent to nonurgent.[30] In addition, more treatments in the ED were associated with greater satisfaction. Patients may have limited ability to assess the technical quality of care, and multiple treatments may create the impression that complete care is being provided.

Furthermore, the data suggest that the actual wait time to be seen by a physician and total length of stay in the ED are not significant predictors of patient satisfaction. Managing the perception of waiting time, by communicating an expected wait time to patients, seems to be more important for satisfaction than the actual wait time. This conclusion is corroborated by studies that have found perceptions of wait time to be a stronger predictor of patient satisfaction than actual wait time.

Finally, the finding that young and black patients are less satisfied with care is consistent with research in the outpatient and hospital settings. Although these patient characteristics are not modifiable, they are important to consider when comparing satisfaction among EDs with different patient populations, especially as ED satisfaction is increasingly used as a quality indicator. These results suggest that EDs need to continue their efforts to provide culturally competent care. In addition, the reasons for the lower satisfaction of these groups are poorly understood and suggest the need for further investigation.

This study has several limitations. The 5 study sites were urban, teaching hospital EDs in the same city, and 4 of the sites were Level I trauma centers. The proportion of acutely ill patients in the study population may be higher than for nonurban EDs. In addition, most of the respondents were from the same metropolitan region, and they may not be representative of patients in other parts of the country.

The inclusion criteria consisted of 6 common chief complaints that were selected as a representative sample of problems seen in the ED. Although satisfaction was not influenced by the studied chief complaints, it is possible that patients with other presenting symptoms may have different characteristics than the reported study group.

Patients who refused to complete the study were more likely to be uninsured or have a chief complaint of head trauma. Although the overall response rate for the survey was high, the differences among respondents and nonrespondents may have biased the findings. This limitation is important given the relatively high proportion of uninsured and head trauma patients seen in EDs.

Finally, the focus on patient-reported problems rather than ratings raises the potential for omitted variable bias. This analysis examines patient-reported problems previously studied in hospital settings and considered important in the ED. However, aspects of care crucial for patient satisfaction may not have been studied by the survey. Omissions would positively bias the importance of the patient-reported problems that were studied.

In summary, ED improvement efforts must focus on improving patient communication and managing patient expectations. Patients have limited ability to judge the technical quality of care. Furthermore, amenities such as food, parking, and cleanliness are viewed by patients as distinct from quality of care,[31] and our data suggest that ratings of environmental cues such as cleanliness of waiting and examination rooms are not critical for satisfaction (analysis not shown). Rather, it is the interactions with health care staff that form the basis of patients' subjective evaluations, and we identified components of the patient-physician relationship that were critical to satisfaction and willingness to return.

The finding that patients perceived that these basic interactions were often missing suggests that quality improvement efforts must be systems-based. Breakdowns in patient communication are inevitable in EDs that rely solely on the individual efforts of busy physicians and nurses, who are distracted by a constant stream of patient demands, telephone calls, documentation requirements, and other administrative tasks. The process of care must be redesigned to minimize distractions to the patient-physician relationship, allowing time for caregivers to communicate with the patient. Systems that build patient communication, expectation setting, and education into the process of care are most likely to improve satisfaction and willingness to return with emergency care.

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• *From the Department of Emergency Medicine,[*] Division of General Medicine, Department of Medicine,[‡] Quality Management Services,[§] Brigham and Women's Hospital; Department of Health Policy and Management[‖] and Biostatistics,[¶] Harvard School of Public Health; Harvard Medical School[#]; Division of Emergency Medicine,[**] Beth Israel Deaconess Medical Center; Boston, MA.*

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• *Address for reprints: Helen Burstin, MD, MPH, Agency for Primary Care Research, Agency for Healthcare Research and Quality, 6010 Executive Boulevard, Rockville, MD 20852; 301-594-4028, fax 301-594-3721; E-mail mailto:hburstin@ahrg.gov*

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The Role of Emergency Medicine in the Future of American Medical Care

Josiah Macy Jr, Foundation [MEDLINE LOOKUP]

Sections

Abstract

TOP

[Josiah Macy, Jr, Foundation: The role of emergency medicine in the future of American medical care. *Ann Emerg Med* February 1995;25:230-233.]

No reprints available from the author.

The conference was held in Williamsburg, Virginia, from April 17 to April 20, 1994, to examine the future of the medical specialty of emergency medicine. The conference was chaired by L Thompson Bowles, MD, PhD.

During the past 30 years, emergency care of seriously ill and injured patients has become an essential component of the US health care system. Most of this care is provided in the emergency departments of acute care hospitals in conjunction with community-based emergency medical services. Within the current health care system, EDs are the only institutional providers mandated by federal law to treat anyone who presents for care.

As emergency care has dramatically saved greater numbers of patients whose lives are at risk, the demand for these services has escalated. EDs are the first responders in a society that has been increasingly concerned about violence and addiction to drugs and in which large-scale disasters seem to be more common. In addition, EDs have become principal providers of primary health care to the poor, homeless, unemployed, substance abusers, prisoners, and all others who have no regular source of health care.

Providing these services has produced severe overcrowding and serious financial losses for EDs, and, although EDs are widely available, they vary considerably in quality and accessibility from region to region and, in many cases, from neighborhood to neighborhood.

In recent decades, as emergency care has become more sophisticated and complex, the new medical specialty of emergency medicine has emerged. It has established standards of competence for physicians who specialize in treating acutely ill and injured patients and has developed and enforced standards for programs that educate emergency medicine specialists. In 1979, emergency medicine was officially recognized as the 23rd, and now second youngest, medical specialty. Currently, there are 16,000 members of the American College of Emergency Physicians, and 10,500 physicians are certified by the American Board of Emergency Medicine as emergency medicine specialists. In addition, approximately 2,200 physicians are being educated in the 101 accredited emergency medicine residency programs, and each year, these programs graduate about 800 physicians who are eligible to be certified as specialists.

Ironically, as the specialty of emergency medicine advances both academically and clinically, it is confronted by issues that threaten its future. The role of the specialty in health care is poorly understood, and plans for health care reform have neglected emergency care. The boundaries and scope of practice of the specialty are broad and are contested by other specialties. Emergency medicine has failed to develop an agenda for research, and the specialty has received less academic recognition than most other medical specialties—emergency medicine specialists have a very limited role in the general education of physicians, especially during medical school, and during the graduate medical education of other generalist physicians.

In response to this crisis, and at the request of the Society of Academic Emergency Medicine, the Josiah Macy, Jr, Foundation appointed a planning committee to organize a conference that would examine the future of the medical specialty of emergency medicine. The committee was chaired by L Thompson Bowles, MD, PhD and consisted of Raymond J Baxter, PhD; Lewis Goldfrank, MD; Louis J Ling, MD; and L Gregory Pawlson, MD. The conference focused on the specialty's role in clinical service, medical education, and medical research. The conference brought together 38 experienced and influential leaders from government, public health care advocacy groups and other medical specialties, as well as leaders from the medical specialty of emergency medicine and from other nonphysician professions that provide emergency care. The foundation commissioned the following five papers, which served as major focal points for discussion—History of Emergency Medicine, Peter Rosen, MD; What Is Clinical Emergency Medicine? Arthur L Kellermann, MD, MPH; The Emergency Department as Safety Net for Non-Emergent Care, Ron J Anderson, MD; Education in Emergency Medicine, Glenn C Hamilton, MD; The Future of Emergency Medicine Research, Gabor D Kelen, MD, and Charles G Brown, MD.

These papers, together with a summary of the proceedings of the conference, will be published and distributed in March 1995 by the Josiah Macy, Jr, Foundation, New York, New York.

RECOMMENDATIONS

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The following recommendations, endorsed by 32 of the participants, represent the Planning Committee's summary of general discussions at the conference.

1. The United States Public Health Service, in its next "Statement of Public Health Objectives for the Nation," should specify, as a new goal, that access to high-quality emergency medical care should be available for all persons who need such care. At present, high-quality emergency medical care is not universally available to the US public. Furthermore, the lack of such care is not adequately addressed in the current US Public Health Service statement of the nation's health care goals.

Access is particularly lacking in many rural areas, but acceptable quality emergency care may be absent as well in many urban and suburban areas.

2. Federal, state, and local governmental organizations, including the Council on Graduate Medical Education (COGME), should ensure that the number of residency positions in emergency medicine is not reduced as planning for health care reform proceeds. Emergency physicians are critically important medical specialists whom many consider to be in short supply at the present time. In many communities, emergency physicians not only provide emergency care but also are the only providers of much primary care to patients for whom access to generalist physicians is difficult or impossible.

Because the demand for emergency physicians will be greatly affected by health care reform, the work force needs of the specialty are difficult to predict. Therefore there should be no arbitrary change and, in particular, no reduction in the current number of residency positions in emergency medicine unless the impact of such change has been studied and justified within a reformed health care system.

3. The Society of Academic Emergency Medicine (SAEM), the American College of Emergency Physicians (ACEP), and the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) should revise the classification of EDs. This classification should reflect the level of care available for emergency patients and indicate whether the facilities are adequate and whether appropriately qualified and credentialed emergency physicians are available 24 hours a day. In addition, this classification of EDs should establish minimum qualifications for physicians, nurses, and other health professionals who provide services in EDs, with special attention to the qualifications of "moonlighters." Currently, the United States has an inadequate system of classifying EDs. As a result, it is impossible for the public to know what level of care an ED is capable of providing. In the interest of both protecting and informing the public, a classification system for EDs should be developed that is comparable to the one that classifies each hospital-based trauma center on the basis of the level of sophistication of care it provides.

Such a classification of EDs should particularly reflect the qualifications of physicians who staff each ED. The presence of physicians in EDs who are neither adequately nor appropriately educated is not conducive to high-quality emergency care. Yet, many EDs continue to be staffed with physicians in specialties other than emergency medicine or with residents in training or with physicians who have as little as 1 year of graduate medical education. The classification of EDs must especially address the qualifications of moonlighting physicians, most of whom provide no emergency care in their primary positions and work additional hours part-time in EDs without specialty training in emergency medicine. In addition, many

moonlighters lack education and adequate experience in any aspect of primary health care.

The classification system should serve as a challenge and a guide to EDs as they work to improve their facilities and services. Because EDs in rural areas may not be staffed with emergency medicine specialists, these EDs cannot be expected to conform to a high-level classification. Nevertheless, physicians practicing in these settings must be trained to provide the highest level of care possible and should meet standards set by the specialty.

Rural communities should be assisted in developing rapid transportation and communication systems that provide links between their EDs and academic health centers and other high-level emergency care providers to ensure expedited professional consultations, patient referrals, and continuing professional education.

4 . State medical licensing boards, the National Board of Medical Examiners, the Liaison Committee on Medical Education (LCME), and medical school deans and faculties must ensure that every medical student has acquired the appropriate knowledge and skills to care for emergency patients. This education must be provided through educational experiences supervised by appropriately qualified emergency physicians. Contrary to the public's expectations, few US medical schools adequately educate students in the fundamentals of emergency care and life support. Fewer than 20% of US medical schools have required courses in emergency medicine in their curricula.

To correct this deficiency, the medical licensing boards of each state should require applicants for medical licensure to have had specific training in emergency care during medical school. Also, the United States Medical Licensing Examination should specifically test students' competence in this subject.

Although faculty members from many different medical specialties may contribute to instruction in emergency medical care, physicians certified in emergency medicine are best qualified to be teachers of emergency care. In addition, specialists in emergency medicine can contribute importantly to other subjects in the medical school curriculum and should be active participants on curriculum committees.

Medical students, as part of their education, should learn about the clinical and economic constraints of care in EDs. They should also understand the ethics of emergency care and the responsibility EDs bear as a "safety net of last resort" for individuals who have no other source of health care.

5. The deans and faculty of all LCME-accredited medical schools, with the assistance of the Association of American Medical Colleges and the Association of Academic Health Centers, should establish in their schools appropriately staffed and supported academic departments of emergency medicine. Recent surveys show that fewer than 50% of US medical schools have academic departments or autonomous divisions of emergency medicine. By creating academic departments of emergency medicine, medical schools can best establish and implement high standards for educational programs in emergency care, and strengthen collaborative professional relationships necessary for research and for high quality clinical services in emergency care. Departments of emergency medicine must be large enough and receive adequate support to develop and nurture faculty role models and mentors.

The Residency Review Committee for Emergency Medicine should reevaluate its requirements for establishing training programs. These requirements now seriously constrain some medical

schools from developing new departments with residency training programs. Additional training programs and residency positions in emergency medicine should be especially encouraged at medical schools that are establishing new academic departments.

Faculty and trainees in emergency medicine must be responsible for enhancing their level of scholarship to gain academic recognition and to warrant designation as an academic department.

6. ACEP and SAEM should quickly convene a conference to develop an agenda for research in emergency medicine and to define strategic options for implementing that agenda. The discipline of emergency medicine currently lacks a broadly accepted and defined research agenda. This deficiency impedes its continued development as a clinical field and its fulfillment as an academic medical specialty. Emergency medicine offers a broad spectrum of research opportunities—in basic medical sciences and in health services research. To explore opportunities for collaborative research, the proposed conference should include representatives of other health professions organizations.

LIST OF PARTICIPANTS

TOP

L Thompson Bowles, MD, PhD
National Board of Medical Examiners Chair
Loren H Amundson, MD
University of South Dakota School of Medicine
Ron J Anderson, MD
Parkland Memorial Hospital
Jennifer L Baskin, DO
Emergency Medicine Residents' Association
Raymond J Baxter, PhD
Lewin-VHI, Inc
F Lawrence Clare, MD, MPH
Bureau of Health Professions, Health Resources and Services Administration
D Kay Lawson, MD
University of Kansas Medical Center
Charlotte W Collins, JD
The Regional Medical Center at Memphis
Gary Fiskum, PhD
George Washington University School of Medicine
Henry W Foster, Jr, MD,
Meharry Medical College
Emily Friedman,
Health Policy Analyst
Larry S Gage
National Association of Public Hospitals
Richard J Gaintner, MD
New England Deaconess Hospital
John E Gallagher, MD,
Albert Einstein College of Medicine
Lewis R Goldfrank, MD,
Bellevue Hospital Center

Constance S Green, MD, MHPE
Cook County Hospital
David S Greer, MD,
Brown University School of Medicine
Glenn C Hamilton, MD
Wright State University School of Medicine
Gabor D Kelen, MD
Johns Hopkins University School of Medicine
Arthur L Kellermann, MD, MPH
Emory University Schools of Medicine and Public Health
Jack O Lanier, DrPH
Medical College of Virginia
Louis J Ling, MD
Hennepin County Medical Center
Carolos JM Martini, MD, MPH, MSc
American Medical Association
John B McCabe, MD
State University of New York
Health Science Center at Syracuse College of Medicine
Richard H Moy, MD
Southern Illinois University School of Medicine
Benson S Munger, PhD
American Board of Emergency Medicine
James L Paturas
Bridgeport Hospital
L Gregory Pawlson, MD
George Washington University Medical Center
Daniel A Pollock, MD
National Center for Injury Prevention and Control
Centers for Disease Control and Prevention
Rosamond Rhodes, PhD
Mount Sinai School of Medicine
Marilyn L Rice, MPA, RN, CEN, CNAA
Emergency Nurses Association
Peter Rosen, MD
University of California, San Diego, Medical Center
Patricia R Salber, MD
University of California, San Francisco
Charles Saunders, MD
University of California, San Francisco
Robert Shesser, MD
George Washington University School of Medicine
Jerome J Vernick, MD
Jefferson Medical College
William J Vicic, MD
Columbia University College of Physicians and Surgeons
James R Winn, MD
Federation of State Medical Boards

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How Do Physicians and Nurses Spend Their Time in the Emergency Department?

Jason C Hollingsworth[*‡§] [MEDLINE LOOKUP]
Carey D Chisholm, MD[†] [MEDLINE LOOKUP]
Beverly K Giles, RN[‡] [MEDLINE LOOKUP]
William H Cordell, MD[‡] [MEDLINE LOOKUP]
David R Nelson, MS[§] [MEDLINE LOOKUP]

Sections

Abstract

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Study objectives: To determine how emergency physicians and nurses spend their time on emergency department activities.
Methods: An observational time-and-motion study was performed at a 36-bed ED with annual census of 84,000 in a central city teaching hospital sponsoring an emergency medicine residency program. Participants were emergency medicine faculty physicians, second- and third-year emergency medicine resident physicians, and emergency nurses. A single investigator followed individual health care providers for 180-minute periods and recorded time spent on various activities, type and number of activities, and distance walked. Activities were categorized as direct patient care (eg, history and physical examination), indirect patient care (eg, charting), or non– patient care (eg, break time).
Results: On average, subjects spent 32% of their time on direct patient care, 47% on indirect patient care, and 21% on non–patient care. Faculty physicians, residents, and emergency nurses differed in the time spent on these three categories of activities. Although the overall time spent on direct patient care activities was not significantly different, emergency nurses

spent more of their time (2.2%) providing comfort measures (a subcategory of direct patient care) than did faculty physicians (.05%) or resident physicians (.03%). Emergency nurses spent 38.9% of their time performing indirect care, whereas faculty physicians spent 51.3% and resident physicians 53.7%. Resident physicians spent more time charting than did faculty physicians or emergency nurses (21.4%, 11.9%, and 6.9%, respectively). Emergency nurses spent more time on personal activities than did physicians, and faculty physicians walked less than either emergency nurses or resident physicians.
Conclusion: Emergency physicians and nurses spent almost half of their time on indirect patient care. Physicians spent significantly more time on indirect patient care activities and significantly less time on personal activities than did nurses.
[Hollingsworth JC, Chisholm CD, Giles BK, Cordell WH, Nelson DR: How do physicians and nurses spend their time in the emergency department? *Ann Emerg Med* January 1998;31:87-91.]

Introduction

TOP

The goals of health care managers, policy makers, and workers include improving efficiency and productivity, reducing waste, redistributing resources, and decreasing costs. Van de Leuv wrote, "The ultimate goal of the emergency department director, or anyone on the staff of the emergency department for that matter, should be to attain maximum efficiency."[1] Hendrickson and Kovner emphasized that "in an era of nurse shortage, it is important to maximize the time nurses spend on patient care and minimize the time spent on tasks that do not require professional nursing expertise."[2]

Achieving these goals depends in part on understanding the type of tasks health care workers perform and the amount of time they spend accomplishing them. For example, in one study it was found that "some 31% of the average healthcare worker's time was wasted through paperwork, rework, duplicate work or inappropriate work."[3] How health care workers spend their working time is of interest not only to managers and policymakers but to health services researchers. Finkler et al[4] noted that studies requiring such information range from evaluations of the use of physical therapy personnel time, through work measurements for nursing services, to Hsiao's work on development of a relative-value scale for physician services.

Mamlin and Baker wrote, "In spite of the growing interest in health planning and new health care delivery systems, very little refinement of measurement technique has been published describing methodologies for measuring such fundamental parameters of clinic operation as patient temporal movement and physician activity."[5] Almost a quarter century later, the same could be said of emergency medicine, a field in which few work measurement or task analysis studies have been conducted to better define the work environment.

We conducted a time-and-motion study to determine how emergency physicians and nurses spend their time in the ED. The number and types of activities performed by subjects and the time spent on these activities were evaluated, and the distances walked by subjects while on

clinical duty was measured.

Materials and Methods

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The study was conducted from June 14 to July 23, 1993, in a 36-bed ED with an annual census of 84,000 in a central city teaching hospital. The hospital sponsors an emergency medicine residency program (postgraduate years 1 through 3). At the time of the study, faculty physicians worked 8-hour shifts, resident physicians 9-hour shifts, and emergency nurses 11- or 12-hour shifts. For 15 hours of the day, the sole job of one faculty physician (the staffing faculty physician) was to oversee patient care given by residents and students and to answer incoming calls concerning patient transfer and referrals. The other faculty members on duty provided primary patient care and often had a nurse or student extender to assist in patient care activities.

A single investigator (JCH) "shadowed" emergency faculty physicians, resident physicians, and registered nurses for 180-minute study periods. Only one provider was studied during each observation period. Nurses in the triage area, who had no direct patient care activities, and in the critical care area, where nursing tasks may be divided into scribing and providing direct patient care, were excluded from the study. First-year residents and medical students were not observed because their tasks were not believed to be representative of typical providers. Because the staffing faculty physician's responsibilities entailed limited provision of direct patient care activities, these shifts were excluded from observation. At the study institution, emergency nurses have a scheduled 45- to 60-minute time period set aside for meals. Nurses whose break time would have fallen during the observation period were not included as subjects. To minimize the Hawthorne effect, the investigator stood in the corner of the patient care room or at a distance of at least 5 feet from the subject in non–patient care areas and held a clipboard that obscured the view of the stopwatch and data sheet. The investigator did not initiate conversation with the subject during the study period. He recorded the start time and end time as well as the nature of each activity on the data collection form.

Participation in the study was voluntary, and verbal consent was obtained. The investigator informed the subjects that a time-and-motion study was being conducted to determine how they spent their time during a clinical shift. Data regarding individual subjects were kept both anonymous and confidential. The project was approved by the Methodist Hospital institutional review board.

The investigator wore a pedometer calibrated to his stride and measured the distance walked as he followed the subjects during the 180-minute observation periods. This method was chosen rather than having each study subject wear a pedometer, which would have required individual calibration.

Observation periods included a convenience sample of all physician and nursing shifts except for the period between 3 and 8 AM and included both weekday and weekend shifts. Measurements included time spent completing tasks, number of tasks completed, distance walked, and time spent walking. After data collection, the subjects' activities were divided into three main categories: direct patient care, indirect patient care, and personal activities (Table).

Table. Minutes spent on activities (mean±SD).

Activity	Faculty Physicians	Resident Physicians	Emergency Nurses
Direct patient care	**58.13 (21.41)**	**58.87 (16.22)**	**55.90 (13.60)**
Talking to patients	34.73 (18.40)	37.14 (9.96)	20.3 (6.51)
Examining patients	13.31 (5.10)	11.11 (5.54)	7.81 (6.57)
Performing procedures	9.99 (11.74)	10.24 (9.23)	16.10 (8.18)
Comforting patients	.09 (.20)	.05 (.19)	4.01 (4.05)
Transporting patients	.00 (.00)	.32 (1.12)	.85 (1.81)
Assisting with procedures	NA	NA	7.10 (8.90)
Indirect patient care	**92.42 (25.98)**	**96.69 (14.39)**	**70.02 (10.58)**
Charting	29.36 (11.12)	38.64 (11.84)	12.48 (4.20)
Telephone calls (patient care)	9.46 (9.00)	7.34 (4.96)	5.87 (5.50)
Talking with physicians	4.45 (4.09)	8.25 (2.96)	3.42 (2.30)
Talking with nurses, EMTs	7.17 (3.37)	3.79 (3.02)	6.72 (4.30)
Talking with ancillary staff	1.07 (2.06)	1.67 (1.53)	2.06 (2.80)
Talking with patient's family	.43 (.97)	1.07 (1.67)	.69 (1.69)
Teaching residents, students	11.35 (8.85)	.00	NA
Staffing cases with faculty	NA	3.02 (2.69)	NA
Research	.00	.08 (.28)	NA
Getting supplies, cleaning up	.72 (.85)	1.30 (1.33)	4.23 (2.59)
Signing up for patients	2.95 (2.39)	1.82 (2.48)	.13 (.32)
Other paperwork	2.18 (3.05)	2.15 (3.63)	1.59 (3.47)
Preparing for procedures	.87 (.97)	.63 (1.51)	.60 (1.06)
Washing hands	1.22 (1.37)	.37 (.49)	1.52 (1.00)
Walking	14.08 (8.21)	19.99 (6.05)	7.14 (4.89)
Preparing medications	NA	NA	4.32 (3.38)
Processing lab specimens	NA	NA	2.65 (2.56)
Cleaning, stocking rooms	NA	NA	5.61 (4.67)
Acquiring and interpreting test results	7.13 (9.13)	6.41 (3.31)	1.00 (1.53)
Personal activities	**29.45 (31.97)**	**24.43 (22.64)**	**54.07 (20.56)**
Personal time	25.75 (30.61)	21.39 (21.03)	53.25 (20.75)

Waiting	3.70 (4.27)	3.05 (2.47)	.83 (.93)

NA, activity not applicable to this staff position.

The statistical analysis of the study focused on determining whether faculty physicians, resident physicians, and emergency nurses differed in the various measures of their shift activity. The MANOVA statistic, Wilk's, was used to determine whether the vector of the three main categories of time (direct patient care, indirect patient care, and personal activities) differed among the three types of emergency personnel. Similarly, Wilk's was used to determine whether differences existed when vectors with all applicable subcategories within a main category were used. For example, all subcategories within direct patient care that all three personnel types could perform were included as a vector. If MANOVA indicated significance, univariate ANOVA and Scheffé's multiple range tests were used to determine significant means within the vector and the groups that differed significantly. In addition, ANOVA and Scheffé's test were used to determine whether the three types of care providers differed significantly in the number of activities performed and the distance walked. F-tests were used to compare levels of variability of the subjects' time spent on activities. All summary statistics are reported as mean±SD.

Results

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Thirty-nine ED care providers were observed: 10 faculty physicians, 12 resident physicians, and 17 emergency nurses. All of the faculty physicians were men; their mean age was 42.7±7.1 years, and their mean full-time ED experience was 15.6±6.3 years. Of the resident physicians observed, 11 were men, and 1 was a woman; their mean age was 28.3±1.5 years. Eight were second-year residents and four were third-year residents. Of the emergency nurses, 16 were women and 1 was a man; their mean age was 31.0±9.9 years, and their mean full-time ED experience was 10.2±9.9 years.

Subjects spent a mean of 57.4±17.8 minutes (32%) of the 180-minute observation period on direct patient care, 84.0±20.6 minutes (47%) on indirect patient care, and 38.6±27.6 minutes (21%) on personal activities□ (Table). Overall, faculty physicians, residents, and emergency nurses differed significantly in time spent on each of these three categories of activities (*P*=.006, MANOVA). There were no significant differences among the three categories of providers in the amount of time spent in direct patient care (*P*=.88, ANOVA). However, the time spent on the vector of subcategories of direct patient care did differ among the three positions (*P*=.0005, MANOVA). Therefore, the three types of care providers spent approximately the same amount of time on direct patient care, although the activities that they performed during that time differed. For example, significant differences existed in the amount of time spent assessing or teaching patients (*P*=.0006, ANOVA). Emergency nurses spent less time assessing or teaching patients than either faculty or resident physicians, who did not differ significantly from one another (Scheffé's test). Although little time was spent on comfort measures (a subcategory of direct patient care) by all care providers, differences did exist among groups (*P*=.0003, ANOVA). Emergency nurses spent significantly more time on comfort measures (eg, raising the head of the bed, providing a pillow, getting a glass of water) than either faculty or resident physicians, who did not differ significantly from one another (Scheffé's

test). No other subcategories were significantly different.

The three categories of providers differed significantly in the amount of time spent in indirect patient care (*P*=.0002, ANOVA)▫ (Table). Emergency nurses spent less time performing indirect patient care activities than either the resident or faculty physicians, who did not differ significantly from one another (Scheffé's test). Within subcategories of indirect patient care, differences existed in the amount of time spent charting (*P*=.0001, ANOVA). Resident and faculty physicians spent more time charting than did emergency nurses (Scheffé's test). Significant differences also existed in the amount of time spent conferring with physicians (*P*=.0006, ANOVA). Resident physicians spent more time conferring with other physicians than either faculty physicians or emergency nurses (Scheffé's test). Nurses spent more time than physicians gathering supplies (*P*=.0001), and physicians spent more time reading and acquiring laboratory results (*P*=.005). Finally, differences also existed in the amount of time spent washing their hands (*P*=.01, ANOVA), with resident physicians spending less time washing their hands than either emergency nurses or faculty physicians, who did not differ significantly from one another (Scheffé's test).

Faculty physicians were more variable in the amount of time spent performing indirect patient care activities than either resident physicians (*P*=.001, F-test) or emergency nurses (*P*=.048, F-test). Therefore, the amount of time performing indirect patient care activities was less predictable for faculty physicians than for the other positions. No other differences in variability were detected.

Significant differences existed among the subject groups in the amount of time spent in non–patient care (*P*=.005, ANOVA) ▫(Table). Emergency nurses spent significantly more time in non–patient care activities than either faculty or resident physicians, who did not differ significantly (Scheffé's test). Within the non–patient care, differences existed among the groups of providers in the amount of time spent in personal activities (*P*=.002, ANOVA). Emergency nurses spent more time in personal activities than either faculty or resident physicians, who did not differ significantly from one another (Scheffé's test). Differences also existed among the providers in the time spent waiting (*P*=.02, ANOVA). Emergency nurses spent significantly less time waiting than faculty physicians (Scheffé's test).

Differences existed among the categories of providers in the number of activities completed during the 180-minute observation period (*P*=.004, ANOVA). Emergency nurses completed more activities (mean, 199.5±23.4) than either faculty (mean, 99.1±22.6) or resident physicians (mean, 94.1±10.7). The latter two groups did not differ significantly (Scheffé's test).

Differences also existed among the subject groups in walking distance (*P*=.03, ANOVA). Faculty physicians walked shorter distances during the 180-minute observation period (mean, .9±.4 miles) than either resident physicians (mean, 1.5±.5 miles) or emergency nurses (mean, 1.4±.5 miles). The latter two groups did not differ significantly (Scheffé's test). Distances walked extrapolated to the entire shift were 2.4 miles for faculty (8-hour shifts), 4.5 miles for residents (9 hours), and 5.6 miles for nurses (12 hours).

Discussion

TOP

Our time-and-motion study demonstrated that emergency physicians and nurses spent almost half of their time on indirect patient care activities. Physicians spent more time on indirect

patient care activities than nurses. Whether this difference resulted primarily from the difference in charting time or from other factors is unknown. Emergency nurses spent more time on personal activities than did physicians. One possible explanation for this findings is that nurses in our ED work 12-hour shifts (compared with 8 to 9 hours for physicians) and may need to "pace" themselves. Emergency nurses and resident physicians walked farther than faculty physicians. This finding could be interpreted that faculty physicians are either more torpid or that they are more efficient. It could also be attributed to the use of physician extenders who performed some of the "leg work" for the faculty physicians.

Although the time spent by patients in an ED has been studied,[6,7] work measurement or task analysis studies of emergency physicians and nurses are rare. Jouriles et al[8] found that faculty and resident physicians in their teaching hospital ED spent 31% of their time on care at the bedside, 34% on nonbedside patient care, 11% on charting, and 24% on non–patient care activities.

Other health care environments have been studied. McDonald and Dzwonczyk[9] conducted a time-and-motion study of anesthetists during 32 surgical procedures and found that approximately 17% of their time was spent in direct contact with patients. The remaining 83% was spent on indirect patient and non–patient activities (defined differently than in our study). Mamlin and Baker[5] conducted a combined time-and-motion and work-sampling study in a general medicine clinic and found that physicians spent 37.8% of their time charting, 5.3% consulting, 55.2% with patients, and 1.7% on miscellaneous activities.

We employed a time-and-motion observational methodology wherein an observer recorded exactly how much time was devoted to each task. Because it requires one-on-one observation, it is more labor intensive than work sampling, another observational technique.[4] Time-and-motion studies are considered more accurate than self-reporting techniques.

The results of our study must be interpreted in the light of several limitations and sources of potential error. First, the study was partially conducted during July, the first month of the academic year, when resident work schedules in the ED are atypical of the remainder of the year owing to the month-long orientation process for first-year residents. Second, nurses in the triage and critical care areas of the department were not studied. Third, although our sample included all days of the week and all shifts except for a 5-hour period between 3:00 and 8:00 AM, our sample may not have been truly representative. Methods for obtaining randomized work-sampling periods for EDs have not to our knowledge been described. Fourth, we did not measure activities that could direct attention away from the patient, such as telephone interruptions or several people talking simultaneously to the subject. Fifth, "a major risk in any monitoring system is that its very presence might change the activity patterns of the observed events."[5] As described in the Methods section, we undertook several measures to minimize the influence of having an investigator observe subjects' activities (Hawthorne effect). Sixth, several features idiosyncratic to our ED may influence the generalizability of our findings. For 15 hours a day, faculty physicians have divided responsibilities, one providing primary patient care and the others directly supervising students and residents. The patient care faculty physician often had the help of a nurse or student extender. However, our results were strikingly similar to those found by Jouriles et al[8] in another teaching hospital ED. Seventh, midway through the study period, a portable phone system became available for use by faculty physicians. This may have lessened the time and walking distance required to answer phone calls. The use of the portable phone was variable and could not be analyzed independently. Its use also may have resulted in an underestimation of total activities performed by faculty physicians. Finally, we are unaware of a generally accepted methodology for categorizing work

tasks in the ED environment. Therefore we have explicitly listed our categorization to guide other researchers who may wish to repeat this study in their own work place.

We recommend that further studies be conducted in both teaching and nonteaching institutions to better characterize the ED work environment. Such studies can be important in improving work conditions, enhancing productivity, promoting career longevity, implementing strategies for change, and measuring the impact of new systems technologies or management policies.

We thank the emergency physicians and nurses at the Emergency Medicine and Trauma Center, Methodist Hospital of Indiana, for participating in this study; and Bruce D Janiak, MD, and Debra Mauk of The Toledo Hospital for sharing the methodology and results of their unpublished ED time-and-motion study.

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- *From the Summer Research Program,* the Emergency Medicine and Trauma Center,‡ and the Department of Medical Research,§ Methodist Hospital of Indiana, Indianapolis, and Wabash College, Crawfordsville,‖ IN.*

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A Study of the Workforce in Emergency Medicine

John C Moorhead, MD* [MEDLINE LOOKUP]
Michael E Gallery, PhD* [MEDLINE LOOKUP]
Thomas Mannle [MEDLINE LOOKUP]
W Calvin Chaney, JD* [MEDLINE LOOKUP]
Lily C Conrad, MD, PhD* [MEDLINE LOOKUP]
William C Dalsey, MD* [MEDLINE LOOKUP]
Sanford Herman, MD* [MEDLINE LOOKUP]
Robert S Hockberger, MD* [MEDLINE LOOKUP]
Steven C McDonald, DO*† [MEDLINE LOOKUP]
Dighton C Packard, MD* [MEDLINE LOOKUP]
Michael T Rapp, MD, JD* [MEDLINE LOOKUP]
Colin C Rorrie Jr, PhD* [MEDLINE LOOKUP]
Robert W Schafermeyer, MD* [MEDLINE LOOKUP]
Roslyne Schulman [MEDLINE LOOKUP]
Dennis C Whitehead, MD* [MEDLINE LOOKUP]
Colleen Hirschkorn [MEDLINE LOOKUP]
Paul Hogan [MEDLINE LOOKUP]

Sections

Abstract TOP

Study objective: Emergency medicine has progressed significantly since its initial recognition as a medical specialty. Relatively little factual information is known, however, regarding who or

how many physicians practice emergency medicine. The purpose of this study is to determine the total number of physicians practicing clinical emergency medicine during a specified period, to describe certain characteristics of those individuals, and to estimate the total number of full-time equivalents (FTEs), as well as the total number of individuals needed to staff those FTEs.

Methods: Data were gathered from a survey of a random sample of 2,062 hospitals drawn from a population of 5,220 hospitals reported by the American Hospital Association as having, or potentially having, an emergency department. The survey instrument addressed items such as descriptive data on the institution, enumeration of physicians in the ED, as well as the total number working during the period June 1, 1997, through June 14, 1997. Demographic data on the individuals were also collected.

Results: A total of 942 hospitals responded (a 45.7% return rate). These hospitals reported a total of 5,872 physicians were working during the specified period, or an average of 7.48 persons scheduled per institution. The physicians were scheduled for a total of 297,062 hours. The average standard for FTE was 40 clinical hours per week. This equates to 3,713 FTEs or 4.96 FTEs per institution. The ratio of persons to FTEs was 1.51:1. With regard to demographics, 83% of the physicians were men and 81% were white. Their average age was 42 years. As to professional credentials, 58% were emergency medicine–residency trained and 53% were board certified in emergency medicine; 46% were certified by the American Board of Emergency Medicine.

Conclusion: Given that there are 4,945 hospitals with EDs and given that the data indicate there are 4.96 FTEs per ED, the total number of FTEs is projected to be 24,548 (standard error=437). Given further that the data indicate a physician/FTE ratio of 1.51:1, we conclude that there are 36,990 persons (standard error=683) needed to staff those FTEs. When adjusted for persons working at more than one ED, that number is reduced to 32,026. [Moorhead JC, Gallery ME, Mannle T, Chaney WC, Conrad LC, Dalsey WC, Herman S, Hockberger RS, McDonald SC, Packard DC, Rapp MT, Rorrie CC Jr, Schafermeyer RW, Schulman R, Whitehead DC, Hirschkorn C, Hogan P: A study of the workforce in emergency medicine. *Ann Emerg Med* May 1998;31:595-607.]

Introduction

TOP

The perennially rising cost of providing health care to the citizens of this country continues to receive the attention of policymakers. Reducing the number of physicians is recognized as but one means to reduce health care costs.[1] In this context, asking how many emergency physicians are needed to appropriately staff emergency departments becomes an important question for policymakers, health care professionals, patients, and the public at large. To date, no clear answers have been provided.[2-5]

Kaufman and English[6] define a need as a statement of difference between what is and what should be. To conduct a proper assessment of workforce needs, one must first begin with a description of what currently exists. Although estimates have been made about the current status of the workforce in emergency medicine, these estimates have been based on untested assumptions.

The purpose of this study, then, is to empirically describe the current clinical workforce in emergency medicine. The key descriptive questions addressed in this study include:

1. What is the number of emergency medicine full-time equivalent (FTE) positions used in hospital EDs for clinical practice?

2. How many physicians are used to fill this demand?

3. How much of the demand is filled by physicians who are residency trained and/or board certified in emergency medicine?

4. What are some key personal and professional characteristics of emergency physicians?

5. What is the distribution of emergency physicians across types of hospitals?

6. To what extent are physician assistants and nurse practitioners employed in EDs?

MATERIALS AND METHODS

TOP

To address the questions posed, we designed a prospective descriptive observational study using a written survey mailed to the medical directors of a random sample of EDs. The survey was conducted of EDs drawn from a representative sample of all hospitals with EDs identified in the 1995 American Hospital Association (AHA) database. The American College of Emergency Physicians (ACEP) contracted with the Lewin Group, a nationally recognized research firm with extensive experience in workforce studies, to assist in the statistical design, instrument development, instrument pilot test, and application of the study. Westat Inc, a private employee-owned research firm, was used to send the survey to the sample, conduct follow-ups, and tabulate the returns.

Population and Sample

The AHA data file was used to identify the number of hospitals in the United States in 1995. This file contained approximately 6,500 hospitals. Eighty-three percent (5,404) of the hospitals responded to the AHA questionnaire. Of these, 4,531 reported having an ED. It was possible that nonresponding hospitals might also have EDs. To avoid sampling error, nonresponding hospitals were included in the sample, after steps were taken to eliminate those with a high probability of not having an ED. The population for the study consisted of 5,220 hospitals and was arrived at as follows:

1. 4,531 hospitals reporting having an ED on the AHA questionnaire minus 33 hospitals selected to field-test the instrument used for this study, as well as 7 pretest cases (for a yield of 4,491)

2. 1,107 nonresponding hospitals less the 378 hospitals that were either (a) subsequently identified by us as not having an ED, or (b) designated in the American Hospital Association file as primarily psychiatric or admitting a majority of their patients for alcoholism or other substance abuse treatment (for a yield of 729).

Twelve strata were formed by cross-classifying the hospitals by ownership type (federal government, nonfederal government, not-for-profit, for-profit) and teaching status (academic medical center, other teaching, nonteaching). Before sampling, hospitals were sorted by location (urban, suburban, rural) and by a number of hospital beds within each stratum. An equal probability sample of 2,062 hospitals was drawn from the population using systemic sampling in each stratum. A systematic sample involves taking every *k*th hospital on the list for each stratum. To determine which of the first *k* element is chosen, a number from 1 to n (where *n* equals the number of hospitals within the strata) is randomly selected.

Survey Design

The survey of EDs was designed to elicit information from each ED medical director. The survey items included:

1. Confirmation/update of basic descriptive data of the institution such as name, address, telephone number, ownership or control structure (eg, public, private), and teaching status (eg, academic medical center, other teaching, nonteaching)

2. Operating and classification characteristics of the ED, such as Joint Commission on Accreditation of Healthcare Organizations (JCAHO) designation, operating hours, and types of services provided

3. An enumeration of all physician staff working in the ED during the 2-week period of June 1, 1997, through June 14, 1997

4. The total hours worked by each individual physician in the ED for that specified period

5. Basic demographic information for each physician identified, including age, gender, ethnicity, as well as professional characteristics such as specialization, board certification status, and residency training

6. Other staffing characteristics, including whether emergency medicine facilities are staffed by employees or independent contractors and whether these facilities employ physician assistants (PAs) or nurse practitioners (NPs) in their EDs.

The survey instrument was developed and reviewed by members of a technical advisory group (TAG) drawn from ACEP's membership and staff and representatives from the Lewin Group. The questionnaire, instructions, and definitions were pretested for clarity, accuracy, and comprehensiveness by members of the TAG. The draft instrument was then pilot-tested with a sample of 33 hospitals drawn from hospitals that reported having an ED in the 1995 AHA file. To ensure that hospitals with different types of ownership, teaching status, and geographic location were included in the pilot, the population was stratified on these variables before sampling. A sample of hospitals was selected with equal probabilities within each stratum.

The draft questionnaire was mailed to the ED medical director for each sample hospital with a 2-week deadline. A second mailing with a 2-week deadline was sent to nonrespondents. Those not meeting the second deadline received reminder calls. A response rate of 42% was achieved by the end of the pilot test.

The goal of the pilot was to test the survey instrument and data collection procedures on a range of hospitals to detect problems that might occur in the full-scale survey. In addition to the data questions in the instrument, questions for evaluating the instrument itself were also included. These questions addressed such issues as the length of time required to complete the instrument, the clarity of the instructions, as well as the clarity of the questions and response categories. On the basis of the pilot results, we learned that the 2-week deadline was inadequate to collect and fill out the information requested. The main study allowed for a 3-week response time. The pilot study confirmed that the methodology, instrument, and instructions were sound and required only minor changes for the main study.

The revised and final form of the questionnaire was mailed on May 23, 1997, to 2,062 EDs along with a prepaid return envelope and a cover letter explaining the purpose of the study. If the hospital no longer provided care in an ED setting, the institution was asked to indicate this information and return the survey.

An incentive package was developed for use in the main study to maximize the response rate. A discount coupon entitling the respondent to a 15% discount on a publication purchased from the College was enclosed in the initial survey mailing. Moreover, all respondents who returned the questionnaire by the first-round deadline were eligible for a drawing to win one of five free airline tickets to any destination in the continental United States.

Those hospitals not responding within a 3-week period were sent another packet requesting their participation. The cover letter explained that this packet was a duplicate and that the project team had not yet received a response to the original mailing. Reminder calls were made to those hospitals not responding to the second mailing within the 2-week period. A third mailing was sent to those hospitals requesting a questionnaire during the reminder call.

Tabular responses (ie, number and percent) were computed for each question. The significance of the differences in estimates presented in the discussion section were measured with a *t* ratio. The critical value of *t* was set at the .05 level of significance. Standard errors of estimates were also computed.

RESULTS

TOP

Sample Response Rates

A total of 942 questionnaires were returned from hospitals from all 50 states, the District of Columbia, and Puerto Rico. The overall response rate was 45.7%. Table 1 shows, by strata, the number of hospitals in the population, the sample, and the respondents.

Table 1. Population, sample, and respondents.

	Population	Sample	Respondents	Response Rate
Overall	5,220	2,062	942	46%

	No. (%)	No. (%)	No. (%)	No. (%)
Control status				
Government, federal	271 (5)	107 (5)	48 (5)	45
Government, other	1,312 (25)	518 (25)	200 (21)	39
Private, not-for-profit	2,913 (56)	1,151 (56)	571 (61)	50
Private, for-profit	724 (14)	285 (14)	123 (13)	43
Teaching status				
Academic medical center	108 (2)	43 (2)	25 (3)	58
Other teaching institution	1,180 (23)	465 (23)	233 (25)	50
Nonteaching institution	3,932 (75)	1,554 (75)	684 (72)	44
Location				
Urban	2,733 (53)	1,093 (54)	528 (56)	48
Suburban	1,072 (22)	423 (21)	188 (20)	44
Rural	1,301 (25)	514 (25)	220 (24)	43

Note: percent based on column totals.

Of those responding, 694 (74%) were private hospitals, 575 (61%) were nonprofit, and 248 (26%) were public facilities. Responses rates were highest for academic medical centers (58%) and lowest for nonfederal government hospitals (39%). A screening question on the survey identified that 55 of 942 hospitals responding did not provide emergency care. These 55 hospitals were excluded from any subsequent analysis, resulting in an adjusted total of 887.

Hospital Demographics

The overwhelming majority of the responding hospitals 933 (99%) reported that their EDs operated 24 hours a day; 810 (86%) of the hospitals reported that physicians staffed the department during all hours of operation.

Among the 131 (14%) of the hospitals where physicians were not always present, the following was noted: nearly all (96%) were covered by on-call physicians, 72% were located in rural areas, and 96% were nonteaching institutions.

The average number of ED visits for responding hospitals was 21,667 with a total of 18.7 million visits for all responders. Table 2 displays ED visit volume across selected hospital characteristics.

Table 2. ED visits in 1996.

Average No. of ED Visist	Average No. of ED Visits Resulting in	% of ED Visits Resulting in Inpatient	Average No. of Inpatient Admissions to	% of Inpatient Admissions to Critical

		Inpatient Admissions	Admissions	Critical Care Units	Care Units
Overall	21,667	3,788	16.2	976	20.2
Control status					
Government, federal	25,502	1,701	5.8	412	21.2
Government, other	16,284	2,598	14.8	634	19.9
Private, not-for-profit	24,112	4,368	16.8	1,113	19.5
Private, for-profit	16,893	3,362	18.8	1,084	25.5
Teaching status					
Academic medical center	45,690	10,116	21.2	2,763	15.9
Other teaching institution	30,001	5,350	17.3	1,291	18.8
Nonteaching institution	17,774	2,929	15.0	806	21.8
Location					
Urban	28,455	5,111	15.8	1,368	20.1
Suburban	13,499	1,975	12.8	431	16.3
Rural	10,481	1,476	12.1	333	18.5

Overall 16% of ED patients were admitted for inpatient care. These inpatient admission percentages ranged from a low of 6% at federal government institutions (eg, Veterans Administration hospitals, military hospitals) to a high of 21% at academic medical centers. Critical care beds were needed for 20% of the inpatient admissions. Critical care admissions varied across hospital characteristics with the highest percentages reported by for-profit hospitals (26%), nonteaching facilities (22%), and hospitals located in urban areas (20%). When asked about changes in ED visits from 1995 to 1996, 388 (47%) of the hospitals reported an increase in 1996, 301 (37%) reported a decrease for that same year, and 136 (16%) reported no change.

ED Physician Staffing

We collected data on three independent variables from which estimates of ED staffing for the sample and the population as a whole could be made. These three variables were as follows: (1) the number of individual physicians used by an ED to staff its expected patient workload for a 2-week period, (2) the total number of hours scheduled to be worked by each individual physician in the ED, and (3) the standard number of hours per week that the hospital considers

to be full-time for an individual physician. Table 3 provides a summary of the survey results for the ED staffing.

Table 3. ED physician staffing: FTEs and physician count.

Physician Labor Force Characteristics		
Total no. of physicians scheduled	5,872	
Average no. of physicians scheduled per institution (n=785)	7.48	
Total no. of clinical hours schedules (2 weeks)	297,062	
	Survey	**Literature**
Definition of 1 FTE	40 hours/week	35 hours/week
FTE clinical hours/2 weeks	80	70
No. of FTE	3,713	4,244
No. of FTE per institution (n=748)	4.96	5.67
Physician/FTE ratio	1.51	1.32

Of the 942 hospitals completing surveys, 785 provided data on ED staffing and 748 provided data on the physicians staffing their respective EDs. The results indicate that responding hospitals scheduled a total of 5,872 individual physicians. These physicians worked a total of 297,062 clinical hours providing patient care in the ED during the 2-week period of June 1, 1997, through June 14, 1997. The average number of physicians per hospital was 7.48. The average standard for FTE was 40 clinical hours per week. Using that figure, the average hospital ED has 4.96 FTEs and requires 7.5 individual physicians to keep these positions filled over time. Thus the physician/FTE ratio is 1.51:1.
Table 4 provides the ED staffing results by type of hospital.

Table 4. ED physician staffing: FTEs and physician count by selected variables.

	Total No. of Physicians	**Average No. of Physicians per Institution**	**Total No. of Clinical Hours in 2 weeks**	**No. of FTEs**	**No. of FTEs per Institution**	**Physician/FTE Ratio**
Control status						
Government, federal (n=29)	235	8.1	12,102	151	5.2	1.56
Government, other (n=163)	1,102	6.8	54,417	643	4.2	1.62
Private, not-for-profit	3,963	8.0	201,849	2,523	5.3	1.51

(n=497)						
Private, for-profit (n=96)	572	6.0	31,694	396	4.3	1.40
Teaching status						
Academic medical center (n=23)	276	12.0	11,270	141	6.1	2.00
Other teaching institution (n=194)	1,774	9.1	92,998	1,162	6.1	1.49
Nonteaching institution (n=568)	3,822	6.7	192,794	2,410	4.5	1.49
Location						
Urban (n=465)	4,035	8.7	208,877	2,630	5.8	1.50
Suburban (n=155)	935	6.0	46,538	582	3.9	1.54
Rural (n=165)	884	5.4	41,289	516	3.5	1.54

Table 5 presents the demographic profile of the 5,872 individual physicians identified by the survey as working in EDs of responding hospitals during the period covered by the survey.

Table 5. ED physicians: demographics.

	Gender			Ethnicity					
	Male No. (%)	Female (%)	Mean Age (yr)	White No. (%)	Black No. (%)	Hispanic No. (%)	Native American No. (%)	Asian/Pacific Islander No. (%)	Other No. (%)
Overall (n=5,702)	4,758 (83)	944 (17)	42	4,635 (81)	316 (6)	125 (2)	25 (0)	294 (5)	301 (6)
Control status									
Government, federal (n=215)	171 (80)	944 (17)	40	169 (75)	6 (3)	6 (3)	2 (1)	18 (8)	24 (11)
Government, other (n=1,078)	897 (83)	44 (20)	42	857 (79)	94 (9)	27 (2)	0 (0)	55 (5)	57 (5)
Private, not-for-profit	3,189 (83)	181 (17)	43	3,145 (82)	195 (5)	69 (2)	17 (1)	198 (5)	197 (5)

(n=3,842)									
Private, for-profit (n=567)	501 (88)	66 (12)	42	464 (83)	21 (4)	23 (4)	6 (1)	23 (4)	23 (4)
Teaching status									
Academic medical center (n=2666)	199 (75)	67 (25)	39	243 (89)	15 (5)	3 (1)	0 (0)	9 (4)	4 (1)
Other teaching institution (n=1,732)	1,391 (80)	341 (20)	43	1,371 (80)	109 (6)	49 (3)	2 (0)	94 (5)	91 (5)
Nonteaching institution (n=3,704)	3,168 (86)	536 (14)	41	3,021 (82)	192 (5)	73 (2)	23 (1)	191 (5)	206 (6)
Location									
Urban (n=3,905)	3,184 (82)	721 (18)	36	3,227 (82)	222 (6)	91 (2)	15 (0)	109 (6)	186 (5)
Suburban (n=907)	790 (87)	117 (13)	39	708 (81)	70 (8)	18 (2)	3 (0)	37 (4)	43 (5)
Rural (n=952)	770 (88)	182 (12)	40	690 (81)	24 (3)	8 (1)	7 (1)	53 (6)	72 (8)

Note: Percent based on row totals.

Overall, emergency physicians were predominantly white (81%) and male (83%). Their average age was 42 years. This table also reveals that the highest percentage of female emergency physicians were practicing in academic medical centers. Public facilities (federal and nonfederal) employed the highest percentage of noncaucasian physicians and, on average, younger emergency physicians practiced in urban hospitals.

Table 6 summarizes the medical training of emergency physicians in this sample.

Table 6. ED physicians: basic medical training.

	Degree			
	MD No. (%)	**DO No. (%)**	**US Medical School No. (%)**	**Other Medical School No. (%)**
Overall (n=5,830)	5,127 (88)	703 (12)	5,055 (87)	742 (13)
Control status				
Government, federal	218 (93)	16 (7)	190 (81)	44 (19)

(n=234)				
Government, other (n=1,099)	970 (88)	129 (12)	960 (88)	135 (12)
Private, not-for-profit (n=571)	3,450 (88)	476 (12)	3,402 (87)	494 (13)
Private, for-profit (n=571)	489 (86)	82 (14)	503 (88)	68 (12)
Teaching status				
Academic medical center (n=276)	269 (97)	7 (3)	270 (99)	4 (1)
Other teaching institution (n=1,769)	1,550 (88)	219 (12)	1,501 (86)	251 (14)
Nonteaching institution (n=3,785)	3,308 (87)	477 (13)	3,284 (87)	487 (13)
Location				
Urban (n=4,009)	3,587 (89)	422 (11)	3,543 (88)	466 (12)
Suburban (n=929)	790 (85)	139 (15)	776 (87)	117 (13)
Rural (n=874)	733 (84)	141 (16)	725 (83)	152 (17)

Note: Percent based on row totals.

The vast majority (5,127 or 88%) were MDs and graduates of US medical schools (5,055 or 87%). The percentage of DOs practicing in EDs ranged from a low of 3% for academic medical centers to a high of 16% for hospitals located in rural areas. The highest percentage (19%) of non–US-trained physicians were practicing in federal government hospitals and the lowest percentage were practicing at academic medical centers (1%).

Hospitals were also asked to provide data on the professional qualifications of physicians practicing in their EDs (see Table 7).

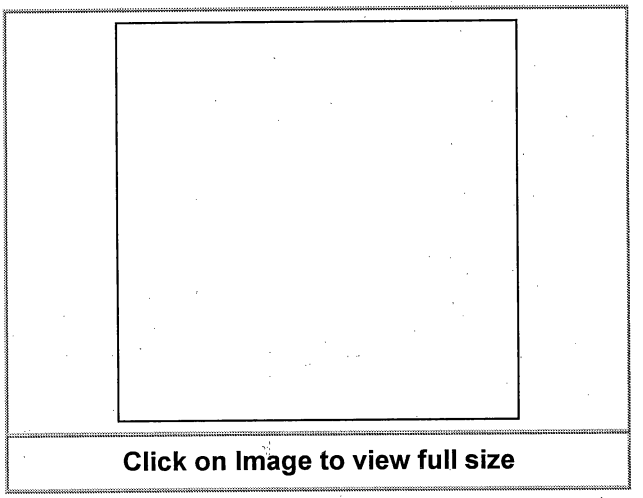
Table 7. ED physicians: qualifications.

	EM Qualifications		Level of EM Training			Certification Type		
	Non-EM-Trained or Certified No. (%)	EM-Trained or Certified No. (%)	Residency-Trained, Not EM-Certified No. (%)	EM-Certified, Not Residency-Trained No. (%)	Board-Certified and Residency-Trained No. (%)	ABEM No. (%)	BCEM No. (%)	AOBEM No. (%)
Overall (n=5,712)	**2,424 (42)**	**3,280 (58)**	**217 (4)**	**1,193 (21)**	**1,878 (33)**	**2,715 (48)**	**149 (3)**	**219 (4)**

Control status								
Government, federal (n-217)	130 (60)	87 (40)	14 (6)	13 (6)	60 (28)	71 (97)	0 (0)	2 (3)
Government, other (n=1,078)	591 (55)	487 (45)	47 (4)	175 (16)	265 (25)	408 (85)	34 (7)	36 (8)
Private, not-for-profit (n=546)	1,441 (37)	2,430 (63)	147 (4)	878 (23)	1,405 (36)	1,998 (95)	93 (4)	18 (1)
Teaching status262 (48)								
Academic medical center (n=276)	41 (15)	235 (85)	15 (5)	42 (15)	178 (64)	217 (99)	0 (0)	3 (1)
Other teaching institution (n=1,738)	570 (33)	1,168 (67)	76 (4)	407 (23)	685 (39)	970 (89)	39 (3)	84 (8)
Nonteaching institution (n=3,098)	1,813 (49)	1,285 (51)	126 (4)	744 (24)	1,015 (33)	1,528 (87)	110 (6)	132 (7)
Location								
Urban (n=3,950)	1,191 (30)	2,759 (70)	177 (4)	953 (24)	1,629 (41)	2,312 (90)	87 (3)	178 (7)
Suburban (n=908)	610 (67)	298 (33)	9 (1)	140 (15)	149 (16)	258 (84)	30 (10)	20 (6)
Rural (n=836)	607 (72)	229 (28)	30 (4)	100 (12)	99 (12)	144 (73)	32 (16)	21 (11)

The majority (58%) of physicians working in EDs were trained and/or certified in emergency medicine. Also a majority (54%) were board certified in emergency medicine; 48% were certified by the American Board of Emergency Medicine (Figure 1).

Fig. 1. Qualifications of emergency physicians.



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Emergency medicine– trained and/or –certified physicians were least likely to work in suburban or rural locations. Academic medical centers had the largest percentage of physicians with emergency medicine training and/or certification staffing their EDs—65% of academic physicians were both emergency medicine– board certified and residency-trained. The highest percentages of non-emergency medicine–trained and/or –certified physicians were found staffing EDs in rural locations and federal facilities. Table 8 provides data on nonemergency medical training received by emergency medicine–trained physicians.

Table 8. EM-trained and/or certified physicians: additional specialty qualifications.

	Residency-Trained and/or Certified in the Following Specialties						
	Internal Medicine No. (%)	**Pediatrics No. (%)**	**Family Practice No. (%)**	**General Surgery No. (%)**	**Anesthesia No. (%)**	**Other No. (%)**	**No Additional Specialty Qualifications No. (%)**
Overall (n=3,288)	474 (14)	63 (2)	295 (9)	103 (3)	6 (0)	71 (2)	2,276 (69)
Control status							
Government, federal (n=87)	3 (3)	0 (0)	4 (5)	3 (3)	0 (0)	3 (3)	74 (85)
Government, other (n=487)	87 (18)	3 (1)	42 (9)	13 (3)	1 (0)	18 (4)	323 (66)
Private, not-for-profit (n=2,430)	343 (14)	58 (2)	209 (9)	76 (3)	5 (0)	43 (2)	1,696 (70)
Private, for-	41 (14)	2 (1)	40 (14)	11 (4)	0 (0)	7 (2)	183 (64)

profit (n=284)							
Teaching status							
Academic medical center (n=235)	33 (14)	3 (1)	4 (2)	1 (0)	0 (0)	17 (7)	177 (75)
Other teaching (n=1,168)	210 (18)	23 (2)	72 (6)	38 (3)	3 (0)	32 (3)	790 (68)
Nonteaching (n=1,885)	229 (12)	39 (2)	221 (12)	61 (3)	5 (0)	24 (1)	1,306 (69)
Location							
Urban (n=2,759)	419 (15)	54 (2)	202 (7)	86 (3)	8 (0)	61 (2)	1,929 (70)
Suburban (n=298)	87 (12)	8 (3)	54 (18)	8 (3)	0 (0)	5 (2)	136 (46)
Rural (n=229)	18 (8)	3 (1)	39 (17)	9 (4)	0 (0)	5 (2)	155 (68)

This table reveals that 31% of these physicians are also trained and/or certified in other specialties. Internal medicine (14%) and family practice (9%) were the predominant specialties for these groups (Figure 2).

Fig. 2. Emergency medicine–trained and/or –certified physicians: additional specialty qualifications.

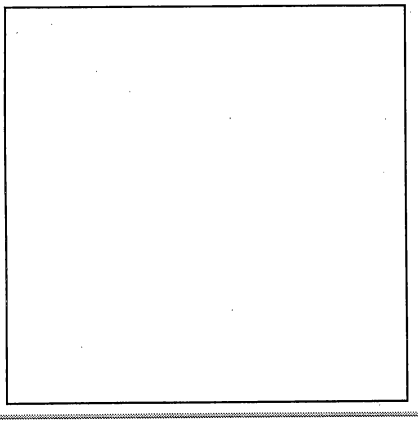

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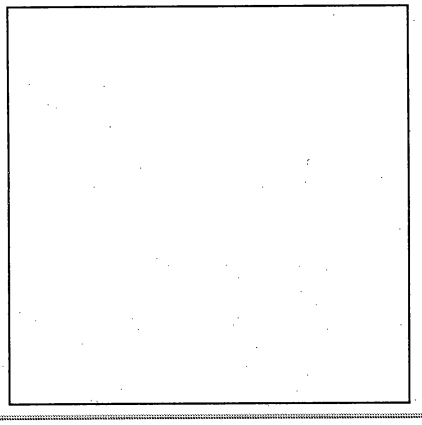
Table 9 highlights the specialty qualifications for the 42% of the emergency physicians who are not trained or certified in emergency medicine.

Table 9. Non–EM-trained and/or certified physicians: additional specialty qualifications.

	Residency-Trained and/or Certified in the Following Specialties						
	Internal Medicine No. (%)	**Pediatrics No. (%)**	**Family Practice No. (%)**	**General Surgery No. (%)**	**Anesthesia No. (%)**	**Other No. (%)**	**No Additional Specialty Qualifications No. (%)**
Overall (n=2,424)	667 (28)	87 (4)	771 (32)	177 (7)	27 (2)	78 (5)	617 (25)
Control status							
Government, federal (n=130)	64 (49)	2 (2)	15 (12)	3 (2)	0 (0)	10 (8)	36 (28)
Government, other (n=591)	122 (20)	7 (1)	157 (27)	44 (7)	9 (2)	30 (5)	222 (37)
Private, not-for-profit (n=1,441)	412 (29)	73 (5)	505 (35)	107 (7)	12 (1)	31 (2)	301 (21)
Private, for-profit (n=262)	69 (26)	5 (2)	94 (36)	23 (9)	6 (2)	7 (3)	58 (22)
Teaching status							
Academic medical center (n=41)	20 (49)	13 (32)	1 (2)	2 (5)	0 (0)	0 (0)	5 (12)
Other teaching (n=570)	232 (41)	42 (7)	129 (23)	42 (7)	5 (1)	15 (3)	105 (18)
Nonteaching (n=1,813)	415 (23)	30 (2)	745 (41)	133 (7)	23 (1)	53 (3)	806 (44)
Location							
Urban (n=1,191)	421 (35)	72 (6)	356 (30)	86 (7)	8 (1)	26 (2)	222 (19)
Suburban (n=610)	128 (21)	5 (1)	249 (41)	49 (8)	9 (1)	21 (3)	149 (24)
Rural (n=607)	116 (19)	11 (2)	259 (43)	43 (7)	11 (2)	21 (3)	146 (24)

The overwhelming majority of these physicians (75%) were also residency trained and/or board certified in another specialty. Family practice (32%) and internal medicine (28%) were the dominant specialties for those physicians not trained in emergency medicine (Figure 3).

Fig. 3. Non-emergency medicine–trained and/or –certified physicians: additional specialty qualifications.



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Additional Responsibilities of Emergency Physicians

Respondents were also asked to indicate, on average, the number of hours per week full-time physicians spend on the following: (1) nonscheduled clinical hours, (2) hours on call as backup in the ED, and (3) hours on administrative work, teaching, or research. As Table 10 reveals, full-time physicians spent on average 3.6 hours on nonscheduled clinical duties, an additional 13.9 hours providing on-call backup to the ED; and 6.1 hours on administrative work, teaching, or research.

Table 10. Average number of hours spent by full-time physicians on additional duties.

	Average Number of Weekly Hours Spent by Physicians on:		
	Nonscheduled Clinical Duties	**On-Call Backup to ED**	**Administrative Work, Teaching, or Research**
Overall (n=812)	3.6	13.9	6.1
Control status			
Government, federal (n=34)	4.9	13.4	9.7
Government, other (n=158)	3.7	15.1	5.5
Private, not-for-profit	3.6	13.2	6.2

(n=521)			
Private, for-profit (n=104)	3.0	17.2	5.4
Teaching status			
Academic medical center (n=23)	5.5	7.4	15.5
Other teaching institution (n=218)	4.5	7.0	7.6
Nonteaching institution (n=576)	3.3	16.9	5.1
Location			
Urban (n=498)	3.2	9.0	7.9
Suburban (n=164)	3.4	13.3	6.7
Rural (n=150)	4.0	17.9	4.5

This table also demonstrates that physicians in private, nonteaching, and rural institutions spend, on average, the greatest amount of weekly hours on call. Moreover, physicians in federal public hospitals, academic medical centers, and urban institutions spend the greatest number of weekly nonclinical hours on administrative work, teaching, or research. The teaching responsibilities of physicians generally are consistent with the medical education roles of the hospitals they serve. The majority of respondents reported that their institution did not train residents (69%), medical students (63%), nurse practitioner students (81%), or physician assistant students (75%). ED medical directors were asked to indicate whether the physicians about whom they were giving information worked at another institution. As seen from Table 11, physicians worked at other institutions in a variety of capacities.

Table 11. ED physicians working at other institutions, by respondent hospital.

	No. of Physicians Working at Other Institutions			
	EM-Trained/Certified Physicians (n=1031)		Non–EM-Trained/Certified Physicians (n=867)	
Respondent Hospital (by Type)	**In ED Capacities No. (%)**	**In Non-ED Capacities No. (%)**	**In ED Capacities No. (%)**	**In Non-ED Capacities No. (%)**
Overall	933 (90)	98 (10)	486 (56)	381 (44)
Control status				
Government, federal	34 (94)	2 (6)	10 (36)	18 (64)
Government, other	144 (93)	11 (7)	119 (52)	110 (48)

Private, not-for-profit	647 (89)	71 (11)	270 (56)	209 (44)
Private, for-profit	108 (89)	14 (11)	87 (66)	45 (34)
Teaching status				
Academic medical center	49 (94)	3 (6)	6 (75)	2 (25)
Other teaching institution	295 (87)	44 (13)	85 (52)	80 (48)
Nonteaching institution	589 (92)	51 (8)	395 (66)	299 (34)
Location				
Urban	756 (91)	78 (9)	238 (59)	166 (41)
Suburban	80 (90)	9 (10)	110 (50)	111 (50)
Rural	57 (85)	10 (15)	131 (56)	102 (44)

Nearly all (90%) of residency-trained and/or certified physicians worked in another ED, whereas 381 (44%) of the non-emergency medicine–trained and/or –certified physicians worked in non-ED capacities.

ED Physician Staffing Arrangements

Hospitals reported a variety of arrangements for staffing their EDs. Approximately half of all hospitals staff their ED with physician employees (44%), and nearly half staff their department with physicians who are independent contractors (49%). A few hospitals staff with both independent contractors and employees (6%). We asked medical directors to indicate for whom the emergency physicians worked. Forty percent reported that physicians worked for the physician group, 23% worked directly for the hospital, and 24% worked for the contract holder.

Resident Staffing

Only 19% of the hospitals (172) report training residents (of any specialty) in their ED. On average one FTE for a resident constitutes approximately 42 hours per week.

ED Nonphysician Staffing

The use of PAs, NPs, or both to supplement physician staffing in the ED was reported by 47% of the responding hospitals. Two hundred fifty-four hospitals used PAs (29%), another 108 (12%) used NPs, and 52 (6%) used both PAs and NPs.

DISCUSSION

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The survey results provide a description of who is practicing clinical emergency medicine (ie, the characteristics of that population) and the number of physicians practicing in participating

hospitals. One of the purposes of the study was to project estimates for the population of all EDs, based on the sample. In particular, we wished to estimate the number of FTEs that are currently being staffed in the population of EDs as a whole, and to estimate the total number of physicians used to staff those positions.

The purpose of sampling is generally to make inferences about the population. Relatively modest sample sizes can typically be used to make relatively precise estimates of population characteristics.[7] In this study, we received complete responses from 785 hospitals that have EDs. This represents about 12% of the total number of hospitals in the population and about 16% of the total number that have EDs. Because hospitals are the unit of analysis, we are able to estimate the number of FTE emergency physician positions that exist in the departments, as well as the number of physicians used by hospitals to staff the FTE positions. We cannot directly estimate the number of individual physicians who practice in EDs because, as has been discussed, many physicians work in more than one ED. By making additional assumptions, however, regarding the number of different EDs at which a typical physician practices, we can make an inference regarding the number of individual physicians practicing in EDs.

Before discussing projections, it is important to consider issues related to our response rate. Whenever a 100% return rate in a survey is not achieved, the potential for bias must be explored. In the present study, we achieved a response rate of 45.7%. A return rate between 40% and 50% has long been considered a respectable return in survey research.[8] Nonetheless, we must explore to what degree respondents might differ from nonrespondents on variables related to the dependent variables. We stratified our data on variables we believed were related to FTEs and the number of physicians staffing them. The data reported in Table 1□ demonstrate a remarkable similarity among the population, the sample, and the respondents on those variables. Moreover, when we compare respondents with nonrespondents on these same stratification variables, we see no significant differences. It is possible that the groups do differ on variables not included in the study.

To arrive at our estimates, we computed the average FTEs for a hospital ED, as well as the number of individual emergency physicians per hospital for the sample responding to the survey. These data provide an estimate of the average per hospital FTE for the population of all EDs. We then estimated the total FTEs and individual physicians that fill those positions for the entire population by multiplying the sample average FTE by the total number of hospitals with EDs in the population. We refer to this as the self-weighted estimate because the weight given to each hospital stratum, defined by control status, teaching status and location, is the number of respondents to the survey.

We tested an alternate method in which the population weights were used to calculate the total number of FTEs and total number of individual physicians employed to fill those positions in the population. With this method, the hospital average for both FTE positions and the number of physicians hired to fill those FTEs is calculated at the cell or stratum level, using the sample. For example, we would calculate the average FTEs of hospitals that are private, for-profit, nonteaching hospitals in rural areas. We would calculate these FTEs for the cells defined by the strata (control status, teaching status, and location). Then, we would estimate the number for the population by multiplying each cell number of EDs with those characteristics in the population. We found no significant differences (at the .05 level of probability) in these two methods for arriving at our estimates. The *t* ratio of the difference was less than 1.96.

Estimates of the total number of FTEs in the EDs and the number of physicians used to fill those positions are shown in Table 12.

Table 12. Physicians practicing in EDs: population estimates.

	Estimates	
	Self-Weighted No. (SE)	**Population-Weighted No. (SE)**
No. of ED	4,945	4,945
FTE physicians ("spaces")	24,548 (437)*	23,376(404)*
Individual physician ("faces")		
Maximum number	36,990(683)*	35,543(579)*
Unduplicated number	32,020	30,773
"Face/space" ratios		
ED perspective (using maximum no.)	1.51	1.52
EM workforce perspective (using unduplicated no.)	1.30	1.31

Numbers in parentheses indicate the standard errors, except when designated by an asterisk.
*Standard error of estimate.

The self-weighted estimate of FTEs across all EDs is 24,548 (with a standard error of 437). The estimate for the number of physicians hired to fill those FTEs is 36,990 (with a standard error of 683). This estimate is, in a sense, the upper-bound estimate of the total number of individual physicians who practice in EDs. It would be the estimate of individuals only if each physician practices in only one department. Because many physicians practice in more than one ED, it overstates the total number of individual physicians. To estimate the number of unique or unduplicated physicians in EDs, we made the following assumptions, based on the reported data:

- 44% of physicians work at more than one job
- Of this 44%, 61% work at another ED
- Therefore, approximately 26.8% of physicians work in at least two EDs
- We assumed that those who work in at least two EDs work in exactly two EDs
- Therefore, these physicians (26.8%) were counted exactly twice.

On the basis of these assumptions, we estimate that there are about 32,026 individual physicians practicing in EDs. Using our estimate of the unduplicated number of individual physicians practicing in the EDs, we estimate a revised physician/FTE ratio for the emergency medicine workforce of 1.3:1.

These estimates are also based on an FTE position equaling 40 hours. Some observers maintain that what constitutes an FTE in the ED cannot be estimated because it depends on

what other activities each physician is engaged. Both the AHA and the literature on physician workforce issues use 35 to 36 hours per week as the basis for FTEs. We find no empirical support for these numbers; they appear to be a result of convention. Because our data indicate that the most frequent standard is 40 hours for an FTE, we used that as the basis of our estimate.

Our projections of emergency medicine FTEs, as well as projections of the number of physicians filling them, is restricted to clinical practice in a hospital setting. Clearly, the scope of emergency medicine goes beyond the clinical setting within a hospital. Clinical emergency medicine is practiced in a variety of nonhospital settings, including EMS, occupational settings, cruise ships, and free-standing urgent care settings. Also, many emergency physicians are engaged full-time in nonclinical aspects of emergency medicine, including teaching, research, administration, and government service. Therefore the total number of individuals who compose the universe of emergency physicians is larger than our projected number of those providing clinical service.

In 1987 ACEP first adopted the position that there was a significant shortage of emergency physicians appropriately trained and certified in the specialty. Moreover, it has been the position of the College that this shortage will continue well into the next century. Others have made similar observations. As early as 1980, the Graduate Medical Education National Advisory Commission (GMENAC) predicted a shortage of emergency physicians until 2010.[2] However, the GMENAC study based its findings on a needs-based model. The needs-based model develops projections based on what a panel of experts believes will be required, given a certain set of assumptions about pathology and epidemiology, as well as what will be required from a professional standpoint to meet health care needs. A major limitation of this model is that such needs assessments are highly subjective and difficult to verify.[2]

Gallery et al[1] reported in 1990 that there was a need for 26,320 emergency medicine FTEs. Their conclusion assumed the following: 5,600 hospitals in the United States with EDs in 1990 and a mean of 4.7 FTEs per ED. The FTE figure was an extrapolation of a previous ACEP study of staffing patterns and, as such, served as an unverified estimate of the total number of FTEs. Moreover, the projection did not address how many physicians composed the workforce complement.[1]

Holliman et al[5] also reported a shortage of appropriately trained and qualified emergency physicians. They developed a model based on the supply of emergency physicians from accredited emergency medicine training programs and the demand for emergency physicians, as estimated from the number of hospital EDs and staffing patterns. Their assumptions were similar to the assumptions made by Gallery et al. As with the projections of Gallery et al, the projections of Holliman et al were based on assumptions that may have had heuristic value but had not been empirically validated.

Although previous estimates reported in the literature were based on untested assumptions, it appears that those assumptions and resulting projections are consistent with the present data. Gallery et al[1] reported a need for 26,320 FTEs, slightly more than the number projected by the present data. They assumed 5,600 hospitals with EDs, whereas the actual number based on AHA data is 4,945. They used an average FTE per hospital of 4.7 which was very close to the number 4.96 reported in this study. Holliman et al[5] used similar assumptions to make projections and offered various models based on those projections.

The present study does not attempt to project future need. "How many physicians are needed

to staff EDs in the next 20 years?" is not an empirical question. Science does not answer the question "should." Such questions are ultimately a matter of judgment and will be solved in the policy arena rather than within academe. Nonetheless, sound science can guide policy decisions. As has been stated, any statement of need must contain not only a description of "what should be?"—a policy question, but also, a description of "what is?"—an empirical question. The present study provides the first empirical data reported to date to answer that question for emergency medicine.

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Introduction
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Commentary

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John B McCabe, MD
Vice Dean and Vice President for Clinical Affairs, Professor of Emergency Medicine, State University of New York, Health Sciences Center, Syracuse, NY

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