

**UTILIZATION AND OVERCROWDING
OF HOSPITAL EMERGENCY DEPARTMENTS**

DRAFT COPY: NOT TO BE CITED OR REPRODUCED

By:

**David Shactman, M.P.A., M.B.A.
Stuart H. Altman, Ph.D.**

January, 2002

Research for this paper was supported by a grant from the Robert Wood Johnson Foundation to the Council on the Economic Impact of Health System Change. The Council is chaired by Stuart Altman and administered at the Schneider Institute for Health Policy, The Heller School, Brandeis University. Copyright 2002, all rights reserved.

ACKNOWLEDGMENT

The authors wish to acknowledge the research assistance of Eva Marie Stahl, Brian Rosman, Catherine Robbins, and Patricia Aloise, and graphics assistance from Lisa Andersen. We are also most appreciative of many practitioners and researchers who gave generously of their time to discuss these issues.

I. INTRODUCTION

Hospital emergency departments (EDs) have become overcrowded in many areas of the United States. The demand for ED services has increased since 1997, reversing a previous trend. Throughout the decade of the 90s, the number of hospitals and beds declined, so there is less supply available to meet the increased demand. Many hospitals, particularly in urban centers, are diverting ambulances to other facilities because they are unable to adequately service arriving patients. Hospitals report longer waiting times for patients visiting EDs, increased numbers of patients who leave without being seen by a physician, and more frequent “boarding” of patients who are waiting for an inpatient bed.

Overcrowding of hospital EDs has significant health implications. Emergent patients diverted to more distant locations risk increased morbidity and mortality. Overcrowding within the ED is associated with poorer outcomes of care and can result in prolonged discomfort and pain for patients. Our public health system depends on the availability of ED services after an accident, public health crisis, or the onset of a serious health problem, and overcrowding can erode confidence in the system as a whole.

The hospital ED is also the core of the health care safety net. It is often the chief point of contact with the health care system for many uninsured, under-insured, and underserved populations. Overcrowding can be a barrier to health care access for these populations who may have few health care alternatives.

In addition to these specific concerns, it is possible that overcrowding of hospital EDs is an early warning sign of at least three fundamental problems emerging in the health care system. As such, it could have significant implications for policy makers and industry leaders. The first of these problems regards hospital and health system capacity. After a decade of over capacity and consolidation, the ED problem could be one of the first symptoms of a hospital system that has reduced its supply of services too much in certain areas. If this is the case, it would have implications for policies regarding future mergers, consolidations, and facility closings, certificate of need legislation, and potential expansions of capacity or siting of new facilities. It

would also have implications for the renewal of the Balanced Budget Act (BBA) in 2002, especially as it affects the availability of post-acute providers.

A second potential problem is that overcrowded EDs could be an indication of a lack of primary care services. This may be particularly evident in poor and underserved communities and among racial and ethnic minorities. But even in well-served areas there is anecdotal evidence of reduced availability of same-day and after-hours appointments and of EDs being increasingly used by patients who could be seen in primary care settings.

A third area of concern is that ED services may be over-utilized as a result of the managed care backlash and patient protection legislation. Addressing this concern might involve reconsideration of patient protection legislation and examination of financial incentives to encourage patients and physicians to utilize the most appropriate settings of care. This may be particularly relevant to the Medicare and Medicaid programs, both of which report high utilization of hospital EDs. The role of managed care and the structure of the Medicare+Choice program may also have to be reexamined in light of recent increases in utilization of ED and hospital inpatient services.

In addition to these fundamental problems, over-utilization is also a concern because of cost. There is no utilization review of ED services, and ED clinicians are often unfamiliar with patients and their records. Hence, patients are often given an extensive set of diagnostic tests that might otherwise be unnecessary. In addition, hospitals include fixed costs in billing for ED services. As a result, the average cost of ED services is high and represents a significant expenditure for patients and payers. The marginal cost of ED services may be much lower, however, particularly during off-hours as compared with other facilities that are not staffed 24/7. This raises the question of how the costs of ED services should be measured, and how EDs should be structured in the future to serve their role in a cost-effective manner.

The structure of the hospital ED and how it interfaces with the rest of the hospital raises another important set of issues. Can ED services be re-configured to operate more efficiently and be better coordinated with other hospital services? At most hospitals, scheduled admissions and

surgeries are not coordinated with expected ED volume. Research into variability methodologies and queuing theory indicate potential for overcrowding to be reduced and efficiency increased by employing operation management techniques. Questions arise as to how EDs can best share hospital services such as observation beds, imaging, lab services, etc., and whether they should have stand-alone urgent care capabilities.

The seemingly straightforward problem of ED overcrowding raises a panoply of operational questions and policy issues. Clearly, the answers to all of these cannot be addressed in a single paper. The objectives of this paper are to identify the many issues that are relevant and to provide a logical framework for considering policy solutions. We begin by looking at how ED utilization first declined and then rose in the 1990s. We briefly consider why ED overcrowding is important and what implications it has for patients. We then attempt to identify and provide a framework for considering all the factors that impact utilization and overcrowding. We address each factor separately and then, in a conclusion, speculate on their relative importance and the implications for policy. Finally, we recognize that overcrowding of EDs may be a harbinger of several broader problems in the health care system, and we provide an addendum in which we consider those issues from a policy perspective.

II. WHAT HAPPENED TO ED UTILIZATION?

In the early 1990s, there were widespread reports of ED overcrowding in many areas of the country. The U.S. General Accounting Office documented the problem in a report issued in 1993, but by that time the problem began to abate. Payers and providers focused on cost control, and utilization of ED services was held in check by competition and managed care until the latter part of the decade. Beginning in 1997, a clear trend toward increased utilization emerged. Figures One and Two show the absolute number of ED visits, and the number of ED visits per thousand population from 1992 to 1999.

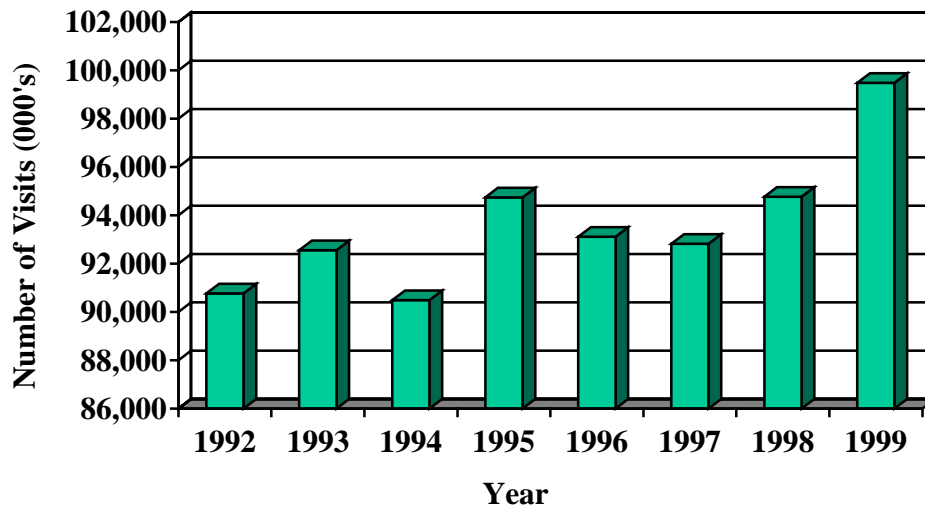


Figure 1: Emergency Department Visits 1992-1999

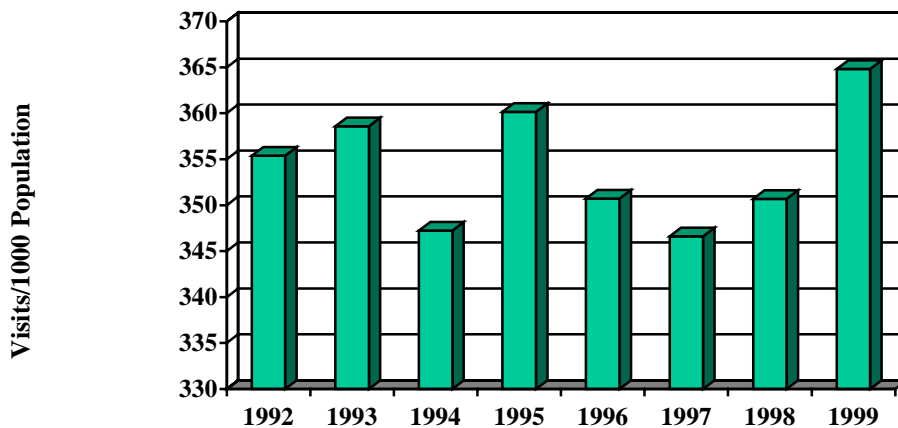


Figure 2: ED Visits per Thousand Population

During the mid-90s, when demand for ED services remained fairly constant, inpatient use of hospitals was declining. Several factors lead to a decline in the number of inpatient days and left many hospitals with excess capacity. These included increased capabilities and substitution of outpatient surgery, growing penetration of managed care, more intense competition, and more widespread use of utilization controls. Many of these factors contributed to shorter lengths of stay. Figures Three and Four illustrate the absolute decline in inpatient days and the decline in inpatient days per thousand population.

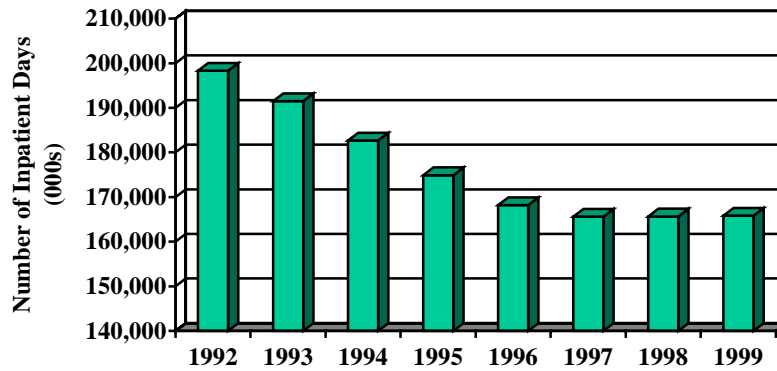


Figure 3: Hospital Unit Inpatient Days

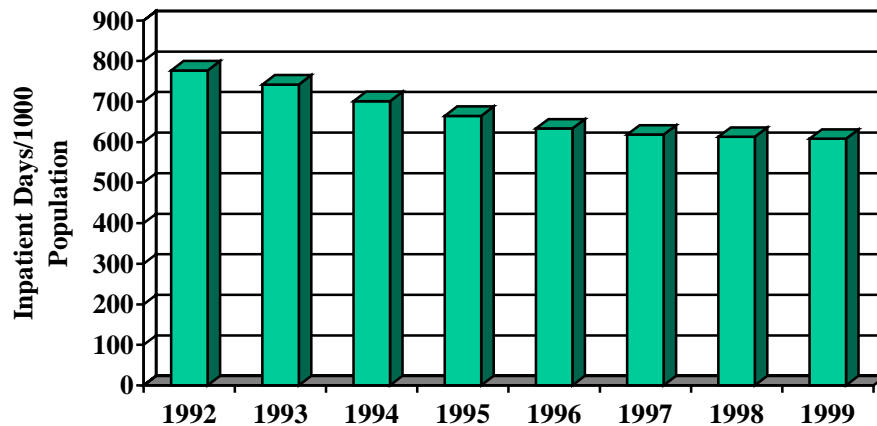


Figure 4: Hospital Unit Inpatient Days per Thousand Population

In response, many hospitals consolidated, closed, or converted to other kinds of facilities and fewer numbers of EDs and inpatient beds were available. Figures 5 and 6 show the absolute

decline in the number of hospital beds and the decline in beds per thousand population.

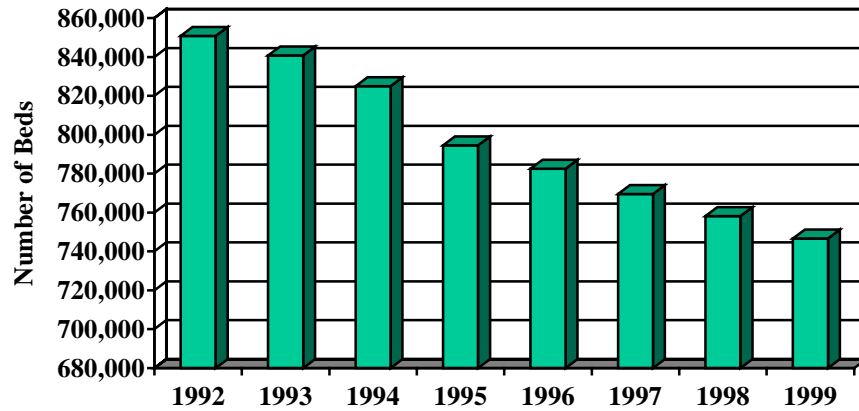


Figure 5: Number of Hospital Beds

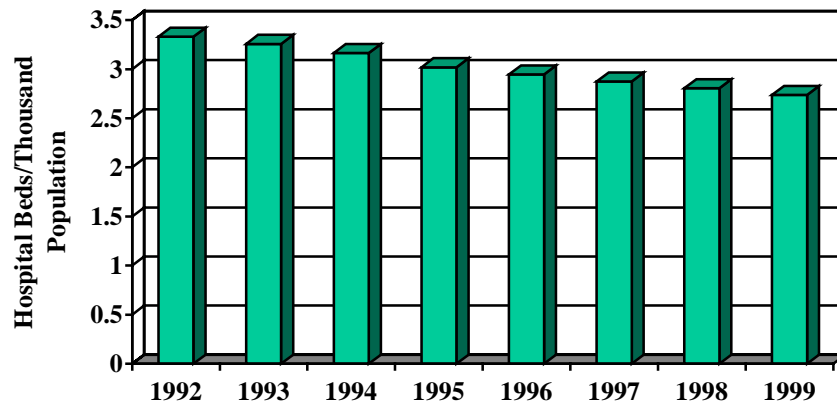


Figure 6: Hospital Beds per Thousand Population

But as the supply of hospital beds continued to decline through 1999, the demand for services began to increase. In 1997, the decline in inpatient days began to level off and, at the same time, ED utilization began to increase. Between 1998 and 1999, ED visits increased sharply from 94.8 million to 99.5 million, an increase of 5% in only one year. In 1999 there were 35,000 more ED patients/day than in 1992. They were seeking treatment in fewer hospitals, and fewer inpatient beds were available to receive ED patients. As a result, the “cushion” that hospitals had to

absorb variation in ED demand largely evaporated. Figure 7 shows that the number of ED visits per hospital bed increased by over 10% in just the last two years.

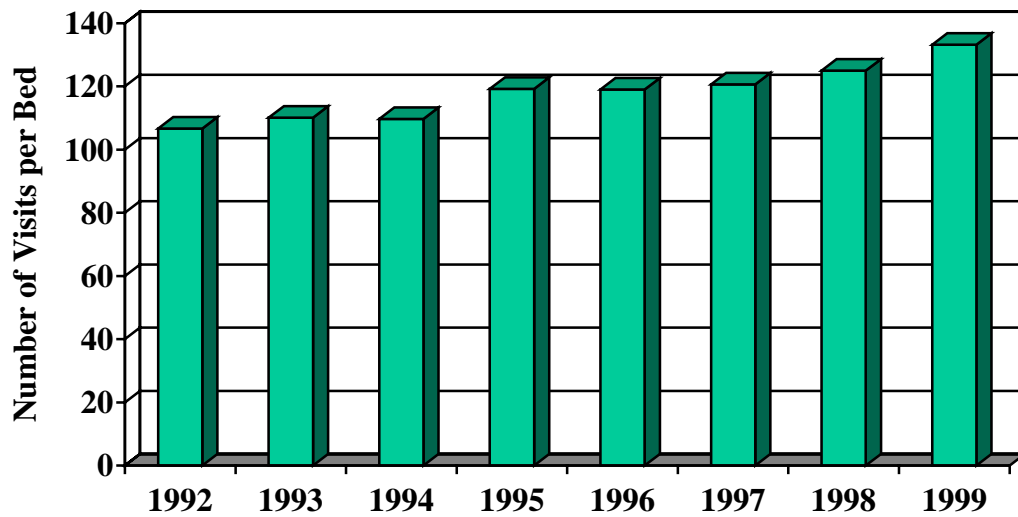


Figure 7: ED Visits per Hospital Bed

It is instructive to examine some characteristics of those utilizing ED services (following statistics from McCaig, 2001). Utilization rates are concentrated among a few payment sources. Medicaid patients utilize the ED most frequently, at a rate of 64.3 visits per hundred. The next most frequent utilizers are Medicare patients at 42.6 visits per hundred and the uninsured at 40.4 visits. Individuals with private insurance have an ED visit rate of 20.5 per hundred. Even though they have the lowest utilization rate, those with private insurance are more numerous and, hence, have the most number of visits. They comprise 71% of the population and constitute 38.9% of total ED visits. Medicaid patients constitute 17% of total visits, self-pay patients 16%, and Medicare patients 15%.

Possibly the most striking characteristic is the difference in utilization by race. The utilization rate for blacks is 71% higher than for whites. Even more striking, is the change in utilization rates for elderly blacks in recent years. Between 1992 and 1999 the utilization rate for blacks over 65 years old increased by 59%, while the white utilization rate for the same age group remained unchanged. During that period the ED visit rate for black seniors increased from 45.4

to 72.2 visits per hundred persons. McCaig concludes that between 1992 and 1999 ED utilization rates increased for age groups 45 and above “primarily driven by increases in visit rates for black persons as no trends were observed for white persons in these age groups.” We examine some possible reasons for these racial disparities in the addendum.

In general, the acuity of patients visiting the ED did not change a great deal in the 1992-1999 period. Perhaps, the most significant trend was that visit rates for illness increased from 21 to 24 visits per hundred while visit rates for injuries fell slightly. Illnesses, on average, generate more hospital admissions than injuries. During this period the average age of patients increased from 33 to 35.7 years. Notwithstanding the increase in illness versus injury, the inpatient admission rate of patients visiting the ED actually fell slightly from 13.5% to 12.9%. Furthermore, those treated and released with no follow-up (presumably an indication of low acuity) increased 50% from 6% to 9%.

The above figures suggest increased visit rates by older and more ill patients accompanied by increased visits from patients simply treated and released who could likely be seen in less intensive settings. It is important to note that the 13% of ED patients who are admitted to inpatient care constitute about 40% of overall hospital inpatient admissions.

Finally, a trend worth noting is the rate of multiple drug mentions.¹ From 1992-1999 the percent of ED patients who had drugs mentioned remained stable. However, the incidence of those who had three, four, or five drugs mentioned (5 was the maximum number queried), increased by 25%, 44%, and 88% respectively. The complexity and the cost of multiple drug prescriptions could be an incentive for people to visit the ED to procure drugs and could also be the basis of more frequent ED visits from patients who could not afford to follow prescribed regimens or who followed them incorrectly. The percent of visits from seniors with five or more drug mentions increased by 59%, and visit rates from patients who had adverse effects from either drugs or from medical or surgical complications rose by 67%.

¹ The NHMCS defines drug mentions as “all new or continued medications ordered supplied or administered at the visit, including prescription and non-prescription preparations, immunizations, desensitizing agents, and anesthetics.”

III. THE IMPLICATIONS OF ED OVERCROWDING

As EDs become more crowded in the United States, there is a growing concern that overcrowding will lead to reduced quality of care. When EDs are busy and lack the bed capacity and staff to cope with increased volume, the risks of medical errors are inevitable. There is a greater likelihood of error or absence of care when there are more patients than resources. Quality of care may be perceived or measured in a number of ways. Research shows that overcrowded emergency rooms lead to a lesser quality of care in patient satisfaction, in the receipt of appropriate services, and in patient outcomes (Bindman, 1991).

Very few studies concisely address the issue of quality in an emergency department faced with overcrowding. Logic would lead one to hypothesize that overcrowding in an emergency room is an element of a causal chain that could lead to numerous externalities, one of which is quality inadequacy. One ED physician expresses the problem as follows:

“Intuitively, the more crowded the place is, the less time you can spend with patients, the fewer resources there are for them, and the longer sick patients wait to be seen in the waiting room. Admitted patients waiting in the ED for a bed, take up resources, space, and nursing care, and more people in an already stressful place adds stress to the environment. These are all issues of quality if not of patient safety. It is also a politically charged situation on so many fronts (Dr. Richard Griffey, Emergency Room Physician, Brigham and Women’s Hospital, Boston, MA).

Two European-based studies attempt to measure the association of emergency room overcrowding and quality. A group in Spain assessed the association of decreased health care quality and emergency room overcrowding in a tertiary teaching hospital (Miro, 1999). The authors utilized established quality markers such as mortality rates and revisit rates to measure quality of care over 104 weeks. They found that during weeks of high volume, there was an increase in mortality ($p=.001$) and an increase in revisit rates ($p=.06$).

A second study reviewed the issue of quality in an overcrowded emergency room through the lens of access. Lombrail and colleagues (1997) reviewed pediatric use of emergency rooms in France where they concluded that overburdened emergency rooms faced a higher likelihood of diminished quality of care.

More research is needed in the United States to examine the impact on quality of care of crowded emergency rooms and of ambulance diversion. Derlet and Richards (2000) report numerous fallouts from overcrowding. These include medical errors, delayed service due to queuing, boarding of patients waiting for inpatient beds, and patients leaving without being seen. Other problems include readmission of patients and a lack of continuity of care. Derlet and Richards cite some specific examples including a patient with hypothermia whose symptoms were not evident until the patient's temperature dropped to a dangerously low level. They also cite a patient who waited in a hallway for 2 hours with an undiagnosed myocardial infarction.

Both patients who leave without being treated and patients who are treated and then return are indicative of ED quality problems. While the former is clearly associated with crowding, the latter may or may not be a function of overcrowding. Those who leave, while they suffer from less severe injury or illness, have higher rates of deterioration than those who wait to be seen by a physician (Bindman, 1991). Those who utilize the emergency room for care and return for additional care, often within 7 to 14 days, have longer length of stays (LOS) in the hospital, are financially burdensome, and are usually admitted back through the emergency room to the hospital (Baer, 2001).

Quality of care in overcrowded emergency rooms is a growing and imprecisely documented phenomenon that demands greater research and attention. Evidence exists that several dimensions of quality are reduced when overcrowding occurs. Clearly, a redress of the current imbalance between the demand and supply of services would help alleviate the problem. But it is also possible that new conceptual frameworks should be considered that include changes in structure, management, and financing of ED services.

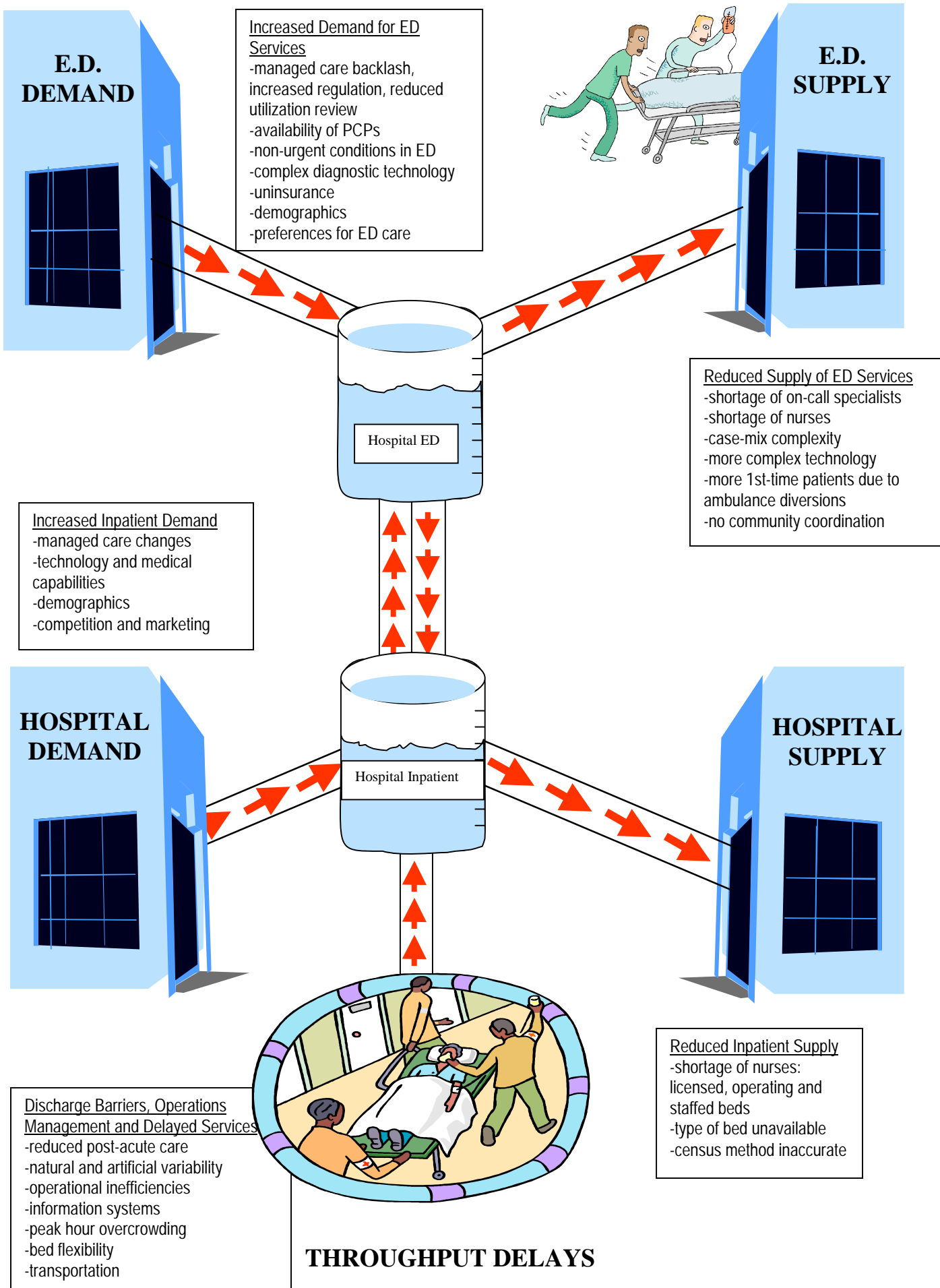
IV. THE FACTORS UNDERLYING ED UTILIZATION AND OVERCROWDING

A complex mix of both supply and demand factors must be examined in order to understand the reasons behind increased ED utilization and overcrowding. It is not sufficient to examine only the demand for, or the supply of, ED services. A much broader view is necessary to grasp the entire scope of this problem. Hospital ED personnel frequently report that the chief reason for ED overcrowding is the lack of availability of inpatient beds and other hospital services (Lewin, 2001). When these inpatient services are not available, either because of an insufficient supply of beds or of qualified personnel to staff them, patients who could otherwise leave the ED and free-up space are often “boarded” until such time as the beds or services become available. Hence, the demand and supply of inpatient hospital services is inextricably entwined with the problem of ED overcrowding. When EDs become overcrowded, ambulances are often diverted to hospitals that have available capacity but may be farther away. Ambulance diversion and community-wide planning for ambulance services are currently the subject of much ongoing research. We consider ambulance diversion to be a symptom of ED overcrowding and, although it is an important issue, we do not address it in this paper.

The flow diagram on the next page illustrates the dynamics of ED overcrowding.²

² We acknowledge an earlier diagram by McManus (2001) with many similarities.

Figure 8: ED Supply and Demand Flow Chart



We identify five major sources of ED overcrowding and discuss each of them in the balance of this section:

- A. Increased demand for ED services
- B. Reduced supply of ED services
- C. Increased demand for inpatient beds and services
- D. Reduced supply of inpatient beds and services
- E. Operational constraints and other factors that reduce patient throughput

A. Increased Demand for ED Services

As shown earlier in Figures 1 and 2, ED utilization was stable through the mid-1990s, and then began to spike upwards in 1997. The previous time that the health system experienced increased ED use was during the 1985-1990 period when utilization increased by 19%. The GAO conducted a study of this period that was published in 1993. They concluded that a major reason for the increase in those years was attributed to the growth in the number of uninsured. Growth in utilization was concentrated among Medicaid and Medicare recipients and the uninsured. Other factors they identified were increased numbers of elderly using ED services, and use by more seriously ill patients. They also found that 43% of ED patients did not have emergent or urgent conditions and could have been seen in “less expensive settings.” Lack of a primary care provider was often given as the reason why patients with lower acuity chose to seek care at the ED. Following the increased penetration and influence of managed care and a more competitive health market, ED visits actually decreased through the middle 90s. The reversal of this trend in 1997 was not anticipated. Definitive empirical data is lacking to identify the specific reasons why the trend reversed. It appears, however, that some of the major factors given for the 1985-1990 increase are not present today. For example, since the early 90s, the number of uninsured remained fairly steady and the proportion of Medicaid visits to the ED actually fell. Although we cannot present empirical evidence of the factors driving the present increase, we can suggest a variety of potential factors whose relative importance could be borne out by future research.

The Managed Care Backlash, Increased Regulation, and Reduced Utilization Review

The well-documented backlash against managed care in the late 1990s eventually caused managed care organizations (MCOs) to reduce the intensity of utilization review. The backlash also foreshadowed stricter regulatory legislation. The Emergency Medical Treatment and Active Labor Act (EMTALA) became effective in 1986 but was strengthened several times in the 1990s. The Act requires any hospital that accepts Medicare (virtually all community hospitals), to treat and stabilize all patients who arrive at the ED regardless of their medical condition or their ability to pay. As the managed care backlash became more pronounced, EMTALA was more strictly enforced, targeting hospitals that were suspected of “patient dumping.”

Also during the 90s, patient protection bills were debated at the federal level and enacted by a majority of states. Many of these bills contained what became known as the “Prudent Layperson Standard” (PLP), which was also included in federal regulation for all patients whose medical bills were paid by federal programs. PLP asserts that if a patient is in pain or reasonably believes that he or she is experiencing a medical emergency, the patient’s insurer has to pay for an ED visit whether or not the patient seeks prior authorization. The widespread adoption of PLP has essentially made it the de facto standard, even where it has not been specifically enacted into law.

Research shows that MCOs are rejecting fewer ED reimbursement claims than they did when review was more stringent. Together, reduced utilization review, patient protection acts, EMTALA, and PLP may be encouraging more physicians to refer and more patients to self-refer to hospital EDs.

Availability of Primary Care Physicians

One potential reason that patients increasingly seek care at the ED is that they have problems finding or scheduling a timely appointment with primary care physicians (PCPs). This is particularly true in underserved areas, where fewer PCPs are apt to be located and where they may not accept uninsured or publicly insured patients. We address differences in non-white and

underserved communities in the Addendum, but a general indication of the problem is that 21% of physicians were not accepting new Medicaid patients in 1998 (Cherry, 2001).

Even insured patients may have difficulty scheduling a timely appointment with a PCP. The increased penetration of managed care and the concomitant requirement of “gatekeeping” increases the demand for primary care appointments. Anecdotally, some have theorized that PCPs, who may be unhappy with managed care, and who may resent the fee-per-patient paid by MCOs, are less apt than in the past to crowd in more patients or to see patients in off-hours, and feel they have less to lose by simply referring patients to the ED. Evidence supporting or refuting this supposed phenomenon is a potential area for future research.

In addition to the above, many of the urgent care centers or “doc in the box” establishments that sprouted up in the early 90s disappeared under tighter reimbursement and more competitive health markets. With fewer urgent care centers, and with long waits common in many community health centers, the hospital ED may have been visited by more patients who might otherwise have accessed these primary care alternatives.

Use of the ED for Non-Urgent Conditions

The combined effect of looser managed care, widespread patient protection regulation, and reduced accessibility to PCPs, provide incentives for patients to utilize the ED for non-urgent conditions. The National Center for Health Statistics (NCHS) has tracked the acuity of ED patients according to triage at arrival for how immediately they should be seen. They use four classifications: Emergent (less than 15 minutes), Urgent (15-60 minutes), Semiurgent (between 1 and 2 hours), and non-urgent (2-24 hours). In 1999, 17% of patients were classified as emergent and 26% as either semiurgent or nonurgent (McCaig, 2001). However, there was a 27% non-response rate. Recalculating only among those responding yields a rate of nearly 36% for those who were triaged as semiurgent or nonurgent. These proportions have changed little since 1992, but comparisons over time are difficult in this data source because the non-responses were apparently imputed in earlier years. The NCHS survey also found that the proportion of ED patients admitted to inpatient has remained about the same over the 1992-1999 period (13.5% in

1999). They did find that patients who were released with no follow-up increased from 6% to 9% over the period, a possible indication of increasing non-urgent utilization.

The Commonwealth Fund (Billings, 2001), in a more recent study in New York City, divided patients between emergent and non-emergent (primary care treatable). Then, they further divided the emergent patients into those that could have seen a PCP and those where ED care was needed. They found that 41.3% of patients were non-emergent and that 33.5% were emergent but could have been seen by a PCP. Furthermore, they found that 7.3% of patients needed an ED but had a condition that was preventable or avoidable. In sum, they found that 75% of ED patients could have been seen by a PCP and another 7% of visits prevented or avoided.

It is clear, that a substantial number of ED patients could be seen and treated in primary care settings, and this could help alleviate some ED overcrowding. There are now few financial disincentives to discourage ED use. In fact, some insured patients can avoid a co-pay entirely by visiting the ED instead of a PCP. Some hospitals and health plans have instituted charges and co-pays for ED use. Such policies could present trade-offs between reducing unneeded use and potentially discouraging needed visits.

Increasing Complexity of Diagnostic Technology

As the capabilities of medicine increase, new, more complex, and more expensive diagnostic equipment becomes a necessary part of patient care. Some of these procedures cannot be done in a PCP's office either because of the equipment needed, or the time necessary for lengthy tests and procedures. Some patients may need a variety of tests, all of which could be performed only in a hospital setting. Hence, advancing technology makes the ED an attractive alternative and is a potential cause for increased utilization.

Lack of Adequate Insurance

Although the number of uninsured declined from 1998 to 2000, over 38 million Americans remain uninsured (EBRI, 2001). Furthermore, it is estimated that an additional 30 million are

underinsured (Commonwealth Fund, 2001). With increased penetration of managed care and with a more competitive health industry, it is harder for providers to shift the cost of the uninsured to privately insured patients as they often did in the past. Hence, studies show that as managed care penetration has increased, physicians have provided less uncompensated care.

A similar problem exists for Medicaid patients whose providers are typically paid less than cost for their services. No longer as able to shift cost to the privately insured, they are less willing to see new Medicaid patients and 21% of physicians refused to do so as mentioned earlier.

Individuals with “Medicare only” coverage may also have added reason to visit the ED. Between 1994 and 1998, the percentage of seniors with “Medicare-only” coverage increased by 83% for white seniors and 30% for black seniors. Some of those with Medicare only insurance may not have been able to afford the escalating costs of drug coverage, which could have resulted in more ED visits.

Demographics

There is no question that a growing population that is also aging contributes to the increase in ED demand. Since 1992, the population increased by about 8% while ED visits increased 14%. During this period, the average age of people demanding services from the ED increased from 33 to 35.7 years. Individuals 75 years of age and over visit the ED at a rate of 62.8 visits per hundred persons compared to the overall average visit rate of 37.8 per hundred (McCaig, 2001).

Preferences for ED Care

Americans have come to rely on the ED as a reliable source of care, regardless of their medical condition or ability to pay. Even if they are able to schedule a visit with a PCP within a week, they know that they can get “same day service” at any hospital ED. They may have to wait several hours if they have non-urgent conditions, but they are confident that they will be taken care of that day, and that a thorough and comprehensive level of care will be provided. Given other alternatives, some simply choose the hospital ED as their preferred locus of care.

B. Reduced Supply of ED Services

As demand for ED services rose 14% between 1992 and 1999, the number of EDs declined. Brewster (2001) reports an 8.1% decline since 1994.³ As a result, existing EDs were seeing 35,000 more patients per day in 1999 than they had in 1992.

The supply of ED services varies considerably around the country. Certain areas experienced a high degree of hospital consolidation. Others were forced to close EDs for financial considerations. For example, in Massachusetts, the number of EDs declined by 24% between 1990 and 2000 (McManus, 2001). In California, hospital EDs lost \$317 million in 1999 and the decade of the 90s saw the closure of 50 EDs (Lewin, 2001). In many places where EDs were closed and consolidated, the burden on the remaining hospital EDs was quite severe. In addition to a declining number of sites, the supply of ED services was reduced because of a number of other factors.

Shortage of On-Call Specialists

Many hospitals anecdotally report a shortage of on-call specialists. Both the California Medical Association and the Arizona College of Emergency Physicians have issued reports identifying this as a critical problem (California Medical Association, 2001, Arizona College of Emergency Physicians, 2000). Lambe (2001) attributes 33% of waiting time in California EDs to patients waiting to see on-call physicians. Potential reasons include more procedures being performed outside the hospital, busier physicians seeing more patients under managed care, lack of incentive to see patients when there is often no compensation for care, and workforce shortages for certain specialties. When patients wait a long time to see on-call specialists, they occupy ED beds and reduce the remaining treatment capacity.

³ We were unable to find a report on the number of ED beds which would be a useful statistic for policy decisions.

Shortage of Nurses

We address nurse shortages in Section D as an inpatient supply problem, but a lack of sufficient nurses to staff ED beds is also a problem for many EDs and reduces their treatment capacity.

Case-Mix Complexity

As the population ages, EDs increasingly see older patients who often present with chronic and co-morbid conditions and require more complex work-ups and treatment. At the same time, with today's increased capabilities, there is an expectation that EDs will treat and release many kinds of complex cases that previously would have been moved to inpatient settings (Derlet, 2000). This tendency is likely exacerbated by pressure from payers to avoid inpatient admissions. The additional procedures performed and the management of these cases impacts the ability to supply other services.

Use of More Complex Technology

Similar to the above, the availability and use of more complex technology outside of the inpatient setting often requires more time, attention, and patient management than in the past. Frequently, the use of such technology, which is often shared with hospital inpatients, requires waiting time for availability that further reduces the EDs ability to supply other services.

More First-Time Patients Due to Ambulance Diversion

In areas that are experiencing ED overcrowding, ambulance diversion is occurring much more frequently. When patients are diverted away from the closest hospital, the facility that treats them often has no prior medical records. In such cases, a full complement of baseline tests and procedures is often necessary. The increased time and additional diagnostic procedures reduce the capacity of the ED to supply other services.

Lack of Community-Wide Coordination Among Hospitals

In many areas that have more than one ED, there is a lack of coordination among hospitals that could otherwise reduce occurrences in which some EDs are overcrowded while others are operating under capacity. Improvements in community-wide information technology can identify specific service bottlenecks within hospitals and steer patients with certain conditions to other facilities. Although this type of solution has merit, there are barriers to increased cooperation. First, some patients will prefer their regular and/or their closest hospital, and this can make sense from a prompt service and continuity of care basis. Second, competing hospitals may be reluctant to surrender control over their chief source of admissions to market competitors. Finally, many rural areas that have been experiencing ED overcrowding have no other close ED or trauma center, so this solution is not relevant.

C. Increased Demand for Inpatient Services

After trending sharply down throughout the 1990s, inpatient visits began to level off between 1996 and 1997 and lately have begun to increase. The number of inpatient beds, however, continued to decline through 1999. The net result is that inpatient days per bed declined from 233 in 1992 to 215 in 1996 and then reversed trend, reaching 222 in 1999. Hence, the supply of inpatient beds relative to patient demand is still less than in 1992, but the turnaround is significant for future planning, and it has contributed to ED overcrowding. Some of the likely reasons for this reversal of trend are similar to those for the increase in ED demand and are listed below.

Changes in Managed Care

During the 1990s, the utilization control strategies employed by MCOs became widespread, even in the fee-for-service sector. The initial gains from a fee-for-service system that had many inefficiencies were easy to achieve. Hospital lengths of stay were reduced by nearly 20% between 1992 and 1999 and inpatient days per thousand population were reduced by 13% (AHA 1998, 2001). Many procedures were removed entirely to outpatient settings. As managed care

has matured, however, and these one-time savings have already been instituted, it is becoming increasingly difficult to garner further reductions in inpatient days. The above is particularly true in light of the managed care backlash, the resulting reductions in utilization review, and increased patient protection regulations that were described in the previous section. It is too early to assess whether recent figures indicate an actual change in trend, but if the above factors continue, the long-term decline in the demand for inpatient services could already have ended.

Technology and the Capabilities of Medicine

With increases in the medical and surgical armamentarium, previously untreatable illnesses can be ameliorated or cured, and even patients who cannot be cured can be stabilized and kept alive for longer periods. More complex procedures such as organ transplants and artificial organ replacements continue to become available. And the biotech revolution and stem cell research promise new vistas of medical treatments in the future. Although future scientific advances hold the promise of reducing medical costs, most technology to date has been cost-increasing and is likely to remain so for some time. Cutler (2001) cites studies estimating that the technological component of medicine alone will continue to increase costs by 1% over GDP annually for the next 75 years. The long-term impact of the enhanced capabilities of medicine is not certain but, at least in the near term, it is certainly likely to increase the demand for hospital services.

Demographics

The demographic changes that impact the demand for ED services also affect the demand for inpatient services. An aging population utilizes more hospital services, and aging patients often experience chronic disease that can result in lengthy hospital stays. Recent hospital experience shows an increasing demand for medical services as opposed to surgery. Some of the latter, having become less invasive, has often been moved to outpatient settings. Medical patients (as opposed to surgical patients) are typically older, suffer more chronic disease and have longer lengths of stay (Advisory Board, 2001).

Competition and Marketing

Hospitals compete for elective surgeries and for profitable specialties such as cardiac care. In a more competitive health care marketplace, many hospitals advertise their specialties and attempt to attract patients to their most profitable services. This can lead to increased or possibly even induced demand for certain services and procedures.

D. Reduced Supply of Inpatient Services

Following the adoption of the prospective payment system for Medicare and the influence of managed care, hospitals have attempted to adjust their supply to an environment with decreasing demand for inpatient services. The number of community hospitals has fell from 5,830 in 1980 to 5015 in 1998. The previously shown Figures 5 and 6 illustrate the steady downtrend in the number of hospital beds. Beds per thousand population declined by nearly 17% between 1992 and 1999 (AHA, 1998,2001). The hospital industry consolidated throughout the 1990s. Mergers and acquisitions increased substantially, peaking at 768 in 1996 (Bellandi, 2001). During the decade, numerous community hospitals were converted to other kinds of health facilities and many others were closed. This consolidation has continued to the present time, despite the fact that demand leveled off several years ago and has begun to turn upward.

In addition to a declining supply of beds, hospital capacity to serve inpatients is diminished by a number of other factors that are detailed below. When inpatient capacity is diminished, it can back up flow from the ED and cause the ED to become overcrowded.

Shortage of Nurses: Licensed, Operating and Staffed Beds

Hospital statistics often refer to the number of licensed beds. However, as the impact of Medicare PPS and managed care reduced the demand for inpatient days, many hospitals began converting licensed beds to other uses. Some were used for different medical services and some were converted to administrative space. The current disposition of these beds varies, as some could be turned almost immediately back in to operating beds, while others could require

construction and/or re-location of the current use and might not be available for a period of several months.

In addition to the fact that not all licensed beds are useable (or operating), not all useable beds are staffed. The well-publicized and widespread shortage of nurses has made it difficult for hospitals around the country to hire and retain sufficient numbers of nurses to staff available beds. Lewin reports that the number of staffed beds in the US declined by 15% from 1980 to 1998 (Lewin, 2001).

There is no short-term solution to the shortage of nurses, and the problem is likely to get worse before it gets better. The nurse workforce in the U.S. is aging and is now older than at any previous time. Fewer people are also enrolling in RN education programs as women in today's society find a much broader choice of career opportunities. It is estimated that there are now 126,000 unfilled positions for nurses (Lewin, 2001) and, if current trends continue, there could be a shortage of 434,000 nurses by the year 2020 (Buerhaus, 2000). The Advisory Board estimates that hospitals could currently increase capacity by 5%-10% if they could just staff all of their licensed beds (Advisory Board, 2001).

Unavailable Type of Bed

Although a hospital might have inpatient beds available, they may not have the right type of bed for the particular patient. About 10% of patients that are admitted through the ED typically need critical care beds. Anecdotally, hospitals report that these beds, such as ICU and CCU beds, are the ones most often unavailable. The supply of medical/surgical ICU beds declined from nearly 46,000 in 1993 to under 38,000 in 1999 (Lewin, 2001). Waiting for these beds to "free-up" is an oft-cited reason for backups into the ED.

In addition to ICU beds, patients are usually sent to specific medical units according to their particular medical problem. Quality of care can be enhanced when staff specializes in repeatedly seeing similar kinds of cases. Hence, for example, orthopedic beds can be available but the patient may be waiting for a bed in thoracic medicine. Pediatric beds are often necessary for

children. Patients are also separated by sex in semi-private rooms, and also may have conditions that require isolation. Conversations with the Massachusetts General Hospital revealed that recent changes in regulations requiring isolation caused the effective loss of up to 40 beds.

Inaccuracy of the Standard Method for Measuring Census

The methodology commonly employed to measure hospital census is seriously flawed and results in an over-estimation of the number of available inpatient beds. Strictly speaking, this is not a causal factor in reducing the supply of beds, but it may well result in management and policy decisions that provide fewer staffed beds than are needed relative to the actual demand.

Hospital *inpatient occupancy* or *average daily census* is measured by the number of patient days divided by the number of hospital beds. For decades, this has been the formula used to measure hospital capacity. The American Hospital Association (AHA) reports this statistic nationally in its Annual Survey. Although this provides a uniform and relatively inexpensive means to measure capacity utilization over time, substantial simplification is assumed in this data. Many researchers and industry leaders are aware of these shortcomings, but then go ahead and use these simplified measures because they are the most readily available.

There are a number of factors that have rendered the current methodology for measuring inpatient occupancy less accurate in recent years. Hospitals report that primary among these is that beds are now occupied for substantial parts of the day, but are often empty by midnight. This can occur in the case of observation stays or “23-hour stays.” As medical capabilities to treat patients in less intensive settings have increased, many patients undergo outpatient or emergency room procedures that might have previously required an inpatient admission. These patients are often “observed” for a number of hours post-procedure and then sent home. Financial pressures from payers deter hospitals from admitting these patients overnight, but they still occupy a bed during the day. In addition, patient care and operational considerations have led to a number of “outpatients” occupying inpatient beds during their stay. When this happens, the bed is unavailable for other inpatients, but the standard census measurement treats the bed as unoccupied.

Financial pressures have also changed the traditional flow of discharges and admissions. Hospitals used to be able to manage their bed turnover more like hotels, discharging patients in the morning and admitting new ones in the afternoon and evening. However, financial pressure to limit patient days often results in patients undergoing tests and procedures during the last day of an inpatient stay and being discharged on that day rather than staying overnight and leaving the next morning. Concurrently, surgical patients who used to often arrive the evening before a procedure, now arrive the morning of the procedure, eliminating the overnight stay. The result is that one set of patients is discharged later and the other set arrives earlier. This creates a bubble in occupancy utilization that can back up scheduled and emergency department admissions, but that disappears by the time the census is taken at midnight.

The above factors represent an increase in the number of inpatient beds occupied during the day, or in the numerator of the measurement “patient days/beds.” Adding to this are several factors that reduce the denominator. Beds under construction or converted to other uses may count as “licensed,” but are unavailable. Other constraints such as changes to previous rules about isolating patients, or the necessity to separate men and women can reduce the number of physically available beds.

Most importantly, labor shortages, particularly shortages of nurses, result in a number of licensed beds being unstaffed and, hence, unavailable. This factor has long been recognized and an occupancy rate calculated using staffed beds in the denominator has been collected to attempt to capture this dynamic. Hospitals, however, have defined “staffed beds” in a number of different ways, making it difficult to interpret this kind of measure.

These and other factors result in a midnight census or occupancy measure that is likely to be substantially understated. McManus (2001) reports on a study calculating the difference in occupancy measuring registered patients/licensed beds at midnight versus total patients/staffed beds at noon. In Boston’s metropolitan “Region 4,” census rose from 77.2% to 96.2%, a radically different picture of available capacity. The Massachusetts General Hospital conducted a similar measurement in the first quarter of 2001. For adult general care beds (Monday-Friday), they

found that census was 87.3% measured at midnight and 101.1% measured at noon. The Advisory Board (2001) estimates that the difference between midnight licensed bed occupancy and daytime peak occupancy can be as much as 20%, with an additional differential of 5%-10% because of staffed versus licensed beds.

It is clear from the size of the differences in the examples cited above, that the traditional way of measuring census has become fatally flawed. A new methodology is needed for policy makers, strategic planners, and hospital executives to be better informed about available capacity and how it fluctuates and changes over time. More accurate census data is also needed to help address the important question of whether additional inpatient capacity might be necessary in the future. We call upon researchers to develop new methodologies to more accurately measure hospital census.

E. Patient Throughput: Discharge Barriers, Operations Management, and Delayed Services

The final one of the five factors underlying ED overcrowding is patient throughput. When patients cannot be moved efficiently into, through, and out of the hospital, they occupy beds, staff, and services for a longer period of time and reduce the capacity that might otherwise be available to treat other patients waiting in the ED.

Reduced Availability of Post-Acute Care

The Balanced Budget Act of 1997 (BBA) reduced reimbursement to post-acute providers considerably more than was originally anticipated by Congress. As a result, a significant number of home health agencies, skilled nursing facilities (SNFs), and nursing homes went out of business. The reduced supply of these providers increases the difficulty of discharge placement and ties up inpatient beds. In addition, hospitals report difficulty in discharging patients for adult mental health and substance abuse services and for pediatric mental health.

Unavailable or Delayed Services and Natural Variability

When capacity utilization increases beyond a certain point, the demand for certain services within the hospital outstrips the supply, and delays occur for those services. Through most of the 90s, hospital census was relatively low and hospitals had a “cushion” of unutilized capacity that they could fall back on during times of high demand. As capacity utilization increases, this cushion disappears, and naturally occurring variability produces bottlenecks around some services. These delays can keep patients in inpatient beds longer, and they can also delay services directly to ED patients who share those services with other hospital patients. Imaging and lab are two common areas that cause overcrowding when ED patients have lengthy waits to access those services.

Operational Inefficiencies, Operation Management Techniques, and Variability Methodology

Operational inefficiencies also affect the throughput of patients. There are many ways that hospitals can avoid bottlenecks by improving operations management and reducing inefficiencies. Litvak and Long (2000) have been doing pioneering research in an operations management technique called variability methodology. They have been focusing their initial efforts on operating rooms, which can often be the source of service delays and lack of available ICU beds. Each hospital has a variable flow of patients and a relatively fixed number of operating beds that must be staffed. Most variability occurs naturally and Litvak and Long (L&L) identify three types of natural variability: the random occurrence of illness (flow variability); the difference in the way patients respond to treatment (clinical variability); and the difference in professional treatment (professional variability). The employment of mathematical queuing theory techniques can manage natural variability and inform hospitals about the efficient number of staffed beds.

L&L identify a fourth form of variability they call artificial variability. One example of artificial variability is the manner in which surgeons typically book operating rooms in advance, often reserving whole blocks of time, according to their professional and personal work schedule. As a result of utilizing OR time according to their own schedule as opposed to the flow of hospital

patients, ORs are typically underutilized on weekends and particularly busy on Mondays and Fridays. Often, surgeons don't use their block time and needed OR space goes unused. About 50% of surgery comes through the ED and about 35% is scheduled (elective). However, L&L believe that there is as much variability from the elective surgeries as there is from the ED. They state:

“...the predictability of the number of admissions to the hospital on any day from elected scheduled surgery may be worse than the purely random appearance of patients for emergent admission through the Emergency Room.”

L&L estimate that they could reduce OR variability by 50% by smoothing elective admissions for surgery. Reducing variability by half could portend fewer bottlenecks that lead to ED and ICU overcrowding and could yield operational efficiencies and substantial savings for hospitals. Given the exigencies of surgical patients, hospitals have to staff for peak load. But according to L&L, there can often be a 50% difference in case loads even on same days of the week (for example every Friday). Consider the savings in efficiency and staffing if, by eliminating artificial variability, that variation in peak loads could be reduced by 50%. L&L recommend that hospitals identify and measure all types of variability, eliminate all artificial variability, and then manage naturally occurring variability with queuing models and other operations management techniques. They contend that hospitals and MCOs have generally not applied operations management techniques that are now commonly employed by other industries.

Information Systems and Processing

Other operations management techniques as well as improved information systems can help maximize the use of existing capacity. Systems to identify inpatient beds as soon as they are available can reduce ED overcrowding. It is not unusual for hospital personnel to actually have to physically search out available beds in which to admit ED patients. Better information systems can reduce the number of beds that are unoccupied, waiting for housecleaning, or simply not identified as available. Late paperwork can also delay discharges and reduce throughput. Management information systems geared toward efficient patient billing and record keeping can

alleviate this problem. As hospitals operate closer to capacity, the utility of good operation management techniques and efficient information systems increases.

Peak Hour Overcrowding

Peak occupancy often occurs at hospitals around noon and early afternoon when new patients are waiting to be admitted and others are waiting to be discharged. In discussions with the Mass. General Hospital, we became aware of changes in admitting and discharge routines over recent years that cause a “census bubble.” We described this “bubble” in the previous section. It is caused by the overlap of last-day procedures for patients being discharged and same-day arrival for incoming patients. When these “last-day” procedures are delayed, both the incoming and outgoing patients occupy a bed. Improving discharge planning, avoiding late physician rounds, and smoothing elective admissions can all help reduce this “census bubble” phenomenon.

Bed Flexibility

Conceptually, bed flexibility is another way to increase capacity. However, considerations of quality must be taken into account. When patients with similar conditions are located together and nurses specialize in treating patients with similar conditions, quality of care improves. Increasing bed flexibility presents an apparent trade-off, because while beds could be more fully utilized, quality of care might be reduced. One might ask, in an age with markedly increased information technology and technical mobility, could more bed flexibility be introduced without sacrificing quality? The answer is well beyond the confines of this paper, but could be a fruitful area for further research.

Transportation

Transportation of discharged patients can also reduce throughput. In today’s world of two-worker families it is often more difficult to find caretakers to provide transport. Discharge planning, sometimes with on-call transportation resources, can reduce this problem and free-up inpatient beds. Some hospitals have instituted discharge-holding units to help accomplish this task.

F. Conclusions

Because of the lack of empirical evidence, it is difficult to draw conclusions about the relative importance of these many factors. In what follows below, we offer our opinions based on our review of the literature and on discussions with practitioners in the field. But most importantly, we call for more research to be done to better inform policy decisions.

Invariably, those who work in the ED identify the supply of inpatient beds as the most important source of ED overcrowding. We found this to be the case throughout numerous interviews across a wide range of hospitals. In general, ED docs do not believe that non-urgent use (or demand for ED services) is the most important factor. Brent Asplin states the case succinctly (Gordon, 2001):

“Although non-urgent use of the ED is an important policy issue, it is not the cause of ED crowding. Non-urgent ED use leads to crowding in the waiting room, not crowding in the treatment area – patients with non-urgent problems are routinely triaged to wait while more urgent medical care is provided for the sickest.”

We agree with Asplin with the qualification that non-urgent use is not the *chief* cause of overcrowding but that it does contribute to the problem, as do all of the other factors that we have identified.

If ED docs are correct, and if the most important cause of bottlenecks is the lack of inpatient beds and services, then it would follow that policies to rectify the problem by dealing only with ED services, may alleviate, but will not solve the core problem. Policies to increase ED capacity (supply) will not alleviate the wait for inpatient beds (although “observation units” and other increased bed capacity can provide a cushion and reduce ambulance diversion). Similarly, policies to reduce ED demand will only be aimed at non-urgent patients, not the ones who need inpatient beds and who are part of the primary bottleneck (although there may well be gains in efficiency, quality, and cost from reducing non-urgent demand). Of the remaining factors, the demand for inpatient services is likely to be the least malleable, at least in the near future.

Demographic trends and increases in technology and the capabilities of medicine will continue, and there appear to be no immediate solutions to garner continued managed care efficiencies while avoiding patient backlash.

If the above points are borne out by research, and if recent trends continue, than increases in hospital inpatient capacity could turn out to be the long-term solution to the core of this problem. And, at least in some areas of the country, the era of excess hospital capacity may have already ended.

Notwithstanding the above line of reasoning, we remain skeptical of the need to build additional inpatient capacity in the short-term and we address this question specifically in the next section of the paper. We conclude in that section that there is not now a general shortage of hospital beds (although there could be shortages in specific localities), and that the future need for more beds is at best uncertain. Although it is true in many regions that the inpatient capacity “cushion” has disappeared so that normal variation in ED demand sometimes exceeds the supply of beds, there are few indications that communities do not have sufficient beds to service the health needs of their populations. In fact, the smaller “cushion” is a good thing in terms of cost-control and resource utilization although there is clearly a trade-off where it translates into greater waiting time for services.

If recent trends continue, increased capacity could be advisable or even inevitable in some areas. But building additional inpatient capacity is the most expensive and least reversible policy solution. Until we have better data, it would be expensive and unwise to sink scarce resources in to fixed capacity. A wiser policy course would be to institute a combination of policies addressing the other identified factors that could sufficiently ameliorate the problem, at least in the short term, or until potential trends discussed herein are borne out.

There are several ways to increase inpatient capacity in the short-term without investment in bricks and mortar. First is to operate and staff all licensed beds. Second is to institute patient throughput measures and operations management techniques that maximize the utilization of existing capacity. These are both discussed in greater detail in other sections of the paper.

Although the demand for ED services may not be the most critical factor, it is still a significant contributor to overcrowding and should not be overlooked. There is no question that non-urgent demand uses up both ED and hospital resources and reducing it could alleviate some overcrowding. In addition, the quality, efficiency, and cost gains that would accrue from placing patients appropriately in primary care settings, augers for significant policy action in this area.

Finally, we should pay lip service to the reversal of trend in inpatient utilization. Managed care in its theoretical sense -- that is, managing the care of patients in the most clinically appropriate *and* cost effective manner -- is not a concept to be dismissed easily. Honest people can differ about whether managed care at least partially lived up or did not live up to its promise. But without the loosening of utilization controls, we would not likely have encountered the problem of ED overcrowding. If national health spending approaches 20% of GDP, as some believe it will, it is bound to crowd out other programs such as housing, elderly security, defense, and the environment, that are fundamental to the well being of our society. If that is to be the case, renewed consideration of utilization controls may be merited.

ADDENDUM: MAJOR POLICY ISSUES

The previous section of this paper focused on the factors that cause ED overcrowding. Some of these factors could be an early warning sign of much broader health policy issues. In this addendum, we identify four of those issues assuming a general health policy perspective as opposed to a narrow focus on ED overcrowding. We offer some recommendations, but our primary objective is to raise these broad issues that policymakers will likely have to confront in the near future. Although we tried to minimize the amount of repetition, some of this necessarily overlaps with the previous sections. The four policy questions we address are as follows:

1. Is ED overcrowding an early warning sign that we need to increase inpatient capacity?
2. Is ED overcrowding a symptom of insufficient primary care services?
3. Is the rise in ED demand an indication that ED services are overutilized, and would reducing demand reduce cost without deterring necessary ED use?
4. Is ED overcrowding an indication that we should re-think the way hospital EDs are organized and structured?

1. Is ED overcrowding an early warning sign that we need to increase inpatient capacity?

As we discussed in the previous section, inpatient days and inpatient days per bed reversed trend and began to rise in 1997. However, inpatient days per bed is still lower than it was in 1992, and hospital census remained at approximately 65% in 1999. The number of inpatient surgeries per bed remained practically unchanged over the same period (AHA 2001, 1998). Although hospitals in many areas of the country have been converting inactive licensed beds to operating beds, the amount of new construction is relatively low. A survey by Modern Healthcare (Crowell, 2001) shows that new and replacement hospital construction fell 37% in 2000 from the previous year (although the number of projects declined by about 10%). The report concluded that many hospital construction projects are still consolidating existing capacity and specialty services in to one building. At this point in time, there does not appear to be any evidence of a widespread, current need for more hospital beds.

But what about the future? Will inpatient demand return to the long-term downward trend it exhibited since the adoption of Medicare PPS, or will it continue the reversal in trend evident in only the past few years? The answers are by no means certain. Available capacity is a balance between supply and demand. We consider several perspectives on the demand side of this question.

A September 2001 article for the journal *Health Affairs* by Strunk, Ginsburg, and Gabel provide some data that is more recent than the AHA and CDC data frequently used in this report. According to their data, hospital inpatient spending rose 2.8% in 2000 and 3.5% in the first three months of 2001 relative to the same months in the previous year. Although this is not an inordinately large increase, it is significant for the sharp turnaround in spending compared to the 1994-1998 period. The authors attribute much of this change as follows:

“Meanwhile, health plans, in an effort to quell the managed care backlash, are reducing their reliance on other cost-control mechanisms such as gatekeepers, preauthorization requirements, and capitation. As these developments unfold, their combined effect on costs is appearing as a major shift in the composition of underlying spending growth, as growth in spending on hospital services is increasingly responsible for overall spending growth.”

Indeed, if cost control in the private sector is reduced by weaker managed care, and if cost-control in the public sector eases with the expiration of the BBA in 2002, the trajectory of inpatient spending and hospital utilization could continue to increase.

This line of reasoning is echoed by a recent report from the Advisory Board Company (Advisory Board Company, 2001). They report a 7.1% increase in inpatient days from 1997-2000 and project an annual growth rate of 3.5% over the next decade (middle of three estimates). Given their projections, they estimate that 2,491 additional hospitals and 436,000 additional beds will be needed by 2011.

However, not everyone agrees with these assessments of future demand. The Lewin Group

points out that most of the long-term decline in inpatient hospital utilization can be attributed to Medicare PPS rather than managed care (Lewin Group, 2000). They state that inpatient utilization rates are predicted to continue falling through the next decade, although the decline will be mitigated by an aging population. They estimate that if utilization rates continue to decline at the rate of the last ten years, inpatient days will decline by 16% over the next ten years despite population aging.

One of the most important drivers of health costs for an aging population is the rate of disability. Cutler argues that health spending is more closely correlated with disability than with age (Cutler, 2001). He estimates that a continued 1% annual decline in disability could reduce what otherwise would be spent by about one third (holding increases in spending due to technological advances constant).⁴ Presumably, this would have significant implications for hospital inpatient utilization. Manton, finds that the reduction in disability rates actually accelerated from 1.0% in 1982-1989 to 1.6% in 1989-1994 and to 2.6% in 1994-1999 (Manton and Gu, 2001). Earlier, he had concluded that a 1.5% annual decline in disability would be enough to keep the Medicare program solvent through the year 2070 despite the aging of the population (Singer and Manton, 1998).

Given the above, as examples of divergent thinking, there is much uncertainty as to whether the demand for inpatient services will increase. Hence, other measures that could alleviate the imbalance between demand and supply in the short term may be wiser than fixed investments in brick and mortar that could later prove to be unnecessary. Fortunately, there are some supply side measures that hospitals could use for this purpose that were previously discussed in Section IV. Among those are the utilization and staffing of all licensed beds, and a focus on a variety of strategies to increase patient throughput. In addition, efforts to reduce ED demand can help alleviate the problem.

⁴ Cutler recognizes that technological advances will not be held constant and will result in increased spending overall.

2. Is ED overcrowding a symptom of insufficient primary care services?

It is generally believed that nationwide, there is at least an ample supply of physicians, but at the same time there is a lack of PCPs and an over supply of specialists. The number of physicians per thousand population has been increasing steadily for more than two decades. In 1998 there were 2.6 physicians per thousand versus 1.9 in 1980 (Lewin, 2001). Since 1985, the number of office-based physicians increased by 43% while the number of office visits only increased by 19% (NAMCS, 2001). Hence, the total supply of physicians relative to demand has increased in recent years. Nevertheless, the supply of physicians can vary considerably among different regions of the country. It is highest in the Northeast and Middle-Atlantic regions and lower in the South and West (Lewin, 2001). Shortage of physicians in some rural areas has been a problem for many years.

For a number of years, it has been U.S. policy to increase the proportion of PCPs relative to specialists. Figure 9 shows that despite policy initiatives in this area, the proportion of specialists has not been reduced in the last decade.

Figure 9: Change in Proportion of Primary Care Physicians, 1980 – 1998

	1980	1985	1990	1995	1996	1997	1998
All Active Non-Federal	417.7	489.5	539.5	624.9	643.5	665.2	688
General and Family Practice	47.8	53.9	57.6	59.9	61.8	62	64.6
Internal Medicine	40.5	52.7	57.8	72.6	77.9	81.4	83.3
Pediatrics	17.4	22.4	26.5	33.9	35.5	36.8	38.4
OB/GYN	19.5	23.5	25.5	29.1	29.9	30.1	31.2
All Active Non-Federal	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
General and Family Practice	11.4%	11.0%	10.7%	9.6%	9.6%	9.3%	9.4%
Internal Medicine	9.7%	10.8%	10.7%	11.6%	12.1%	12.2%	12.1%
Pediatrics	4.2%	4.6%	4.9%	5.4%	5.5%	5.5%	5.6%
OB/GYN	4.7%	4.8%	4.7%	4.7%	4.6%	4.5%	4.5%
Primary Care/Total Physicians	30.0%	31.2%	31.0%	31.3%	31.9%	31.6%	31.6%

Source: U.S. Bureau of the Census, Statistical Abstract of the United States: 2000

The proportion of PCPs has remained relatively stable, with the increase in internists more than making up for a decline in general and family practitioners. There is not definitive evidence to conclude that a primary care shortage exists for insured populations, although anecdotal evidence often indicates patient difficulties in securing prompt appointments. Additional research would be helpful in this area, and some potential indicators of primary care shortages might be as follows: the average number of days in advance that PCPs book appointments: PCP's availability for same-day appointments, number of patients seen by PCPs in a year, average time spent with patients, and patient's reasons for visiting an ED.

Even if there is a sufficient number of PCPs, the current incentive structure may lead to increased PCP referrals to the ED. Although anecdotal evidence exists of this phenomenon, further research is needed to bear it out, and there are a number of potential sources for researchers to pursue. At the health plan level, one could see if there are increases in PCP referrals to the ED, if acuity level is declining for insured enrollees who visited the ED, or if enrollees who visited the ED had fewer encounters with PCPs than in the past and are substituting ED for PCP care. At the patient level, surveys could determine directly whether the patient went to the ED because of PCP referral and/or unavailability.

If privately insured patients are visiting the ED either because PCPs are unavailable or they are making more frequent referrals, this would be an important finding for private health plans. They could derive financial benefit from increasing the size of their PCP panels or from providing stronger financial incentives or disincentive to PCPs to reduce ED utilization. If Medicare patients are substituting ED for primary care, it could simply be a result of too few PCPs in an area. But it could also be a result of low reimbursement or lack of financial incentives within the program. In 1999, 10% of physicians were refusing to accept new Medicare cases (NAMCS, 2001).

Availability of PCPs in Underserved Areas

There is little question that a severe shortage of primary care options exists in poor and underserved communities. More than 71 million Americans live in what the IOM calls

“medically underserved areas,” primarily inner-city and rural localities, and more than half are poor blacks or hispanics (Lewin, 2000). Compared with the white population, blacks make approximately 33% fewer primary care visits per person and Hispanics make 20% fewer visits (Forrest, 2000). Not only is there a general lack of PCPs, but community health care clinics are often overcrowded and have long waits for appointments. Grumbach (1993) reported that in 1990, at San Francisco General Hospital, 45% of surveyed ED patients said that they came to the ED because they lacked accessible alternatives. Billings (Gordon, 2001) describes the hospital ED as the “safety net for the safety net,” as alternative safety net providers are simply not accessible.

A comparison of recent statistics shows sharp disparities in ED utilization along racial lines. As mentioned previously, from 1992 to 1999 the utilization rate for blacks over 65 increased by 59% while the utilization by whites in the same age group remained unchanged (NHAMCS, 2001). What might account for such a disparity in such a short period of time?

A number of recent statistics suggest that a lack of primary care alternatives could be a major cause. Consider the following findings:

- Increased ED visit rates for black seniors (over 65 years old)
- Increased inpatient admission rate from EDs for black seniors
- No change in rates for total hospital discharges for black seniors
- Decreased outpatient visit rate for blacks since 1997. Between 1992 and 1999 the outpatient visit rate by whites increased by 42% but was unchanged for blacks.
- Decreased physician visit rate for black seniors since 1997
- Black seniors three times as likely to have Medicaid than white seniors and 21.6% of physicians did not accept new Medicaid cases in 1999 and Medicaid patients were the highest utilizers of ED services (64.3 per hundred vs. 20.5 for privately insured).
- Sharp decrease in availability of home health services following the BBA and black seniors twice as likely to use home health than white seniors
- ED visits concentrated in MSAs and huge (50%) increase in ED visit rates in MSAs from 1996 through 1999 (Burt, 2001).

Although research would be needed to confirm any conclusion, the combination of these findings would be consistent with the effects of a decreased availability of primary care services. The data suggest that elderly blacks could be substituting ED visits for PCP visits or outpatient visits (that often might originate with a PCP referral). Furthermore, the lack of Medicaid providers and the reduction in home health services, both used disproportionately by blacks, could be further increasing ED utilization.

Providing adequate primary care in underserved areas has been a persistent problem. Ultimately, policy solutions of a different magnitude will be needed than those attempted in the past or suggested herein for insured populations. The IOM Safety Net Commission recommended the need for both a new federal initiative to fund providers that cared for a disproportional number of poor people and a coordinated effort among the various type of providers that fund safety net services. Programs to train and provide incentives to more PCPs to work in underserved areas, and efforts to provide medical training to more individuals from underserved populations have been ongoing. But that has not been enough to significantly improve primary care access. It may be that in some communities, given apparent patient preferences and the difficulty in supplying adequate primary care services, the hospital ED *should* be the locus of primary care. In that case, however, it is likely to be an ED that is operated and configured differently and has a significantly different cost and price structure than the current model.

3. Is the rise in ED demand an indication that ED services are over-utilized, and would reducing demand reduce cost without deterring necessary ED use?

Hospital EDs serve patients with urgent needs, but they have also been a place where anyone can receive same-day treatment for any condition regardless of having an appointment or the ability to pay. As the backbone of the safety net, they are a place that will provide care for individuals that have no insurance, no other source of care, or no other connection to the health care system. At the same time, however, they are sometimes a convenient and dependable site of care even for those who have other alternatives. As a result, EDs have provided much non-emergency care for some time. But since the price of care at EDs is high, the continuity of care less than for patients

with regular providers, and the facilities are often overcrowded, the question of over-utilization becomes particularly important.

In the previous section we cited statistics about the acuity of patients visiting the ED. Those statistics have been relative stable over time and show that a substantial proportion of patients could be seen and treated by PCPs. This raises the policy question of whether financial incentives to deter ED use should be employed, and what the effect of those incentives might be.

From a quality and outcomes perspective, it is generally accepted that individuals are better off having an established relationship with a PCP who is familiar with their history and who institutes a regular regimen of preventive and well-care in addition to treating specific illnesses and injuries. Gill et al (1998) finds that patients with continuity of care have fewer hospitalizations and, in a later study finds that they also have less ED utilization (Gill, 2000). Falik (2001) found that patients who used Federally Qualified Health Centers as their primary source of care had significantly less ED use and fewer hospitalizations.

In addition to quality considerations, the cost and price of ED services have also become important issues. Hospitals typically build part of their overhead costs into the price of an ED visit. Baker (1994) found that the price of ED services was nearly three times that of a typical first office visit (\$143.72 vs. \$49.87). Calculating that differential for non-urgent visits, Baker found that at much as \$5-\$7 billion dollars could theoretically be saved in 1993. The actual savings, he acknowledged, would be smaller since hospital EDs are open and staffed 24/7 and would incur costs even if patients went elsewhere. President Clinton called the ED the most expensive place to seek care, and a primary cost control strategy of many MCOs, at least in the 80s and 90s, was to reduce ED utilization.

But it is not clear how the real resource costs of an ED visit should be measured. Although the prices that EDs charge for their services are relatively high, the marginal cost of providing those services is much lower. Williams (1996) computed the average charge, average cost, and marginal cost of ED visits. He found that overall, the average charge of an ED visit was \$383, while the average cost was \$209. But the marginal cost was only \$88. For non-urgent visits the

difference was even more pronounced. The average charge of a non-urgent visit was \$124, the average cost \$62, and the marginal cost only \$24. One reason for the large differential between cost and charge is that hospitals try to recover the uncompensated care provided by EDs by charging higher prices or “cost-shifting” to insured patients. Because of that, prices of ED services are not an accurate reflection of the underlying cost.

An important question for researchers to pursue is how to measure the real resource costs of an ED visit. Should one look at marginal or average costs? Should one take into account that 40-50% of a hospital’s business often comes through the ED? Can EDs be reconfigured so that the price more nearly reflects the cost of only the ED facility? Should non-urgent patients, who require fewer resources, be subject to the same price structure as those who are admitted to the hospital?

Given that the relative price of ED services is high and the lack of continuity of care deleterious, should policy makers alter incentives directly to patients to attempt to reduce ED utilization? Financial incentives (or disincentives) to directly discourage patients from inappropriately using the ED would usually be in the form of increased cost sharing or co-payments. The issues to be considered are 1) whether co-payments will discourage needed use as well as over use and 2) whether co-payments will more adversely impact lower income individuals and families or those without adequate access to primary care alternatives.

We cite two studies bearing on these questions. O’Grady et al (1985) studied the effect of cost-sharing on ED use as part of the RAND Health Insurance Experiment. They found that cost sharing had a considerable effect; a 42% reduction in use between no cost sharing and 95% cost share (income-related with caps), and about a 20% reduction in use compared with lower levels of cost sharing (25% and 50%, income-related with caps). They found that the 25% level of cost sharing accomplished nearly all of the deterrence for less serious conditions than would have been accomplished at higher cost sharing levels, and did not deter utilization for more serious conditions. Cost sharing above 25% did begin to deter use for more serious conditions. An interesting part of the finding was the difference in deterrence according to the severity of the condition. For example, patients with no cost sharing (free care) who had lacerations that

required no sutures reported 63% higher ED use than those with cost sharing (25%, 50% and 95%). But among those who had lacerations that required sutures, there was no difference in ED use between those with cost sharing and those with free care.

A more recent study by Selby et al (1996), on an insured population, confirmed the results of the RAND experiment. A small co-payment resulted in a 15% decline in ED utilization, but did not impact conditions classified as “always an emergency.”

Results from the RAND study suggest caution, however, in the case of poorer populations. Lower income individuals utilized the ED far more than those with higher incomes, even after adjusting for differences in insurance coverage. The authors attributed this as a possible sign of lack of access to PCPs, a problem that persists today. The authors also found that if the lower income people in their study had had a “lower effective cost-sharing rate” than those with higher incomes, they would have experienced a disproportionate reduction in ED utilization; a worrisome result, particularly since they are more dependent on the ED to begin with.

The results of both of these studies suggests that for a moderate to high income, privately insured population, a small co-payment could help deter ED use for non-urgent conditions without discouraging patients with urgent conditions from seeking ED use. However, cost sharing could be an ill-informed policy for Medicaid, Medicare only, or the low-income insured, because of a lack of access to other providers, and a disproportionate deterrent effect on those with low incomes.

4. Is ED overcrowding an indication that we should re-think the way hospital EDs are organized and structured?

Most of the solutions to ED overcrowding that are suggested in this paper could be called technical solutions. That is, they seek ways of ameliorating the problem without re-conceptualizing the very role and structure of hospital EDs within the health care system. Depending upon the future course of ED and inpatient demand, these kinds of solutions might be adequate to preserve a high quality, well functioning system. But it is also possible that

“adaptive” or more comprehensive changes should be considered if the ED is going to remain the primary locus of care for many individuals. In what follows, we provide a short list of technical solutions and then raise some more fundamental questions.

Technical Solutions

In addition to the five factors we discussed that contribute to ED overcrowding, there are some operational characteristics within the ED that can help alleviate the problem. It is beyond the scope of this paper to functionally analyze ED operations, but, from a review of the literature, we list a number of actions hospitals have taken. Clearly, these measures do not fit all situations and must be considered on an institution-specific basis.

- Provide a non-urgent clinic that has its own dedicated staff and space where all patients are immediately sent who are triaged non-urgent
- Expand the size of EDs to add more beds and services
- Add observation beds so that patients who have to be treated or watched, but who are unlikely to be admitted, can occupy beds without taking up ED capacity.
- Provide an automated tracking system for bed status information throughout the hospital
- Add dedicated capacity for frequently used ED services such as imaging
- Add “express method” of submitting lab samples (for example, pneumatic tubes).
- Triage patients immediately and do not let registration delay services even if registration has to be accomplished later in the visit.
- Utilize ambulatory surgery space (especially in the evening and overnight) for overflow beds
- Communicate to referring physicians the need to reduce non-urgent ED use
- Provide financial incentives (disincentives) to reduce ED referrals by physicians
- Institute additional charges for ED use
- Initiate a program to minimize wait time for on-call specialists
- Initiate a referral program to PCPs and community health centers for non-urgent patients
- Institute community-wide planning to increase availability of primary care and ED services

Adaptive Solutions

The long-term trend toward increased utilization of hospital EDs may be an indication that we should re-conceptualize the role of the hospital ED within the community. It is clear that at least in underserved communities, efforts to reduce ED use by increasing the use of other primary care alternatives have been largely unsuccessful. This is not to denigrate or even minimize the valuable role of federally qualified community health centers (FQCHCs) that have been a quality source of care serving increased numbers of patients in recent years. But even an increased number of FQCHCs has not solved the problem. It could be that hospital EDs, not in place of, but in addition to, community health centers, should be restructured to play the role of primary care provider.

In such a role, hospital-based non-urgent clinics, with dedicated staff and space, would keep records of patients and assume responsibility for patient populations much on the order of community health centers. They would undertake care coordination, follow-up visits, and other measures that one would expect to provide continuity of care. Such clinics would be open and staffed 24/7, but would also arrange to see patients by appointment for both well care and treatment of sickness and injuries. Since a high proportion of care would likely be uncompensated or from public payers such as Medicaid, a new financing source would have to be created to make such an effort financially feasible for hospitals.

Whether or not such a model has merit, it may also be worthwhile to re-conceptualize the cost and charge structure of the hospital ED. If hospitals increasingly tend toward having dedicated centers where they send patients who are triaged non-urgent, then the overhead in these centers might be measured differently than for other ED services. If the marginal cost for non-urgent patients is as low as we cited earlier from the Williams study (page 40), then a reconfigured ED might be able to be both a cost and price effective way to deliver services, particularly to underserved communities that have too few primary care alternatives. It was clear from the IOM report that a coordinated effort among a number of different types of providers will be necessary to shore up the safety net. A re-conceptualized hospital ED with a new financing and pricing structure could be one part of that effort.

REFERENCES

- Advisory Board Company/Hworks, "Building the Clockwork ED: Symposium for Clinical and Operations Leadership," (Washington, DC, February 11, 12, 2001).
- Arizona College of Emergency Physicians, *The Critical State of Emergency Care in Arizona*, (Phoenix, Arizona: December 18, 2000).
- Baer, Ryan B., Joel S. Pasternack, Frank L. Zwemer, Jr., "Recently Discharged Inpatients as a Source of Emergency Department Overcrowding," *Academic Emergency Medicine*. 8, no.11. (November 2001): 1091-1094.
- Baker, Laurence C., Linda Schuurman Baker, "Excess Cost of Emergency Department Visits for Nonurgent Care," *Health Affairs*. 13. no. 5, (Winter 1994): 164-171.
- Bellandi, Deanna, "The Deals are Off," *Modern Healthcare* (January 8, 2001).
- Billings, John, Nina Parikh, Tod Mijanovich, "Emergency Department Use in New York City: A Substitute for Primary Care?" *The Commonwealth Fund/Issue Brief*, (November, 2000).
- Billings, John, Nina Parikh, Tod Mijanovich, "Emergency Department Use in New York City: A Survey of Bronx Patients," *The Commonwealth Fund/Issue Brief*, (November, 2000).
- Billings, John, Nina Parikh, Tod Mijanovich, "Emergency Room Use: The New York Story" *The Commonwealth Fund/Issue Brief*, (November, 2000).
- Bindman, Andrew B., Kevin Grumbach, Dennis Keane, Loren Rauch, John M. Luce, "Consequences of Queuing for Care at a Public Hospital Emergency Department," *The Journal of the American Medical Association*, 266. no. 8, (August 28, 1991), 1091-1096.
- Brewster, Linda R., Liza S. Rudell, Cara S. Lesser, "Emergency Room Diversions: A Symptom of Hospitals under Stress," *Issue Brief: Findings from the Center for Studying Health System Change*, no. 38, (May, 2001).
- Burt C.W., Linda F. McCaig, "Trends in Hospital Emergency Department Utilization: United States, 1992-99," *National Center for Health Statistics. Vital and Health Statistics of the Centers for Disease Control and Prevention*, U.S. Department of Health and Human Services, Series13, no.150, (November, 2001).
- California Medical Association, *California's Emergency Services: A System in Crisis*, (January 2001).

- Cherry, Donald K., Catherine W. Burt, David A. Woodwell, "National Ambulatory Medical Care Survey: 1999 Summary," *Advance Data from Vital and Health Statistics of the Centers for Disease Control and Prevention*, U.S. Department of Health and Human Services, no. 322. (July 17, 2001).
- Christakis, Dimitri A., Loren Mell, Thomas D. Koepsell, Frederick J. Zimmerman, Frederick A. Connell, "Association of Lower Continuity of Care with Greater Risk of Emergency Department Use and Hospitalization in Children," *Pediatrics*, 107, no. 3, (March 2001): 524-529.
- Commonwealth Fund, Task Force on the Future of Health Insurance, available at <http://www.cmwf.org/programs/insurance_coverage.asp?link=2#1>
- Croswell, Camille L., "Building New Strategies," *Modern Healthcare*, (March 12, 2001):23.
- Cunningham, Peter J., Carolyn M. Clancy, Joel W. Cohen, Melissa Wilets, "The Use of Hospital Emergency Departments for Nonurgent Health Problems: A National Perspective," *Medical Care Research and Review*, 52, no. 4, (December 1995): 453-474.
- Derlet, Robert W., John R. Richards, "Overcrowding in the Nation's Emergency Departments: Complex Causes and Disturbing Effects," *Annals of Emergency Medicine*, 35, no. 1, (January 2000): 63-68.
- Falk, Marilyn, Jack Needleman, Barbara L. Wells, Jodi Korb, "Ambulatory Care Sensitive Hospitalizations and Emergency Visits: Experiences of Medicaid Patients Using Federally Qualified Health Centers," *Medical Care*, 39, no. 6: 551-561.
- Forrest, Christopher B., Ellen-Marie Whelan, "Primary Care Safety-Net Delivery Sites in the United States," *The Journal of the American Medical Association*, (October 25, 2000), 284, no. 16.
- Fronstin, Paul, "Sources of Health Insurance and Characteristics of the Uninsured: Analysis of the March 2000 Current Population Survey," *EBRI Issue Brief*, no. 240, (Employee Benefit Research Institute, December 2001).
- Fronstin, Paul, "Employment-Based Health Benefits: Trends and Outlook," *EBRI Issue Brief*, No. 233, (Employee Benefit Research Institute, May 2001).
- Fronstin, Paul, "Sources of Health Insurance and Characteristics of the Uninsured: Analysis of the March 1999 Current Population Survey," *EBRI Issue Brief*, no. 228, (Employee Benefit Research Institute, December 2000).
- Gill, James M., Arch G. Mainous III, Musa Nsereko, "The Effect of Continuity of Care on

- Emergency Department Use,” *Archives of Family Medicine*, 9, (April 2000).
- Gordon, James A., John Billings, Brent R. Asplin, Karin V. Rhodes, “Safety Net Research in Emergency Medicine: Proceedings of the Academic Emergency Medicine Consensus Conference on “The Unraveling Safety Net,” *Academic Emergency Medicine*, 8, no. 11, (November 2001): 1024-1029.
- Grumbach, Kevin, Dennis Keane, Andrew Bindman, “Primary Care and Public Emergency Department Overcrowding,” *American Journal of Public Health*, 83, no. 3 (March 1993): 372-378.
- Hargraves, J. Lee, Peter J. Cunningham, Robert G. Hughes, “Racial and Ethnic Differences in Access to Medical Care in Managed Care Plans,” *Health Services Research*, 36, no. 5, (October 2001): 853-868.
- Health Care Advisory Board: Watergate Meeting of Chief Executives, “Prosperity Amidst Shortage: Briefing for the Board and Senior Administrators,” The Advisory Board Company, (Washington, D.C., 2001).
- Lambe, Susan, Steven Asch, Arlene Fink, Honghu Liu, Jessica Fosse, Katherine Herbst, Donna L. Washington, *A Day in the Life of a California Emergency Department*, Submitted by UCLA to the California HealthCare Foundation, (July 18, 2001).
- Lewin, Marion Ein, Stuart Altman, “America’s Health Care Safety Net,” Institute of Medicine, (Washington, D.C: National Academy Press, 2000).
- Lewin Group/American Hospital Association, TrendWatch: Chartbook, “Trends Affecting Hospitals and Health Systems,” (July 2001).
- Lewin Group/American Hospital Association, TrendWatch: “Emergency Departments-An Essential Access Point to Care,” 3, no. 1, (March 2001).
- Lewin Group/American Hospital Association, TrendWatch: “Redefining Hospital Capacity,” 2, no. 3, (September 2000).
- Litvak, Eugene, Michael C. Long, “Cost and Quality under Managed Care: Irreconcilable Differences?” *American Journal of Managed Care*, (2000), 6. no. 3: 305-312.
- Lombrail, P., C. Vitoux-Brot, A. Bourrillon, M. Brodin, G. De Pouvourville, “Another Look at Emergency Room Overcrowding: Accessibility of the Health Services and Quality of Care,” *International Journal for Quality in Health Care*, 9, no. 3, (1997): 225-235.
- Lowes, Robert, “What Will It Take to Solve the ER Crisis?” *Medical Economics*, 23, (December 3, 2001).

- Ly, Nghi, Linda McCaig, Catharine W. Burt, "National Hospital Ambulatory Medical Care Survey: 1999 Outpatient Department Summary," *Advance Data from Vital and Health Statistics of the Centers for Disease Control and Prevention*, U.S. Department of Health and Human Services, no. 321, (June 26, 2001).
- Malone, Ruth E, "Heavy Users of Emergency Services: Social Construction of a Policy Problem," *Social Science and Medicine*, 40, no. 4, (1995): 469-477.
- Manton, Kenneth G, XiLiang Gu, "Changes in the Prevalence of Chronic Disability in the United States Black and Nonblack Population Above Age 65 from 1982-1999," *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, 98, no. 11, (May 22, 2001): 6354-6359.
- Martin, Brian C., "Emergency Medicine versus Primary Care: A Case Study of Three Prevalent, Costly, and Non-Emergent Diagnoses at a Community Teaching Hospital," *Journal of Health Care Finance*, 27.no.2, (2000): 51-65.
- Massachusetts Dept. of Public Health, "The DPH Ambulance Diversion Survey: February 1-7, 2001."
- McCaig, Linda F., "National Hospital Ambulatory Medical Care Survey: 1992 Emergency Department Summary," *Advance Data from Vital and Health Statistics of the Centers for Disease Control and Prevention*, U.S. Department of Health and Human Services, no. 245, (March 2, 1994).
- McCaig, Linda F., "National Hospital Ambulatory Medical Care Survey: 1998 Emergency Department Summary," *Advance Data from Vital and Health Statistics of the Centers for Disease Control and Prevention*, U.S. Department of Health and Human Services, no. 313, (May 10, 2000).
- McCaig, Linda F., Catharine W. Burt, "National Hospital Ambulatory Medical Care Survey: 1999 Emergency Department Summary," *Advance Data from Vital and Health Statistics of the Centers for Disease Control and Prevention*, U.S. Department of Health and Human Services, no. 320, (June 25, 2001).
- McManus, Michael, "Emergency Department Overcrowding in Massachusetts: Making Room in Our Hospitals," *The Massachusetts Health Policy Forum: Issue Brief*, Waltham, MA. (June, 2001)
- Medicare Payment Advisory Commission, "Report to the Congress: Medicare Payment Policy," (Washington, D.C., MedPac, March 2001).
- Miro, O., M.T. Antonio, S. Jimenez, A. De Dios, M. Sanchez, A. Borrás, J. Milla, "Decreased Health Care Quality Associated with Emergency Department Overcrowding," *European*

- Journal of Emergency Medicine*, 6, no. 2, (1999): 105-107.
- O'Grady, Kevin F., Willard G. Manning, Joseph P. Newhouse, Robert H. Brook, "The Impact of Cost Sharing on Emergency Department Use," *The New England Journal of Medicine*, 313, no. 8, (August 22, 1985): 484-490.
- Prochazka, Ernest J, "A Possible Solution to the Cost Explosion of the Emergency Department," *Hawaii Medical Journal*, v.57, no. 2, (February 1998): 404-407.
- Reschovsky, James D., Peter Kemper, Ha T. Tu, Timothy K. Lake, Holly L. Wong, "Do HMO's Make a Difference?" Issue Brief: Findings from the Center for Studying Health System Change, no. 28, (March 2000).
- Schull, Michael J., John-Paul Szalai, Brian Schwartz, Donald A. Redelmeier, "Emergency Department Overcrowding Following Systematic Hospital Restructuring: Trends at Twenty Hospitals over Ten Years," *Academic Emergency Medicine*, 8, no. 11, (November 2001): 1037-1043.
- Selby, Joe V., Bruce H. Fireman, Bix E. Swain, "Effect of Copayment on Use of the Emergency Department in a Health Maintenance Organization," *The New England Journal of Medicine*, 334, no. 10, (March 7, 1996): 635-641.
- Singer, Burton H., Kenneth G. Manton, "The Effects of Health Changes on Projections of Health Service Needs for the Elderly Population of the United States," Proceedings of the National Academy of Sciences, USA, 95, (December 1998): 15618-15622.
- Strunk, Bradley C., Paul B. Ginsburg, Jon R. Gabel, "Tracking Health Care Costs," *Health Affairs-Web*, (September 2001): 39-50.
- U.S. Census Bureau, Statistical Abstract of the United States: 2000, (120th edition), Washington, D.C. 2000.
- U.S. General Accounting Office, "Emergency Care: EMTALA Implementation and Enforcement Issues," Washington, D.C., GAO/HEHS publication no.01-747, (June 2001).
- U.S. General Accounting Office, "Growth and Change in Emergency Department Use," Washington, D.C., HRD- (1993-94).
- U.S. General Accounting Office/ Human Resources Division – 93-4, "Growth and Change in Emergency Department Use," (January 1993).
- Williams, Robert M., "The Costs of Visits to Emergency Departments," *The New England Journal of Medicine*, 334, no. 10, (March 7, 1996): 642-646.

Wuerz, Richard C., David R. Eitel, Nicki Gilboy, Debbie Travers, Alexander M. Rosenau, Thomas O. Stair, "ED Triage Instrument to Predict Resource Needs/Outcomes," Final Report to Agency for Health Care Policy and Research, Grant Number RO3 HS 10381-01.

Wuerz, Richard C., Leslie W. Milne, David R. Eitel, Debbie Travers, Nicki Gilboy, "Reliability and Validity of a New Five-Level Triage Instrument," *Academic Emergency Medicine*, 7, no. 3, (March 2000): 236-242.