We qualitatively examined the impact of the permanent closure of St. Vincent’s Hospital in New York City on the remaining hospitals in the area and analyzed how these hospitals responded to this event. We conducted a descriptive survey consisting of interviews with clinical (n = 24) and administrative (n = 11) staff from 4 hospitals in lower Manhattan after the sudden closure of St. Vincent’s Hospital. These hospitals experienced a sudden and sustained increase in patient volume. Each was faced with specific constraints (eg, finances, physical plant, bureaucracy), but they developed similar strategic responses. Generally applicable principles included: soliciting innovative ideas from clinical staff, re-examining previous proposals to improve efficiency, fast-tracking stalled capacity-building projects, and focusing on improving patient care and flow. Three broad tactical themes were apparent: increases in staff and staff hours, use of alternative sites of care, and implementing novel ways of operating. The impact on hospital operations resulting from the closure of St. Vincent’s Hospital is a surrogate medical surge event and met thresholds for activating emergency operations plans. Novel operating methods used in response to this surge event offer practical and broadly applicable principles that might improve medical surge management in other hospitals.

On April 30, 2010, Saint Vincent’s Hospital, a not-for-profit, Level 1 trauma center located in the West Village in lower Manhattan, abruptly, completely, and permanently ceased operations, creating a surge of patients for the remaining hospitals in the area. This article examines the impact of the closure on those hospitals.

Medical surge is defined as “the capability to rapidly expand the capacity of the existing healthcare system (long-term care facilities, community health agencies, acute care facilities, alternate care facilities and public health departments) in order to provide triage and subsequent medical care.”1(p459) Over the years, most medical surge events have been the result of sudden and unexpected emergencies that cause traumatic injuries, such as tornadoes, terrorist bombings, and bus crashes. The increase in patient volume is immediate, relatively modest in magnitude, and short-lived. Once patients are treated, hospitals return to normal operations—often within hours or days. By contrast, a severe influenza pandemic could cause a surge of patients lasting several months. But since a pandemic unfolds gradually, in most locations there would be time to “ramp up” and prepare for the flood of patients.

Catastrophic health events—that is, any natural or manmade incident, including terrorism, that results in a number of ill or injured people sufficient to overwhelm the capabilities of immediate local and regional emergency response and healthcare systems2—such as a nuclear detonation or a large-scale attack using biological weapons, would create both a sudden and prolonged surge in patients. In response to such a no-notice surge event with a
sudden large increase in patient volume that does not diminish over time, hospitals may need to implement additional or different strategies than are normally part of their emergency operations plans.

Planning for catastrophic events in the healthcare sector is limited. Hospitals, most of which operate on tight budgets, focus primarily on planning for higher likelihood hazards. Because examples of such sudden and prolonged surge events are infrequent and therefore hard to study, we sought lessons from a surrogate event that could be applied to hospital preparedness and planning more widely. The consequences of St. Vincent’s closure can be viewed as a no-notice, prolonged medical surge event for the hospitals in the area that remained open.

Following the 1993 and 2001 attacks on the World Trade Center in New York City, St. Vincent’s Hospital was the primary receiving hospital for those needing medical care. The experiences of St. Vincent’s during those disasters exemplified the management of medical surge in response to a substantial increase in patient volume. We perceived the closure of St. Vincent’s to be a significant event because of its status as a Level 1 trauma center, an ambulance provider, and a full tertiary care center.

St. Vincent’s Hospital handled 62,000 emergency department visits, 22,000 hospital admissions, and 1,800 births annually. The hospital had been in financial trouble for years and had gradually been cutting back its clinical services. Although the hospital’s financial trouble was well known in New York, it had been widely assumed that the city, state, or another hospital would step in to prevent its closure. Negotiations were under way with another hospital to take control of St. Vincent’s, but these discussions fell through, and on April 30, 2010, St. Vincent’s Hospital permanently closed its doors and ceased all operations. This created a surge of patients to be absorbed by other area hospitals, primarily by the 4 remaining hospitals in lower Manhattan, only 1 of which was a Level 1 trauma center. The closure appeared to occur with no advance notice, prolonged medical surge event for the hospitals in the area that remained open.

The present study was undertaken to qualitatively examine the impact of the closure of St. Vincent’s on the remaining hospitals in lower Manhattan and to understand the practical challenges the hospitals faced and the operational changes they made in response to this event. Studying these responses could provide principles and techniques of medical surge management that would be applicable to healthcare response to other large-scale health events.

**Methods**

**Study Design**

In order to identify those medical surge strategies that were employed during the ongoing response to the St. Vincent’s Hospital closure, researchers from the Center for Biosecurity of UPMC chose a qualitative and descriptive survey consisting of interviews with clinical (n = 24) and administrative (n = 11) staff from 4 hospitals in lower Manhattan. Clinical staff included both frontline workers and those in clinical leadership positions. This study was conducted from September through November 2010. The study protocol received an exemption from the University of Pittsburgh Institutional Review Board.

**Setting**

We identified the 4 hospitals in lower Manhattan, defined for the purpose of this study as the geographic region south of 42nd Street, that continue to act as receiving hospitals for their surrounding communities. Three of the 4 institutions are privately owned not-for-profit hospitals, and the fourth (the largest of the 4) is a city-owned facility that is part of the city’s extensive public health infrastructure.

**Selection of Participants**

The research team identified project participants on the basis of leadership in departments most likely to be affected by the increase in patient volume: emergency, psychiatry, surgery, social work, critical care, and ambulatory care. This determination was partially guided by work done previously by the Center for Biosecurity on the medical response to catastrophic health events. Hospital administrators who had experience in managing the response to the surge were also included in the study. Charge nurses, emergency department (ED) administrators, operating room (OR) administrators, intensive care unit (ICU) directors, psychiatric administrators, social workers, and ambulatory care administrators were included. Clinical staff (nursing and medical) were also interviewed. In 3 of the 4 institutions, the emergency department chair was the point of contact and assisted in assembling personnel from other departments. In 1 institution, the chief medical officer served in this role.

**Data Collection and Processing**

In-person interviews were conducted on a not-for-attribution basis by a team consisting of 3 to 5 researchers, including at least 1 emergency physician. Sometimes the interviews involved only 1 individual, and other times several individuals were interviewed as a group. The researchers used semistructured, open-ended questions designed to qualitatively assess the impact of the surge from institutional and departmental perspectives. For the most part, specific quantitative data were considered proprietary and confidential by the participating hospitals and
were therefore not available for publication. One hospital provided monthly ED census numbers.

The research team asked participants to describe the impact of the closure of St. Vincent’s Hospital on their department, to identify the surge strategies that were implemented to maintain or improve the institutional capacity to provide care, and to suggest ways the response could have been improved. Follow-up questions relating to specific specialties or institutional roles were posed. The research team met following each set of interviews to analyze the findings, approaches, and challenges. Notes and audio recordings of the interviews were used to facilitate the identification of medical surge strategies.

**RESULTS**

The impact of St. Vincent’s closure on the 4 hospitals in lower Manhattan was felt in several hospital departments, including psychiatry, critical care, surgical services, emergency care, and hospital administration (Figure 1). The increase in demand for services differed across the 4 institutions and across the departments in each institution. The responses were generally characterized by increased staffing and increases in physical space with interspersed innovation. The closure of St. Vincent’s and the resulting surge coincided with the global recession and financial cuts in the public hospital system, and, not surprisingly, the costs of the various potential responses to the surge influenced the decisions of what actions to pursue.

**Emergency Department**

**Impact**

The emergency departments at the 4 remaining receiving hospitals bore the brunt of the patient surge caused by the closure of St. Vincent’s Hospital. The closure of a hospital was not an unprecedented event in New York, as 3 other area hospitals had closed in recent years prior to St. Vincent’s closure; however, none of these hospitals was as large as St. Vincent’s, nor did they have Level 1 trauma status.

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**Figure 1. Departmental Strategies**

**Emergency**

- Increased staffing
- Triaged higher acuity patients to designated lower acuity care zones (i.e., “fast track”)
- Eliminated mechanical ventilators in CT scan
- Created discharge center
- Changed resident physician moonlighting policy
- Increased threshold for high census alerts
- Annexed areas for patient care
- Expanded role of volunteers

**Administrative**

- Expedited credentialing of providers
- Shortened period of nurse orientation
- Used inpatient hallway beds
- Re-opened “ward style” rooms

**Surgical**

- Shifted from acute care surgery model to traditional trauma model
- Increased staffing
- Directed elective surgery cases to alternative sites

**Critical Care**

- Converted step-down beds to ICU
- Increased oversight of step-down beds
- Expanded scope of care on step-down units
- Increased frequency of bed meetings to facilitate discharge

**Psychiatric**

- Increased use of crisis clinic to avoid admission
- Staffed psychiatric ED like an inpatient unit
At the hospitals surveyed, monthly ED census numbers increased by 10% to 30% from baselines that ranged from approximately 30,000 to 100,000 (Figure 2). The increases were perceived to be sudden, occurring within days of the closure, and, as of the date of publication, have not subsided. Figure 3 presents 1 representative hospital’s monthly ED census, illustrating the magnitude of the increase that was evident within 1 month of St. Vincent’s Hospital’s closure. An average of 2008 and 2009 versus 2010 is presented (2008 and 2009 numbers were averaged because of aberrations associated with 2009’s influenza pandemic).

The increased patient volumes led to a number of clinical and administrative challenges. Nurse-to-patient ratios were adversely affected in the months immediately following St. Vincent’s closure. Patient crowding in EDs contributed to difficulties in maintaining privacy during the patient history and examination process. To ensure continuity of operations, hospitals increased ancillary staffing, such as patient care technicians, transport personnel, and clerical staff. They relied on volunteers to augment the strained ancillary staff’s efforts to meet basic patient needs. Finally, the surge was characterized as “crushing” to staff morale as hours and workload increased dramatically.

Clinicians reported a slight but noticeable shift in patient demographics. The increase in emergent psychiatric patients presented challenges as waiting room violence increased. In the public hospital, higher numbers of uninsured patients presented for care.

Despite the increased volume, no hospital reported a decrement in their clinical core measure attainment rates, including time to antibiotic administration and transport of myocardial infarction patients to the cardiac catheterization laboratory. Additionally, there was no evidence of supply chain disruptions, as no participants reported perceptible shortages of either pharmacological products or medical supplies.

Response

Although the ongoing response has involved elements of emergency and crisis response, it was not perceived by hospital staff as a disaster response. Consequently, none of the hospitals activated their emergency operations plans or used their hospital incident command systems. Both clinicians and administrators accepted that the increased ED volume represented a “new normal” and have taken steps to adjust to it.

Increases in staffing in all personnel categories were the most commonly requested intervention. However, bureaucratic and budgetary constraints complicated the...
hospitals’ ability to rapidly respond to this need. Senior nursing personnel reported difficulty in recruiting experienced ED nurses and noted that it could take from 3 to 6 months before an inexperienced nurse could be brought online. One hospital reported that by the time it was prepared to hire former St. Vincent’s ED nurses, they had largely dispersed to other facilities. In the short term, the nursing shortage was addressed through the use of agency or traveling nurses. Additionally, nursing managers at the privately owned hospitals reported the use of overtime pay as an incentive to extend hours. All facilities have started the process of adding nursing staff in their respective EDs.

Physician staffing was also increased in response to the surge. In general, hiring physicians was a faster process than hiring nurses. Attending emergency physician coverage was increased in some hospitals. At one hospital, the roles of resident physicians were enhanced to include working overtime (“moonlighting”) in the fast-track area. In addition to increases in attending physician coverage, 1 facility reported the development of an “attending-only” unit in order to increase ED throughput. This unit used a designated attending physician working in conjunction with the charge nurse to facilitate rapid diagnosis, treatment, and discharge of specific patients. A scribe team was deployed at 1 hospital to increase physician efficiency by facilitating the completion of medical records.

Fast-track areas of the ED—those areas designed to expedite the care of lower acuity patients—were often used in an augmented or alternative fashion. Increasing hours of operation, altering patient acuity levels, and use of mid-level providers characterized this change. In one institution, a fast-track area that had been in the planning stage was quickly opened in response to the surge. Additionally, 1 institution co-located an inpatient admission holding area in the unused physical space in the fast-track area.

Innovative tactics were employed in EDs to address physical space issues. One hospital repurposed its asthma treatment room as a resuscitation room. Another hospital used its waiting room as an alternative clinical site during periods of exceptionally high census in the ED. Discharge centers staffed by a single nurse, to which inpatients...
awaiting discharge could be moved to alleviate inpatient burden, were used in 2 of the 4 hospitals.

In addition to altering the hospital’s physical plant to increase capacity, clinicians used alternative procedures or practices to minimize the length of stay. One ED, in order to minimize inpatient length of stay for cardiac telemetry monitoring, devised an electronic method of appending its ED telemetry data to the inpatient telemetry recording. The use of different oral contrast agents with more rapid gastrointestinal transit time were explored as a method of decreasing ED length of stay in those patients requiring oral contrast administration for computed tomographic (CT) scans of the abdomen.

**Administration**

**Impact**

Hospital administrators who were involved in the response to the patient surge were aware of the impact on hospital operations. Administrators confirmed that, unlike a public health emergency, there was no disaster designation, so evidence of significant disruptions in the provision of care would need to be documented before a response could be mounted.

Many clinicians and administrators characterized the environment as being “pro-innovation,” as thoughts on how to maintain or improve hospital operations were well received by the administrations.

**Response**

Three hospitals worked quickly to adjust policies in order to recruit and accommodate former St. Vincent’s physicians by granting expedited emergency privileges and sending clerical staff to St. Vincent’s Hospital to assist in the completion of credentialing forms.

Administrators were aware of the surge and communicated with clinical staff to understand the impact on their facilities. No hospital declared an internal emergency or activated incident command structures to manage the surge, though they all reported that the increased patient volume met or exceeded thresholds for emergency operations.

Instead, administrators focused on maximizing space utilization. In 2 EDs, the surge was an impetus for accelerating previously planned renovation and expansion efforts. One hospital also reopened ward-style inpatient rooms, which housed 4 patients per room. Additionally, hallway beds on inpatient units were used in 2 hospitals to minimize ED boarding times.

**Ambulatory Care**

**Impact**

Ambulatory care centers noted some shift in patient demographics and increases in volume. However, in some cases the surge was viewed positively, because clinics had been operating at less than full capacity. The absence of easily accessible medical records for those patients previously seen at St. Vincent’s Hospital was a complicating factor that made continuity of care difficult.

**Response**

Ambulatory clinics responded to the surge primarily by reserving time slots for displaced St. Vincent’s patients. One hospital referred some of the excess ambulatory patient volume to more remote clinics (in some cases, outside Manhattan borough).

**Psychiatry**

**Impact**

Psychiatry services noted an increase in utilization that paralleled the ED patient surge. St. Vincent’s, which had more than 100 psychiatric beds, admitted a relatively large number of psychiatric patients. Following its closure, the hospitals that participated in this study observed a surge of psychiatric patients.

**Response**

In all 4 hospitals, psychiatry departments added nurses and technicians to address the needs in the emergency department. One hospital, which had a specific psychiatric ED, instituted staffing changes to ensure continuity of care because, after the surge occurred, it was effectively transformed into an inpatient psychiatry unit due to lack of bed space on true inpatient units. Two hospitals curtailed acceptance of patients transferred from other institutions and had to seek facilities to which to transfer their own patients because of bed space constraints.

**Critical Care**

**Impact**

The volume of the surge in the ICUs was spread among various critically ill patient populations. In 1 hospital, ICU operations increased from 93% of capacity to 104%, with surgical and neurosurgical cases constituting most of the volume increase. In all cases, no shortage of medical equipment was reported.

**Response**

To meet the increased demand for intensive care, step-down units were converted to provide ICU-level care and intensivists managed the step-down units to better ensure optimal resource allocation. Similar to the EDs, immediate staff demands were addressed through agency nurses. The frequency of bed management meetings among ICU staff was increased to improve flow to and from the ICU. Ad-
ditionally, 1 institution devised an electronic list of patients to identify which patients could, if needed, be transferred to a lower acuity setting.

Augmented capabilities were created on non-ICU units to accommodate the use of ICU-level interventions, such as vasoactive medication infusions. In 1 institution, mechanically ventilated patients who required only palliative care were transferred out of the ICU.

**Surgical Services**

**Impact**

The 1 Level 1 trauma center experienced a surge in trauma patients. While the OR in this hospital was not operating at full capacity prior to St. Vincent's closure, the sudden and sustained increase in trauma cases necessitated operational changes. One hospital representative observed that more exploratory laparotomies for trauma were performed in 1 month than in all of 2009. Other hospitals experienced heightened volume in both vascular and orthopedic surgical cases, which corresponded with the recruitment of St. Vincent's physicians.

**Response**

Departments of surgery responded to the surge in several fashions, including by increasing OR staffing—specifically nurses and anesthesiologists. Enhanced efficiency measures in the OR to ensure on-time starts and room turnover were employed. One hospital added 3 operating rooms to their suite after seeking and receiving expedited approval from regulatory agencies. Hospitals also increased the hours of operation of their ORs, keeping rooms running later in the day and on weekends. Prior to the closure of St. Vincent's Hospital, the trauma surgical service at the Level 1 trauma center had moved to an acute care surgery model in which they provided care to nontraumatic patients needing urgent surgical intervention (eg, urgent gall bladder surgery), but they had to discontinue this service because of the increased numbers of trauma patients. Two hospitals referred non-urgent surgical cases to other sites affiliated with their hospitals.

**Discussion**

The closure of St. Vincent's Hospital produced a sudden medical surge in which patient volume at the remaining hospitals of lower Manhattan increased noticeably. The patient volume increases have been sustained, creating a “new normal” for these hospitals. Each hospital was faced with constraints specific to their particular hospital (eg, finances, physical plant, and bureaucracy) but developed similar plans of attack. Three broad tactical themes were apparent: increases in staff and staff hours, use of alternative sites of care, and implementation of novel ways of operating. Of these 3 tactical themes, novel operating methods offer practical and broadly applicable principles that might improve medical surge management in other hospitals. We found several of these novel operational tactics to be especially innovative, whereas some strategies employed have been identified before (Figure 4).

Many of the surge strategies implemented were not ideas that were first developed because of the surge—they were ideas that had been proposed prior to the event but had not been instituted for a variety of reasons. The immediacy of the surge environment created an atmosphere in which innovative ideas were given more than usual consideration and were often implemented. Additionally, many initiatives undertaken during the surge had already been slated for implementation but had languished with slow roll-out schedules. The surge provided an impetus to accelerate the adoption of these new practices.

Although the closure of a hospital is not typically thought of as a disaster, in this case, the lack of prior warning to the clinical staff and the sheer increase in the number of patients seen at the remaining hospitals qualifies it as a surge event, albeit a different form of surge than that experienced during a terrorist attack or natural disaster. An influenza pandemic is likely the most similar scenario to a hospital closure—with important differences—and many of the techniques employed would be applicable to a pandemic. In fact, many of the subjects interviewed stated that some of their actions were taken from their pandemic influenza planning.

Notably absent from the responses of the hospitals was any formalized declaration of a “disaster” and the use of an incident command structure (ICS) to facilitate effective response. This occurred despite patient volume, especially the number of admitted patients being boarded in the ED, meeting or exceeding thresholds for emergency operations—sometimes for days at a time. Each hospital uses similar procedures for activating internal disaster response plans, but all decisions are chiefly made at the discretion of the ED administration and no strict quantitative threshold numbers are used. Moreover, the fact that measures to increase efficiency alleviated much of the surge burden should inform consideration of possibly higher disaster thresholds. Such thresholds might be designed to reflect a level of patient surge that cannot be met with efficiency-enhancing measures alone. Hypotheses to explain the lack of activation of emergency operations include: (1) the absence of any sort of official disaster declaration; (2) the fact that the closure of a hospital, especially for financial reasons, was not previously considered in emergency planning; (3) only the volume of patients, not the types of patients, had changed; (4) the chronic rather than acute nature of the surge that caused it to be viewed as a “new normal”; and (5) the almost daily frequency with which disaster thresholds were exceeded.

The fact that this surge event was not a declared emergency constrained the surge response options available to
the hospitals and precluded the implementation of some medical surge strategies that might be considered in other circumstances. In particular, strategies that would have an impact on standards of care or federal, state, or local laws and regulations, such as reduced medical record documentation, could not be employed.

Additionally, since some facilities viewed this event as an opportunity to competitively enhance market share, information sharing and collaboration between hospitals was limited. Several interviewees conveyed that hospital closures are not uncommon in New York City and, in the past, hospitals had been expected to cope with the increased patient volume without major changes to hospital operations, although no hospital the size of St. Vincent’s, with its level of services (psychiatry, trauma, ambulance operator), had closed in the recent past.

Because the closure of St. Vincent’s Hospital was not a declared emergency and was qualitatively different in many ways from a traditional disaster, much of the response was focused on removing existing operational inefficiencies and choke-points. Several representatives from 1 hospital described this process as analogous to “blocking and tackling”—that is, getting back to basics—and focusing on basic operations and removing slack in the system, thereby enabling the hospitals to absorb the patient surge before a “tipping point” is reached. Examples of this strategy included improved use of flat space for patient care, expediting credentialing of new providers, increasing oversight of step-down units, and reconfiguring the operation of fast-track areas of the ED. One representative went so far as to state that, in a surge event, using procedures outside of normal operations may not be necessary because eliminating existing systemwide inefficiencies may be sufficient. While strategies to enhance efficiency may be less applicable to a traditional brief surge event (versus a longer term sustained surge),11 they were an important component of each hospital’s response to the St. Vincent’s closure. Also, such endeavors as creating new operating rooms likely would not be employed in an acute surge resulting from a traditional disaster. During a declared disaster, efficiency-enhancing measures—the major component of the St. Vincent’s closure response—would likely play a less prominent role, as wholesale changes in standards of practice and care would ensue due to resource scarcity that might occur.

The enhanced and prolonged use of these multiple minor adaptations together enabled the hospitals to maintain essentially normal standards of care. This adaptive use of coping tactics to maintain standards of care has been referred to as “contingency surge capacity.”6

The limitations of this study stem from its qualitative and descriptive nature. Quantitative analysis of the impact of each of the surge strategies was not feasible because many of the data elements—including occupancy rates, geographic locales from which patients were admitted, and ambulance traffic issues—were considered proprietary and were either not made available or were shared with the research team in confidence. The primary data sources were personal interviews, which may suffer from recall bias (ie, actions that were obvious successes and failures were more likely to be recalled) and a hesitation to fully disclose all the interventions undertaken.
CONCLUSION

The closure of St. Vincent’s Hospital forced the 4 remaining hospitals of lower Manhattan to respond to a sudden and sustained increase in patient visits. Facing financial and administrative constraints, the hospitals implemented measures to accommodate this influx of patients. Because the science of surge response is a developing field, documentation and analysis of surge events is essential for creating an evidence base. Although a catastrophic health event would generate a very different type of surge from the one noted in lower Manhattan after the closure of St. Vincent’s, the resulting impact on hospital operations met thresholds for activating emergency operations plans. Generally applicable principles that are apparent from the surge response to the closure of St. Vincent’s include: soliciting innovative ideas from clinical staff, reexamining previous proposals, fast-tracking stalled capacity-building projects, and focusing on improving patient flow. In the future, these principles may prove applicable in other scenarios where local or regional healthcare capacity is stressed.

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