Rochester, New York: A Decade of Emergency Department Overcrowding

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Abstract. Overcrowding is common in emergency departments (EDs) throughout the United States. The history of ED overcrowding in Rochester, New York, is notable due to its unique health care system that introduced the concepts of managed care as early as the 1950s. An effect of this system was to intentionally restrict resources and allow the issue of access to limit utilization. Overcrowding in EDs was severe in the late 1990s–2000, and became an accepted local standard of care. **Objective:** To study the strategies to reduce ED overcrowding in Rochester in the last decade. **Methods:** A descriptive analysis of individual hospital and community efforts to decrease ED overcrowding. **Results:** Of the strategies tried, those that had little effect on ED overcrowding were based from the ED, such as ambulance diversion. Those that were successful were those that addressed factors external to the ED such as increased flexibility of inpatient resources; float nurses who responded to acute care needs; a transition team (mid-level provider along with registered nurse (RN)/licensed practical nurse) who cared for inpatients boarded in the ED; integrated services across affiliated hospitals/systems; an early alert system that notified key personnel before "code red" criteria were met; and a multidisciplinary team to round in the ED and analyze resource needs. Current community-wide initiatives include precise tracking of code red hours; monitoring patient length of stay (LOS) in the ED and inpatient units; education of physicians and nursing homes regarding ED alternatives; exploration of additional resources for subacute and long-term care; establishing a regional forum to address the nursing shortage; development of an ED triage system to coordinate diversion activities during code red; and consideration of a county-wide state of emergency when needed. **Conclusions:** Emergency department overcrowding is the end result of a variety of factors that must be addressed system-wide. **Key words:** emergency department overcrowding; history; Rochester, New York. ACADEMIC EMERGENCY MEDICINE 2001; 8:1044–1050

EMERGENCY department (ED) overcrowding is common, and receives much attention in the lay and professional press. In a recent study, 91% of hospital ED directors reported overcrowding as a problem. They described conditions such as patients in the hallways, full occupancy of ED beds, and long patient waits as occurring several times a week and daily.[1] Emergency departments in the Rochester, New York, area struggled with overcrowding for more than a decade. In this paper we present a descriptive analysis of attempted solutions and outcomes so that others might adapt successful approaches as demands increase and resources diminish.

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METHODS

Study Design. This was a descriptive analysis of efforts to address ED overcrowding. Attempts at finding a solution to Rochester's ED overcrowding were broken into two phases. During the first phase (1990–2000), solutions were sought within the ED. In the second phase (late 2000–2001), a community-wide effort involving senior hospital leadership considered solutions both within and outside of the ED. Because of its retrospective nature, this study was considered exempt from informal consent.

Study Setting and Population. Rochester is located in upstate New York (Rochester population 225,000; Monroe County 800,000). In 1990 it was served by six hospitals clustered around the metropolitan area in a radius of 3 miles. Characterizing the ED community, two institutions were large, high-volume teaching centers (volume >50,000), three were moderate-volume departments (volume 25,000–35,000), and the remaining ED was a low-volume center (15,000).

Beginning in the 1950s, Rochester developed a

unique health care system.[2] Described in greater detail elsewhere,[2] components of the system included community-rated insurance, formal community health care planning, and early and widespread entry of managed care dominated by a single payer. Rochester became known for its low inpatient bed utilization.[2] Managed care developed rapidly. By the late 1980s, 65% of the employed population was enrolled in a managed care program.

There were many successful outcomes of the Rochester system. As reported in 1992, Rochester had achieved lower per-capita health care costs than New York State overall, as well as nationally ($775 vs. $1,064 vs. $811).[2] However, despite the successes of the Rochester system, there were concerns. An effect of the system was to intentionally restrict resources and allow issues of access to limit utilization. Hospital occupancy within the six hospitals averaged 87.8% in 1992.[2] Emergency department overcrowding and delays in admission of patients were common. When demand for inpatient beds exceeded supply, inpatients were kept in the ED until beds were ready. The treatment of new, acutely ill patients took place wherever space was available.

In the mid-1990s, hospitals and EDs throughout the United States experienced a decrease in demand. In Rochester, despite a long history of managed care and managed resource utilization, inpatient services had a similar decrease in demand. Hospital occupancy dropped below the 80% mark. Licensed beds decreased from 2,300 in 1985 to 1,832 in 1998 (20% reduction).[3] Beds were permanently eliminated from many physical structures through remodeling. The number of hospital patient days/1,000 population declined from 961 in 1980 to 607 in 1997 (37% reduction).[3] An inner-city acute care facility and ED closed in 2000, with passive distribution of 30,000 annual ED visits. The closed facility still functions as an urgent care and walk-in psychiatry unit but does not accept ambulance patients and transfers all patients who require inpatient care. In March 2001, the third largest hospital in Rochester went into foreclosure and limited services. It eventually closed in early May, including its 30,000 annual visit ED.

Hospital utilization and ED visits experienced a marked increase in the late 1990s–2000, both nationally and in Rochester. Several factors played a role in the increase locally. First, during the changes of the mid-1990s, hospitals began to employ large numbers of primary care physicians in an attempt to secure inpatient and specialty referrals. Anecdotally, these salaried physicians provided fewer off-hour services. Though 50% of ED patients called their physician prior to coming to the ED[4] and potentially had care provided by other means, referral to the ED increased. Second, standards of practice led to increased utilization of technology (e.g., computed tomography scans as a new standard of diagnosis for appendicitis), increasing referrals to the ED. Third, in the model of limiting resources to reduce utilization, radiology resources were limited and contributed to patient delays. Fourth, the most successful observation unit closed due to changes in Medicare reimbursement, presumably resulting in additional inpatient admissions. Fifth, an increase in the uninsured population (up to 16% of ED registrations) contributed to the overcrowding.[3]

Study Protocol.

Phase 1 Interventions. Ambulance diversion was used to control flow into EDs. In the late 1980s, a community effort was made to decrease diversion. A consortium of emergency medical services (EMS), county health department, and hospital leaders established uniform criteria for ambulance diversion ("code red"). Each hospital agreed to implement code red only when three of the following conditions were met: no available inpatient beds; no available intensive care unit (ICU) beds; 40% of beds in the ED occupied by inpatients; delays in evaluation of waiting room patients (patients triaged and not yet placed in rooms) exceeding four hours. The ED medical directors and EMS leadership met monthly to monitor code red, investigate any violations, and discuss problems of mutual concern.

As code red hours increased, pressure was placed on the EDs to reduce patient throughput times. The ED directors collected data on the causes of code red, and the most significant factor proved to be inpatient presence in the ED. The directors presented these findings to individual hospitals and to the area hospital consortium. Leadership groups were invited on several occasions to play the simulation game "Friday night in the ER," a business game that vividly illustrates the downstream effect of bottlenecks.[5]

The EDs began to hold selected inpatients indefinitely (known as "boarding") to ensure beds for sicker, more care-intensive patients. Observation areas were opened in the two largest hospitals.

As a medical-nursing best practice, hospitals used cohorting of patients (i.e., neurology with neurology, cardiology with cardiology). Unfortunately, in a setting of high occupancy rates, this led to further delays (one admission office estimated two inpatient moves were needed for every ED admission to ensure the correct bed cohort). To address these delays, one hospital opened a short-stay unit with cardiac telemetry, accepting undifferentiated ED patients until a cohorted inpatient bed could be found.

Phase 2 Interventions. In late 1999 and 2000, despite the programs implemented in phase 1, code red hours increased dramatically (Fig. 1). On several occasions, four (of five) hospitals were code red simultaneously ("mega code red").

As a result of code red pressures, the county health director convened a workgroup in summer 1999 to define the problem of hospital diversions and recommend solutions. This group comprised hospital administrators, ED directors, the EMS administrator, and the EMS medical director. The group met monthly, and intermittently included the health insurance representatives. A major breakthrough occurred in winter 2001, when this group recognized that the problem of ED overcrowding was *not* primarily a function of the ED, but was a complex issue of inpatient capacity, reimbursement issues, regulatory constraints, inadequacy of alternatives for hospitalization, and hospital resource shortages such as nursing. By changing the focus from the ED, the workgroup identified short- and long-term strategies. The resultant white paper contained long-term recommendations, which included data collection, education, developing inpatient alternatives, and improved reimbursement (Table 1).

As a unique development, the white paper included a recommendation for crisis management calling for the county health and law departments to establish threshold criteria for a code red state of emergency. The same group would review a mechanism by which the county executive could declare a state of emergency. In addition, the county health department (in conjunction with the regional hospital association and the two associations of nursing homes) would develop a contingency plan to reduce the demand for inpatient services by directing patients to nursing homes and other appropriate sites when a state of emergency is declared.

Each of these recommendations (long-term and crisis) was assigned to a key leader to complete the action and report progress. A collective body representing all of the hospitals' highest leadership

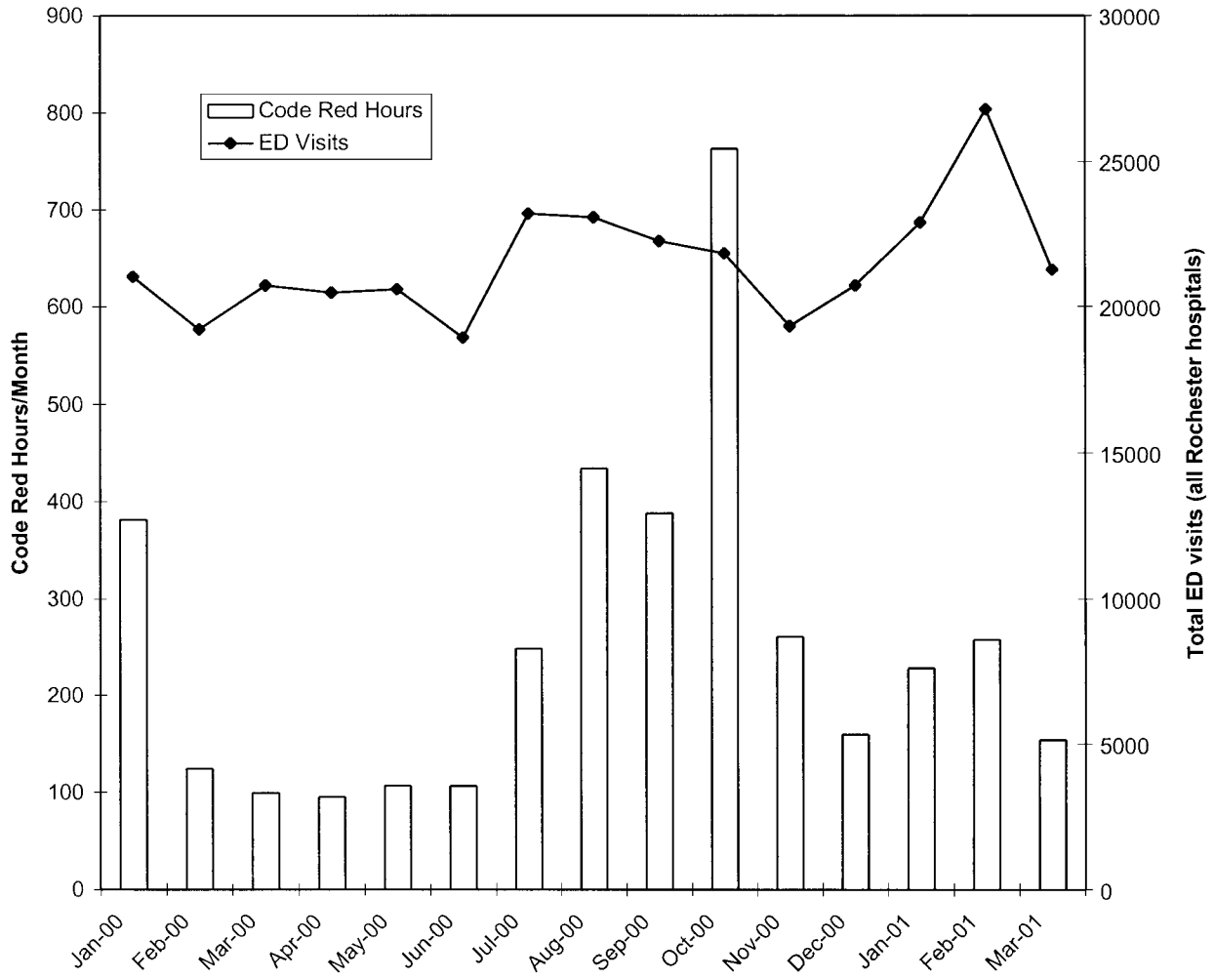

Figure 1. Code red hours (hours on diversion) by hospitals during the year 2000. Numbers shown represent total numbers for all Rochester hospitals. ED = emergency department.

and senior leaders from the major payers accepted the white paper and its findings.

Data Analysis. The EMS cost estimates were obtained by comparing mean personnel and equipment costs associated with various EMS hospital turnaround times. Code red hospital costs were estimated by the decrease in the mean number of patients admitted during code red hours compared with similar time periods on adjacent days.

RESULTS

Phase 1. Ambulance diversion eventually failed to control patient inflow as all institutions went code red, and code red was accepted as "business as usual." At one institution, the time from decision-to-admit to leave-for-inpatient-room averaged 5.5 hours/admission. Data presentations to hospital administrators and the consortium failed to result in change. "Friday night in the ER" evoked discussion but little change.

Limited space and nursing resources hampered the observation units; the patients were largely treated in hallway beds. Even hampered by space limitations, the most successful unit admitted 180 patients per month, significantly reducing ED overcrowding. However, changes in Medicare reimbursement led to the decision to close the unit in 2000.

The short-stay undifferentiated unit was initially successful. Emergency department length of stay was temporarily reduced for both admitted and treat-and-release patients.[6] However, problems occurred when the inpatient staff imposed barriers to regulate their workflow. The unit eventually stopped functioning as a designated ED resource.

Because of the attention focused on code red during 2000, it was possible to perform a cost analysis. Code red grew out of the decision to reduce costs by limiting access. Increasing length of stay in the ED required increased ED staff and resources. Additionally, ambulance diversion resulted in loss of potential revenue. Estimated loss in one hospital system was one inpatient admission per code red hour.[7]

Emergency medical services were directly affected by code red as well. An accredited proprietary EMS provider (Rural/Metro Medical Services) contracted with the City of Rochester for 911 ambulance services, and had backup agreements with several volunteer corps. Rural/Metro responded to more than 60,000 EMS calls annually. Rural/Metro used the high-performance System Status Management (SSM) model to meet the city's response time requirements of 8 minutes, 59 seconds, or less (life-threatening) and 15 minutes, 59 seconds, or less (non-life-threatening) in each of ten geographic zones covering 36 square miles. One consequence of ED overcrowding was the delay for EMS to find an available and open ED. Second, a delay in finding an ED space resulted in a longer patient wait time on an EMS stretcher, effectively prolonging the EMS unit's return to active duty. Similar to the relationship of ED capacity and patient-hours, a 20-minute delay for EMS increased resource requirements, and had no net increase in revenue.

The EMS service saw a significant increase in cost related to prolonged hospital turnaround times. The increase in EMS staffing needs resulted in additional expenses to the ambulance provider that are not reimbursable at the present time. This increased expense ultimately needed to be addressed by the payers and could not continue to be absorbed by the care providers. In Rochester an additional 20-minute delay in hospital turnaround times cost \$1,500–\$2,250 a day (\$547,000–\$821,250 annually) as additional units were staffed to maintain response-time requirements.[8]

TABLE 1. White Paper Recommendations to Reduce Rochester-area Emergency Department (ED) Overcrowding

Development of a precise and efficient means of tracking diversion hours
Monitoring of ED lengths of stay and standards for hospital admissions
Education of physicians and nursing homes on alternatives to ED use
Examination of inpatient length of stay
Exploration of alternatives to inpatient
Reviewing reimbursement for short-stay and observation admission stays such as subacute beds
Development of a coalition of health care providers, the Hospital Association of New York, insurers, and local nursing schools to address the problem of nursing shortage
Development of strategies to promote the greater utilization of EDs where inpatient capacity can be developed (e.g., closed beds exist)
Development of protocols for a physician-staffed ED triage function that would coordinate diversion activities during code red

Phase 2. After the causes of ED overcrowding were accepted by the hospital administration, change began to occur within the individual hospitals. It was clear that flexibility was needed in the inpatient admitting and bed-assignment processes. Purchase of additional adaptable cardiac telemetry units created more choices in the use of medical-surgical beds. Further flexibility was put into place by evaluating the process of cohorting inpatients by care needs. Nurse staffing resources were improved by creating float teams of RNs who could provide coverage in a variety of settings, both in the ED and elsewhere in the hospital. To max-

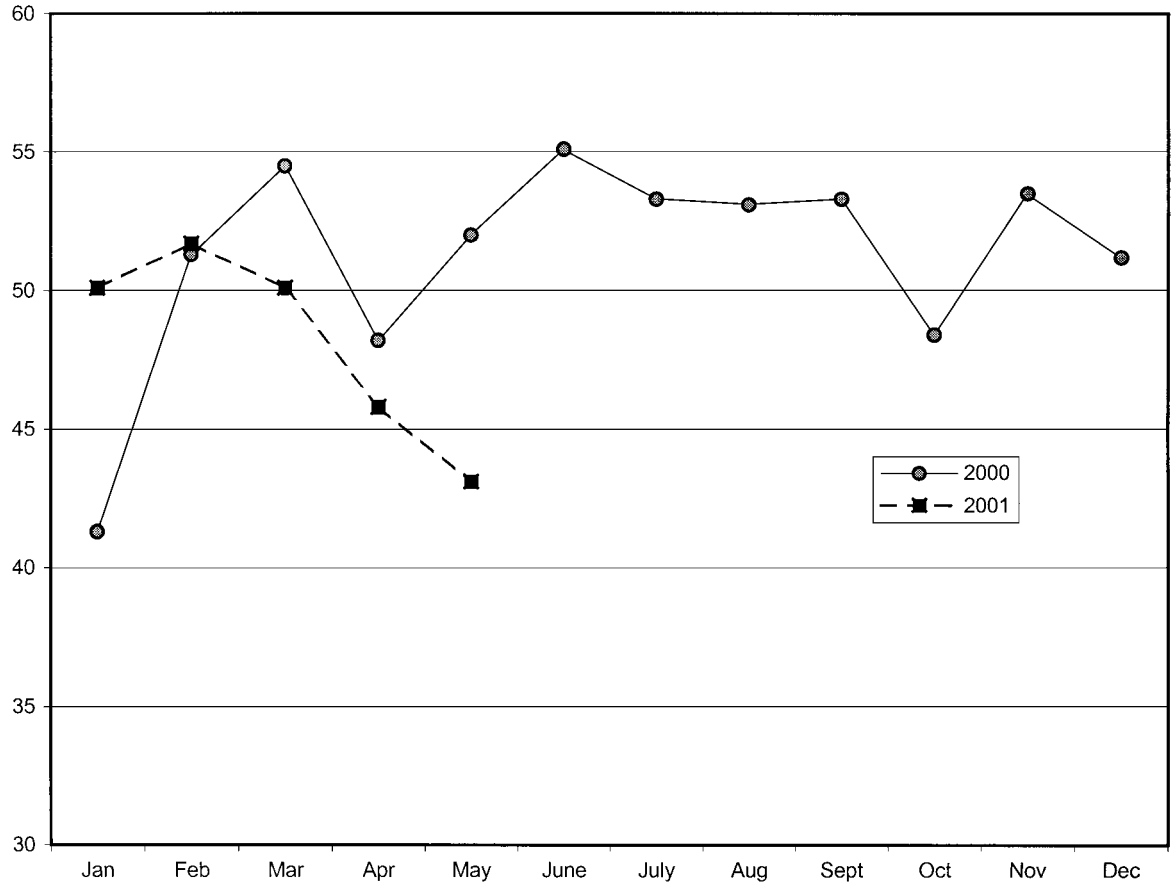

Figure 2. Mean emergency medical services turnaround time (minutes) for all hospitals for the year 2000 through May 10, 2001.

imize ED resources, each hospital system undertook an effort to integrate ED care across individual systems. An example of this included transfer of admissions (after ED evaluation) from one hospital in a system to the partner. At hospitals with excess inpatient capacity, emergency physician coverage was enhanced to encourage EMS to transport patients to the same locations. Emergency physician staff was integrated across an individual system to improve community perception, and to encourage direction of patients to the institutions with excess capacity. Aggressive attempts were made to provide RN staff for all physically present inpatient beds.

Code red policies were revised. A new priority was established to *avoid* code red. In this model, "pre-code red" was an institutional and EMS alert, with the stated goal of avoiding code red. Emergency medical services encouraged patients to choose an affiliated hospital. Hospital administration made efforts to optimally use inpatient space and resources.

Recognizing that admitted patients in the ED share resources with acute ED patients, at one large hospital unique attempts were made to improve the care and environment for admitted patients awaiting inpatient beds (transition team). The care needs of these patients required both physical space and physician/provider/nursing staffing. The hospital financed additional personnel, including mid-level providers (physician assistants and nurse practitioners) who filled a defined role of physician extenders. Nurse staffing came from the ED pool, but inpatient services augmented staffing as needed. Pending completion of a new ED with dedicated space (scheduled March 2001), location of interim space proved to be problematic and could not be located. As an interim solution, a virtual space was designated in the ED treatment area for inpatients utilizing mobile cardiac monitors and hallway spaces. The transition team successfully filled a patient care need.[9]

Current space and processes received optimal use. At one large hospital all available ED space was converted to patient care areas, including relocating administrative offices and using hallways for patient waiting. The ED managers and inpatient admissions coordinators conducted daily early morning rounds to plan for patient placement.

Some improvement was seen in ambulance diversion. There was no change in code red criteria

or monitoring during this period. Despite mild increases in ED volume, code red hours fell in late winter and early spring 2001 (Fig. 1).

Another sign of system improvement was EMS turnaround time. The time EMS spends at a hospital is dependent on several factors, but the availability of staff and space to care for the patient was key. The EMS turnaround time decreased since January 2001 (Fig. 2).

As a current challenge, the closure of a second hospital in Rochester and the redistribution of 30,000 annual ED visits has occurred without a code red crisis. However, the true test came with the summer trauma season. To handle the increased volumes, the EDs received additional personnel, and new initiatives were implemented to rapidly admit patients when beds are available. At one hospital, additional inpatient space was identified by converting previously private rooms to semiprivate rooms. Space was identified in both large hospital EDs to hold inpatients when necessary.

DISCUSSION

From our perspective, the processes that brought about the greatest subjective relief of overcrowding focused on rapid removal of inpatients from the ED. Initiatives such as the short-stay undifferentiated unit and observation unit transiently helped to decompress the ED. These programs were not sustained because of other priorities (e.g., financial performance). Of the programs initiated in the ED, we consider the transition team the most successful. This program acknowledged that the root problem of ED overcrowding was the presence of inpatients, and provided appropriate services to care for inpatients awaiting beds.

There were several important components to the relative success achieved in Rochester. Crucial was the involvement of the Department of Health, senior management of the institutions, and payers. Recognition that the cause and solution to ED overcrowding lay outside the ED was pivotal. In addition, the crisis brought about by increased code red hours and the recent closure of the second institution brought urgency to solve the problem.

Changing ED staff perceptions was an important component of improving ED overcrowding. The ED has been described as being in the center of many forces that cause the crowding of EDs.[10] Those forces include ED volume increases, decreased revenue (Medicare/Medicaid, managed care, uncompensated care, stock market), on-call specialty physician shortage, inpatient bed shortage, the Balanced Budget Act of 1997, ambulance diversion, the Emergency Medical Treatment and Labor Act (EMTALA), undocumented aliens, and increased operational costs (nurse shortage, technology, on-call, inflation). What became clear is that there is another layer of forces that causes each of these problems. Unless these secondary and tertiary problems are resolved, overcrowding is inevitable. The ED staff recognized that the admitting process issues did not belong only to the admitting office. Utilization of inpatient beds is a complex throughput issue. Beds may not be available because of nursing shortages, financial reimbursement issues, lack of subacute or long-term care options, limitations on visiting nurse services, and other complex issues. There was recognition by all that solutions would not be easy.

Getting systems to change can be challenging. The greatest barrier to change is frequently a lack of readiness,[11] and it often takes a crisis (such as mega code red) to stimulate change. Crises seldom present to organizations as clearly and suddenly as the iceberg that struck the Titanic. In addition to the crisis, there must be common understanding of the problem before viable solutions can be advanced. This often takes time and effort on the part of those who are personally affected by the crisis. However, it is necessary that all completely understand the problem. Interestingly, even those on the front line, who experience the overcrowding daily, learned that their own understanding of the problem was simplistic.

LIMITATIONS AND FUTURE QUESTIONS

This paper presents more of a case study than a scientific analysis. It represents relative short-term successes that may not be reproducible in other settings, nor even sustainable in Rochester. Factors other than the ones presented certainly occurred and may have been crucial.

In the case of Rochester, inpatients in the ED were the primary source of overcrowding. This may not be true in other settings. However, the principles of change remain constant.

The cost analysis here are estimates only, and should not be interpreted as hard scientific cost analysis. They do represent approximate numbers that may have some use in comparing options. For example, if ambulance diversion results in the loss of one inpatient admission per hour of diversion, it may make financial sense to pay premium rates for additional personnel to prevent excessive diversion hours. Other factors such as inpatient capacity, payer reimbursement, and casemix play roles in this analysis.

We noted it was most important to get the attention of health care leaders, and direct them to the correct source of the problem. The true assessment of our success will only come with time.

Quantitative assessment should be started before the interventions to understand the impact of each change.

CONCLUSIONS

While Rochester has not yet solved the problem of overcrowding of its EDs, significant progress has been made. Today more patients receive care in our busy EDs with a decreased number of code red hours. The EMS turnaround time has improved. Other important community measures are unfortunately not available (e.g., number of EMS ambulance runs diverted by code red). Specific individual hospital measures continue to be elusive, with limited infrastructure to identify inpatients awaiting beds. Though hallways and offices function as patient care areas, quality of care remains high and morale, for the most part, has improved.

The greatest success in Rochester was the understanding that the cause of ED overcrowding lay outside the ED. Once considered an ED phenomenon, ED overcrowding is now perceived as a system problem. Overcrowding is the end result of a complex array of downstream services (such as nursing homes, subacute services, home nursing), payer issues (such as reimbursement for observation services, tightening of hospital budgets), resource availability (such as the current and future nursing shortage), regulatory issues (such as observation services, expansion of hospital beds), and myriad issues that arise secondarily from these. Failure to identify and act on these issues results in continued ED overcrowding.

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