

Central Brooklyn  
Center for Bioterrorism and Preparedness Planning

**An Integrated Plan to Augment Surge Capacity**

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## **Central Brooklyn Center for Bioterrorism and Preparedness Planning**

The Central Brooklyn CBPP (Center for Bioterrorism Preparedness Program) was formed in 2003 under the auspices of the New York City Department of Health and Mental Hygiene. Participating in this program were four major health care institutions of central Brooklyn: Kings County Hospital Center, State University of New York Downstate Medical Center/University Hospital of Brooklyn, Kingsbrook Jewish Medical Center and the Kingsboro Psychiatric Center. While geographically near one another these institutions have no financial or administrative connection with one another making this a somewhat unique health care planning entity in the NYC area. Under the leadership of Dr. Bonnie Arquilla of the SUNY Downstate Department of Emergency Medicine the Central Brooklyn CBPP has sought to tie together the disaster preparedness planning and training programs of each of the affiliated institutions and to expand this collaboration in new and novel ways. Among other activities the group has:

- 1) developed global inventories and resource sharing plans
- 2) conducted large scale cooperative drills
- 3) instituted uniform and standardized disaster response policies
- 4) helped to develop and distribute a toolkit for the care of pediatric victims of disaster.
- 5) planned and operationalized a fully serviceable respiratory isolation unit expressly to handle surge cases seen in the setting of an outbreak of communicable disease

After several years of operation it is expected that collaboration within the framework of the CBPP will continue irrespective of ongoing funding and that the central Brooklyn CBPP could serve as a model for disaster planning for institutions around the nation.

# An Integrated Plan to Augment Surge Capacity

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## Abstract

Surge capacity is defined as a health care system's ability to rapidly expand beyond normal services to meet the increased demand for appropriate space, qualified personnel, medical care and public health in the event of bioterrorism, disaster, or other large scale public health emergency. There are many individuals and agencies, including policymakers, planners, administrators, and staff at the Federal, State and local level, involved in the process of planning for and executing policy in respect to a surge in the medical requirements of a population. They are responsible to ensure there is sufficient 'surge capacity' within their own jurisdiction. In response to the New York City Department of Health and Mental Hygiene request to plan for mass casualties, area hospitals have taken an inventory of available beds and set a goal to provide for a 20% 'surge capacity' that may be available during a mass casualty event or other conditions calling for increased inpatient bed availability. Thus four hospitals in Central Brooklyn formed the Central Brooklyn Center for Bioterrorism and Preparedness Planning (CBCBPP). The CBCBPP hospitals have developed a surge capacity plan to provide necessary space and utilities. As these plans have been applied, they identified and created a bed surge capacity of approximately 30% for Central Brooklyn to provide for the increased demand on the medical care system that may accompany a disaster.

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## **Introduction -**

### *Background*

Recently, preparation for events that could increase demands on the medical care system has come to the fore of social policy. Events including terrorist attack, natural disaster, and infectious outbreaks have put strain on health care delivery systems and are likely to do so again. Recent challenges to standing infrastructure have provided certain lessons for those creating protocols and upgrading facilities in preparation for a potential public health incident.

Consider as an example the events of the Rhode Island nightclub fire of 2003. This particular tragedy quickly flooded the area's community hospitals with a large number of patients, many of them critical, which superseded these hospitals' capacities. Key to the response was the effective triaging of critical patients and timely interventions employed for their stabilization. This required prompt mobilization of extra space, staff and supplies. As the response continued, many of the patients were successfully stabilized. Following timely interfacility communication, some were transferred to referral burn centers thus freeing resources for the care of an abundance of less critical patients. The response of the Rhode Island community hospitals provides a case and point of the mobilization of a surge capacity and utilization of regional resources to reestablish a sustainable state of function.<sup>1</sup>

The demands on a health delivery system by an isolated and limited event like the one in Rhode Island pale in comparison to the potential of more regional or expansive public

health events. While some mass casualty incidents may follow the pattern of an intense, short-time peak of activity, others (e.g. bioterrorism incidents) will present the community and health system with rapidly increasing demands that plateau and have to be addressed for days to weeks.<sup>2</sup> The recent events of the SARS epidemic and later Hurricane Katrina documented the contrast of more enduring challenges to health care delivery capacity. The SARS epidemic not only required health care providers to diagnosis and treat waves of those affected by a new pathologic entity, but the institution of measures for the containment of the infectious disease were of primary importance. The flooding following Hurricane Katrina necessitated the evacuation and closure of key health care facilities in New Orleans, a logistical nightmare for an incapacitated command and communication infrastructure. In the meantime, the health care system was still required for the thousands of displaced who suffered from exposure, trauma, infectious, and exacerbations of chronic illnesses.<sup>3</sup> Both of these incidents demonstrate what may be expected in future incidents that may have sustained or far reaching consequences.

As alluded to, every aspect of hospital functioning becomes strained during a public health incident, and as result decreases its ability to maintain order and continue to maintain patient care. A plan that addresses meeting the increased needs for physical space including needs for isolation capacity, increased needs for medical supplies, and increased needs of staffing and support is indicated. This article will narrow its vision to the physical capacity aspect of 'surge capacity', though noting those medical supplies, staffing and support services are also key aspects of this response.

### *Importance*

'All of us practice in a highly competitive environment, with an emphasis on cost containment and “efficiency”. As a result many medical facilities operate at near capacity and supply inventories are kept as low as practical, depending on “just in time delivery systems.”’<sup>4</sup> There is evidence regarding the lack of reserve within the current health care system that support Dr. Roy Alston's testimony to the House Committee on Homeland Security. Today we see the prominence of the use of 'diversion' status in emergency departments' in order to redistribute patients away from their hospitals which are already functioning at capacity. In a survey, 39% of emergency department administrators stated that diversion was a daily issue.<sup>5</sup> If a significant number of hospitals are running at or near capacity, their ability to manage the further demand to their physical capacity in an infectious outbreak or mass casualty event may be questioned. In such a situation, the availability of the 'diversion' of patients to other hospitals in the region will not be a feasible option, and the ability of hospitals to provide appropriate space for medical treatment is a prerequisite to effective response to a public incident. How then is the medical system expected to be prepared for events that might require significantly greater capacity than their current market demands? As Dr. Alston postulated, 'It is also primarily a local and regional responsibility to develop and operate these “surge” programs.’<sup>4</sup> There is a need to devise, support and implement plans that will establish further capacity above and beyond functioning levels, and to maintain this surge capacity as a reserve. In this context, it is a challenge to establish how much reserve

capacity would be an acceptable level. The Health Resources and Services Administration has set benchmarks that can be used to guide hospitals in their disaster management planning. Their recommendations state that systems should be established that can triage and stabilize at least 500 cases per million of population of acute infectious disease and 50 cases per million each of acute chemical poisoning (i.e. botulism), trauma victims, and those with radiation injury. <sup>6</sup> These numbers provide a guide for the preparation for an incident in a community.

The preparation for an infectious disease outbreak has particular issues that must be addressed. As mentioned earlier in the case of SARS, the containment an infectious disease epidemic is a priority. 'It became apparent during the SARS outbreak that some Ontario hospitals had ineffective or absent infection control programs. Outside of larger teaching hospitals, the expertise to deal with serious infection control issues appears minimal.' <sup>7</sup> In Hong Kong as well, 'the SARS epidemic exposed substantial weaknesses in hospital design and environment. Wards are overcrowded and facilities outdated. Before the epidemic, beds were generally placed close together; in order to cope with the increasing caseload. Ward design is often inappropriate for the management of communicable disease.' <sup>8</sup> The historic use of quarantine hospitals for containment of communicable disease has largely been abandoned in exchange for the distribution of isolation wards throughout the multiple hospitals in a region. This has allowed for the expertise in the management of the communicable diseases to also be distributed throughout the health care system. Though postulated to be beneficial to public health, this places the responsibility of infectious disease management on the individual

hospitals. 'Hospitals dealt with the isolation surge requirement in different ways: some installed temporary facilities using HEPA filtration units, whereas others elected to construct permanent banks of rooms with dedicated ventilation systems.'<sup>9</sup> The ability to provide for a surge, specifically in isolation patients, remains a challenging part of the disaster management plan of a facility and of a region.

Another characteristic of the current medical delivery system is a lack of integration and communication between its units. Hospitals generally operate independently and without interaction with their counterparts in the region. This fact hinders the potential response that could be expected from a well integrated system. In comparison, consider the effectiveness of a response to a multiple alarm fire that may be hindered when numerous fire departments respond and act independently.<sup>10</sup> Recalling recent events in New Orleans following Hurricane Katrina, it is clear that the ability to transfer patients through flexible and redundant regional command and communication structure is essential in a disaster management plan.<sup>3</sup> Cooperative regional planning by health care facilities allows for more streamlined response and requests for resources. Cooperative agreements should include staff and supply sharing and describe process for communication and resource request or reallocation during an incident. A mechanism for interacting with jurisdictional authorities should be in place within the region so that patients can be moved from one facility to another (although some contagions may alter these referral plans). Interregional agreements are also encouraged and may be facilitated by state health authorities.<sup>11</sup> Through a process of critical self evaluation and active planning and development, Central Brooklyn CBPP, with grant funding from the New York City Department of

Health and Mental Hygiene, has addressed these issues within its individual facilities and negotiated a cohesive response for the hospitals involved. This article documents the development, implementation and integration of a physical space surge capacity plan within the Central Brooklyn CBPP.

## **Methods -**

### *Setting*

The Central Brooklyn CBPP hospitals include Kings County Hospital Center (KCHC), University Hospital of Brooklyn (UHB), Kingsbrook Jewish Medical Center (KJMC), and Kingsboro Psychiatric Center (KPC). These hospitals have chosen to cooperate in merging their resources to address potential public health incidents that could affect Central Brooklyn, NY.

### *Data Collection and Processing*

A generalized plan was applied to all four facilities. In the process of addressing surge capacity, each facility was required to perform certain parallel steps. First, each facility performed an inventory of physical capacity as well as capacity of staffing and supplies. This included bed counts in each unit that were or had the potential to become an inpatient unit. Further inspection was performed to identify possible negative pressure isolation bed surge capacity as well as ventilator capacity at each facility. These numbers

were collected by an evaluation team in each facility and compiled. Recommendations and protocols were then developed and documented for the expeditious activation of this inherent surge capacity. Next, potential plans to increase each hospital's respective surge capacity were evaluated and then put into policy, thereby increasing the capacity of the Central Brooklyn CBPP network.

### **Central Brooklyn CBPP Hospitals**

#### *Kings County Hospital Center (KCHC)*

Kings County Hospital Center is a tertiary care hospital in New York City, part of the Health and Hospitals Corporation (HHC) system, which serves central Brooklyn. It has approximately 1700 admissions a month. In response to the requirements of Central Brooklyn CBPP pertaining to surge capacity, counts of regular and isolation beds were carried out. An internal surge capacity was then extrapolated by using available resources maximally. It was found that much of the existing isolation space at any given time was not being used by patients requiring isolation in Kings County Hospital Center. Plans to free this existing isolation space in a time of need were devised.

#### *University Hospital Brooklyn (UHB), SUNY Downstate Medical Center*

University Hospital of Brooklyn, SUNY Downstate Medical Center, is a university hospital that has a hospitalist service as well as admitting privileges to private physicians,

admitting approximately 1200 patients a month. It is adjacent to Kings County Hospital Center yet a separate entity. This facility also performed a bed inventory throughout its divisions. In parallel to Kings County Hospital Center, the mobilization of the inherent isolation capacity within the hospital was planned.

*Kingsbrook Jewish Medical Center (KJMC)*

Kingsbrook Jewish Medical Center is a hospital with 800 admissions per month. This hospital has a prominent rehabilitation service. It boasts an affiliation with 48 nursing homes which have in addition to regular care beds, the ability to provide tracheotomy care, ventilator beds, and IV medication. In addition, several of these nursing homes have dialysis capability. These beds are staffed and are accessorized. Isolation beds are not customarily provided for through the Kingsbrook Jewish Medical Center system. A comprehensive census of the hospital proper was performed. Bed availability data of the nursing homes was also gathered to estimate the potential surge capacity of the network.

*Kingsboro Psychiatric Center (KPC)*

Kingsboro Psychiatric Center is a long term state mental health facility. A census of its beds was performed. The facility has neither staff nor supplies for primary medical care. Yet, it does have resources that may be critical in a public health incident that supplement the other facilities in the Central Brooklyn CBPP. In its own inventory it was found to have the space to temporarily harbor a significant number of people. This space was

evaluated for its potential uses.

## Results

The results for the bed and ventilator inventories for the Central Brooklyn CBPP hospitals can be seen in the following Tables, (Tables 1, 2, 3):

**Table 1.**

**Kings County Hospital Center, Brooklyn, NY**, an inventory of facility physical capacity as well as capacity of staffing and supplies. This included bed counts in each unit that was or had the potential to become an inpatient unit. Further inspection was performed to identify possible negative pressure isolation bed surge capacity as well as ventilator capacity at each facility. These numbers were collected by an evaluation team in each facility and compiled.

<i>Unit</i>	<i>Staffed</i>	<i>Surge Capacity</i>	<i>Resp Isolation Rooms Convertible</i>	<i>Ventilators</i>
<i>Peds Floor</i>	28	-	2	5 (peds exclusive)
<i>Nursery</i>	10	-	2	-
<i>Neonatal Step Down</i>	10	-	-	-
<i>Neonat ICU</i>	10	-	-	-
<i>PICU</i>	7	-	2	-
<i>Med/Surg Floor</i>	199	23	39	52
<i>MICU</i>	12	-	2	-
<i>CCU</i>	8	-	2	-
<i>SICU</i>	12	-	2	-
<i>Neuro ICU</i>	8	-	-	-
<i>Rehab/Ortho</i>	23	-	-	-
<i>GYN</i>	6	-	-	-
<i>L&amp;D</i>	7	-	-	-
<i>OR</i>	9	-	-	-
<i>Ambulatory OR</i>	7	-	-	-
<i>Dialysis</i>	24	8	-	-
<i>Cysto</i>	4	-	-	-
<i>A42</i>		36	27	-
<i>ED</i>	40	-	-	-
<i>Total</i>	424	67	78	57
<b>Total Surge Capacity</b>	<b>491</b>			

**Table 2.**

**Kingsbrook Jewish Medical Center, Brooklyn, NY**, an inventory of facility physical capacity as well as capacity of staffing and supplies. This included bed counts in each unit that was or had the potential to become an inpatient unit. Further inspection was performed to identify possible negative pressure isolation bed surge capacity as well as ventilator capacity at each facility. These numbers were collected by an evaluation team in each facility and compiled.

<i>Unit</i>	<i>Staffed Beds</i>	<i>Surge</i>	<i>Resp Isolation Rooms Convertible</i>	<i>Ventilator</i>
<i>Med/Surg Floor</i>	268	76	32	46
<i>ICU</i>	10	-	-	-
<i>CCU</i>	10	-	-	-
<i>Total</i>	288	76	32	46
<i>Total Surge Capacity</i>	364			

**Table 3.**

**UHB, SUNY Downstate Medical Center, Brooklyn, NY** an inventory of facility physical capacity as well as capacity of staffing and supplies. This included bed counts in each unit that was or had the potential to become an inpatient unit. Further inspection was performed to identify possible negative pressure isolation bed surge capacity as well as ventilator capacity at each facility. These numbers were collected by an evaluation team in each facility and compiled.

<i>Unit</i>	<i>Staffed</i>	<i>Surge</i>	<i>Resp Isolation Rooms Convertible</i>	<i>Ventilator</i>
<i>Med/Surg Floor</i>	175	38	6	5
<i>ICU Step Down</i>	-	-	-	2
<i>Med/Surg ICU</i>	10	13	2	9
<i>CCU</i>	-	-	-	2
<i>Neuro ICU</i>	-	-	-	4
<i>CTICU</i>	-	-	-	8
<i>GYN</i>	20	-	-	-
<i>Peds Floor</i>	23	-	2	-
<i>PICU</i>	5	8	-	4
<i>Neonat ICU</i>	25	-	-	15
<i>ED</i>	17	18	2	4
<i>Total</i>	275	77	12	53
<i>Total Surge Capacity</i>	352			

## **Discussion**

There are multiple ways in which capacity can be increased in a hospital. The primary response that facilities will employ is the redistribution of resources from outpatient divisions to inpatient care. This will be done in an effort to mobilize resources for those patients in a public health incident who have relatively acute medical needs or whom themselves are a concern of public health as in the case of an infectious disease. It follows that, in a state of emergency, a hospital may be expected to discontinue nonessential medical care, canceling elective medical procedures and closing ambulatory clinics, thus augmenting both physical and staffing capacity to deal with a surge of admissions. Secondly, admitted patients who do not require a high level of care may be discharged with medical needs met, mobilized to a holding area, or transferred to other facilities, i.e. nursing homes, to increase bed availability.<sup>11</sup> A third option to increase bed availability is to create secondary wards that can be activated as needed. This proves a particularly useful option when decommissioned wards are available for retrofitting. A last resort of intra facility surge capacity, and surely an indication to transfer patients to other facilities, would be using hallway and other available space to care for patients. This would portend an unwanted further degradation of care, especially in the case of an infectious disease outbreak, where isolation precautions are obligatory.

*Kings County Hospital Center*

Following the results obtained through the inventory, it was determined that further capacity would be beneficial in the case of an infectious outbreak or mass casualty. Fortunately after an evaluation of potential space, a decommissioned ward within the Kings County Hospital Center was found to be an excellent candidate for providing additional capacity. As Kings County Hospital Center continues to modernize, it has moved out of its historic wards and moved to new facilities that are directly connected to the old by adjoining passageways. During the 1980's the now decommissioned 4th floor of A building (A42) had been converted into an isolation ward during the epidemic of tuberculosis in the immunocompromised patients of that time. The medical gases and negative pressure systems continue to be in functional status despite its abandonment. The unit was deemed in need of an upgrade by information technology, in addition to the provision of patient room accessories. Staffing would have to be organized in the advent of the mobilization of the unit. These plans were accepted as feasible and work was begun on the conversion of A42. It was determined that the activation of a decommissioned unit like A42 would require an inspection of the functionality and safety of the unit. A proposed protocol to activate the unit includes facility management preparing space, respiratory checking for the medical gases, housekeeping preparing the rooms, basic servicing, nursing assigning staff, infection control performing inspection, information technology assessing the phone lines, security checks, and safety checks for hazards.

The 48 isolation beds in the inpatient wards could be mobilized in less than 48 hours by transferring non-isolation patients from negative pressure rooms. In addition, the 27 isolation beds in A42 could be mobilized within 72 hours. After further investigation for additional augmentation of the isolation room surge capacity, it was determined a ward in the current inpatient facility could be converted to an isolation unit. This would be carried out by transferring its patients to other wards and using HEPA (High Efficiency Particulate Air) filters to create additional isolation beds.<sup>12</sup> The total amount of isolation beds available according to these plans is 78 beds, all of which could be available within 72 hours.

*University Hospital Brooklyn, SUNY Downstate Medical Center*

In its evaluation for surge capacity, UHB found a significant potential resource in its outpatient department which is located largely on the first floor of the hospital. The series of suites of outpatient clinics would be utilized for inpatient care. In addition the Post Anesthesia Intensive Care Unit (PAICU), the catheterization lab, endoscopy suite, and ambulatory surgery suite could all be converted to provide staffed inpatient care. The outpatient rehabilitation unit located in the basement of the hospital was identified as a secondary space for potential surge capacity. In the case of necessity, rehabilitation services would be terminated and the space could be prepared to receive patients. As the rehabilitation unit is not an active medical ward, patient room accessories and staff would be needed to be provided. This would require a similar time frame and activation procedure as noted for A42 in KCH. In addition to native isolation capacity, it was

decided that an inpatient ward could be converted to an isolation ward, again with the use of HEPA filters.

*Kingsbrook Jewish Medical Center*

In parallel, KJMC performed a bed census, potential surge capacity evaluation, and development of protocol for the activation of that surge capacity. Along with the results of the hospital proper in Table 3 are the total bed counts from the nursing homes affiliated with KJMC. In accord with the census trends gathered from the nursing homes for the past 25 years, the vacancy at any given time was conservatively estimated at 3-10%. The capabilities of each nursing home are available to Central Brooklyn CBPP hospital network.

With a total number of 290 beds, the availability would be approximately 10-30 beds available at any certain time. The beds in the affiliated nursing homes are actively staffed beds and could be made available for transfers within 72 hours in a time of need. These beds are not to be considered acute care beds but able to provide stable needs of select patients.

During the planning process, it was decided that it would not be feasible to require isolation capability of these entities in a state of emergency. This decision was based on the unfamiliarity of the staff with required precautions and the inherent susceptibility nursing home patients have to infectious diseases. Isolation patients would be cared for at the other Central Brooklyn CBPP facilities.

*Kingsboro Psychiatric Center*

An internal census of KPC resulted in 290 inpatient beds. These beds are not staffed or accessorized for medical inpatients and are specifically reserved for mental health inpatients. Yet, the prominent amount of unused space within the facility provides a flexible reserve space within Central Brooklyn CBPP . It was projected that patients from the Central Brooklyn CBPP network of hospitals with medical needs met and those without other potential shelter, as well as staff requiring shelter, may benefit from the space available in KPC. To mobilize the available physical space within this facility to provide basic needs, it was determine that bedding and Doffit Kits would be beneficial. These supplies and 350 cots are to be held in reserve for this purpose. The facility's special niche would surely be harnessed, when its facility and staff would be called on to provide respite for staff from other facilities, family assistance, post-traumatic counseling, social work assistance, and acute psychiatric care to both the staff and the Central Brooklyn CBPP community. The facility role would be to serve the community as a referral service.

*Integrated Plan*

The maintenance of an adept response to the dynamic nature of a public health incident requires adequate inter facility communication and transportation to address potential transfers. A system of networking of resources, including bed availability guiding the transfer of patients to alternative facilities where their needs may be met, will improve the ability of facilities to manage the increased demand on their own resources as point of

care providers.


The integration of the developed surge capacity plans for these facilities will provide further reserve and specialization that may improve the overall response to a public health incident and avoid a facility being overwhelmed individually. Communication between the executive command centers of the different facilities will be provided by radio on reserved emergency channels. This exchange of information will be a fundamental in their decision making processes. The integrated preparation of disaster management plans will undoubtedly be helpful during inter facility communications and for the overall effectiveness of execution. During the preparatory process, each facility's protocols have been publicized to the other Central Brooklyn CBPP facilities staff, thus making actions predictable and more like those of a cohesive unit of health care.

The Central Brooklyn CBPP is an excellent example of how a concerted effort can be organized within the multifaceted American health system. It joins a community hospital, a university hospital, a private hospital with nursing home affiliations, and a state mental health care facility into a cohesive unit to benefit from a cooperative effort. This model of cooperation seems workable through the experiences of our facilities and may benefit many communities despite an inherently fractioned medical system.

**Conclusions -**

Recent events and theoretical models have prompted a process of critical self evaluation of our medical system's 'surge capacity.' The Central Brooklyn CBPP hospitals have attempted to address the issue by developing an integrated plan that would engage a surge to the infrastructure by partnering multiple community health care facilities. This process can result in the creation of plans within and between facilities that will augment their ability to respond to a public health incident.

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