

Pandemic Critical Care Capacity Planning Survey: Preliminary Results and Future Directions

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Introduction

- U.S. Centers for Disease Control (CDC) FluSurge 2.0 models used for NYC pandemic influenza planning suggested a possible shortage in citywide critical care surge capacity
- Need for updated data on ventilator and staff capacity in NYC hospitals
- Discussion of how DOHMH could best supplement existing capacity

Methodology (1)

- 11/2005: Survey developed by DOHMH
- 12/2005 – 01/2006: Survey sent to 68 hospital EP Coordinators
- 01/2006: Data reviewed and approved by hospital Directors of Respiratory Therapy
- 01/2006: Data clarified and tabulated

Methodology (2)

- NYC DOHMH conducted survey to ascertain:
 - accurate number of ventilators and “surge ventilators” in NYC hospitals: by type of ventilator and population served
 - hospitals’ familiarity with portable ventilators used in the U.S. Strategic National Stockpile (SNS)
 - hospitals’ willingness to train, maintain, and possibly use portable ventilators purchased externally
 - NYC hospital system’s reliance upon oxygen vendors
 - under what scenarios during pandemic influenza more ventilators would be needed

Results

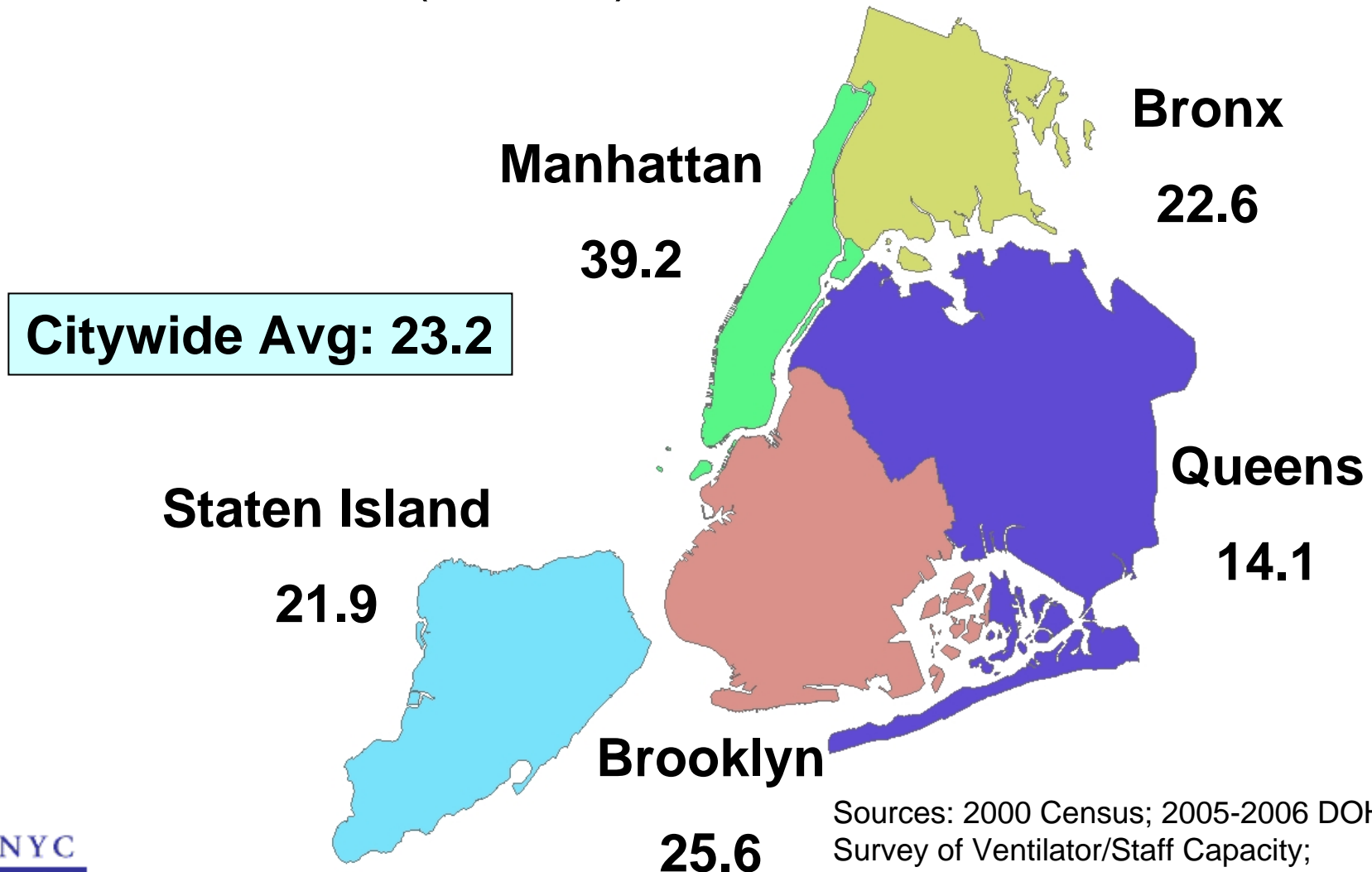
- 65 hospital units analyzed in survey, which represents ALL acute care hospitals in New York City
 - Data from 2 hospitals reported as part of other hospitals' data
 - 1 hospital excluded from analysis (hospice)
- Thank you for your excellent response, EP Coordinators!

Mechanical Ventilators in NYC Hospitals (N=65), December 2005

Variable	Number
Full-Featured Ventilators– Adult/Pediatric	1,857
Full-Featured Ventilators - Adult-Only	561
Full-Featured Ventilators - Neonatal Only	270
Total Full-Featured Ventilators	2,688
Automatic Resuscitators	614
Anaesthesia Machines (N = 62)	790
Portable Ventilators	186

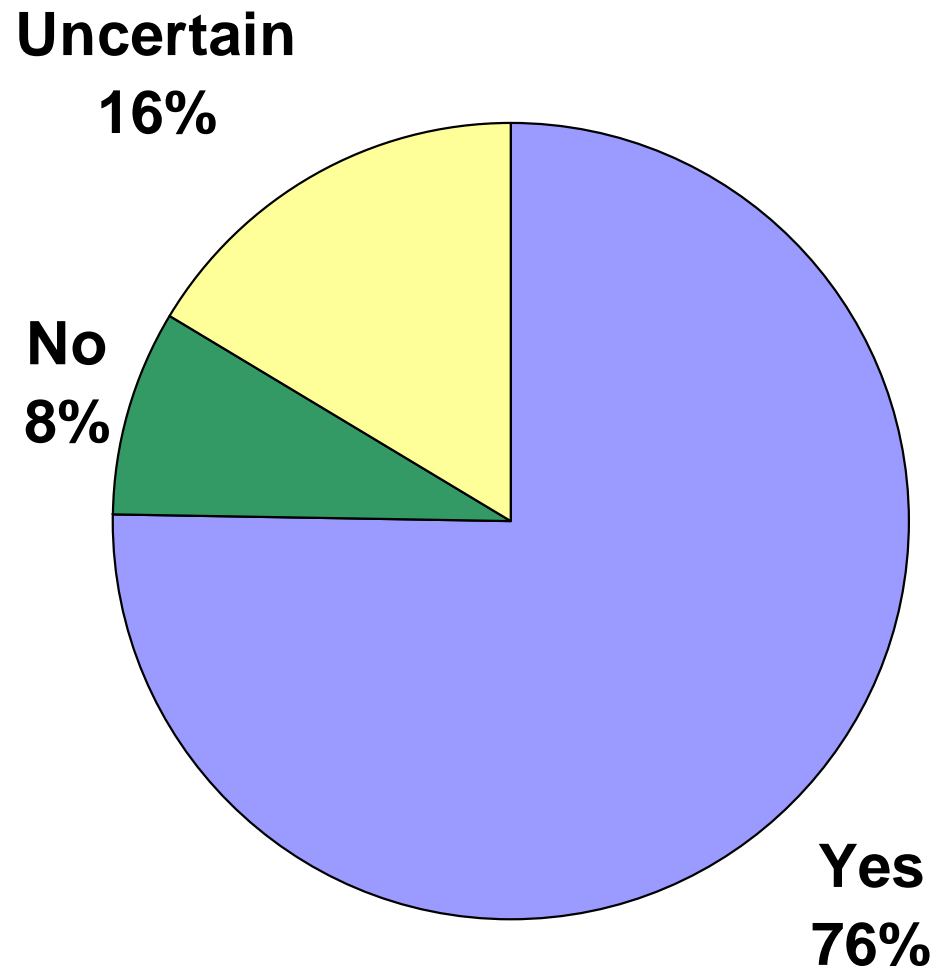
Source: 12/2005 - 01/2006 NYC DOHMH Survey of Ventilator/Staff Capacity

Distribution of “Adult and Pediatric” Full-Featured Ventilators in NYC Hospitals per 100,000 Population (N = 65) December 2005



Sources: 2000 Census; 2005-2006 DOHMH Survey of Ventilator/Staff Capacity;

NYC Hospital Willingness to Store Additional Portable Ventilators (N = 65 Hospitals) December 2005



Other Results

- SNS Ventilator Issues: Only 2/65 hospitals had experience with the Impact 754 ventilator; only 1/65 with the Puritan-Bennett LP-10 ventilator
- Oxygen Issues:
 - 16 vendors reported as contracted vendors for oxygen citywide, either for liquid oxygen, for oxygen cylinders, or for both:
 - A total of 40 hospitals reported contracting with either CGI-Welco or Praxair (now one company)
 - BOC Gases (12 hospitals) and AGA (11 hospitals) were the next most often reported vendors

Estimated National Impact of Pandemic Influenza on Healthcare Utilization

Table 1. Number of Episodes of Illness, Healthcare Utilization, and Death Associated with Moderate and Severe Pandemic Influenza Scenarios*

Characteristic	Moderate (1958/68-like)	Severe (1918-like)
Illness	90 million (30%)	90 million (30%)
Outpatient medical care	45 million (50%)	45 million (50%)
Hospitalization	865,000	9,900,000
ICU care	128,750	1,485,000
Mechanical ventilation	64,875	742,500
Deaths	209,000	1,903,000

*Estimates based on extrapolation from past pandemics in the United States. Note that these estimates do not include the potential impact of interventions not available during the 20th century pandemics.

Flu Surge 2.0 Projected Use of Ventilators in New York City Hospitals During Influenza Pandemics of Varied Severity

	Full-Featured Mechanical Ventilators (FFV) Owned/Part of Long-Term Lease in NYC Hospitals (Baseline: 2,711)	15% of pandemic patients require ICU care, with 50% of those patients requiring mechanical ventilation ("MODERATE NEED FOR VENTILATORY CARE")			25% of pandemic patients require ICU care, with 50% of those patients requiring mechanical ventilation ("MODERATE NEED FOR VENTILATORY CARE")			25% of pandemic patients require ICU care, with 100% of those patients requiring mechanical ventilation ("EXTENSIVE NEED FOR INTENSIVE CARE")		
		15% attack rate	25% attack rate	35% attack rate	15% attack rate	25% attack rate	35% attack rate	15% attack rate	25% attack rate	35% attack rate
		Total # staffed ICU beds in NYC hospitals		1,713	1,713	1,713	1,713	1,713	1,713	1,713
ICU beds needed for pandemic patients		684	1,141	1,597	1,141	1,901	2,662	1,141	1,901	2,662
Total # full-featured mechanical ventilators (FFV) in NYC hospitals		2,711	2,711	2,711	2,711	2,711	2,711	2,711	2,711	2,711
Total # ventilators needed for pandemic patients		342	570	799	570	951	1,331	1,141	1,901	2,662
FFV Vents available for pandemic patients - with 25% vents already in use	2,033	1,691	1,463	1,234	1,463	1,082	702	892	132	-629
FFV Vents available for pandemic patients - with 50% vents already in use	1,356	1,014	786	557	786	405	25	215	-546	-1,307
** Survey Data: FFV Vents available - with 60% vents already in use	1,084	742	514	285	514	133	-247	-57	-817	-1,578
FFV Vents available for pandemic patients - with 75% vents already in use	678	336	108	-121	108	-273	-653	-463	-1,223	-1,984
FFV Vents available for pandemic patients - with 100% vents already in use	0	-342	-570	-799	-570	-951	-1,331	-1,141	-1,901	-2,662

Note: These projections are based on CDC FluSurge 2.0 projections and data from the 2005-2006 DOHMH Ventilator/Staff Survey conducted at 68 New York City hospitals. Reported data are from 65 hospitals, out of a total of 65 surveyed hospitals considered for this analysis. Survey data indicate a 60% citywide average baseline use of full-featured ventilators (FFV) on a given day during the 2004-2005 influenza season, which is assumed to be a period of "peak" ventilator use. These assumptions do not account for the possible decrease in ventilator and ICU bed use/need if elective surgery is curtailed.

Example of Estimated Ventilator Shortfall Using Flu Surge 2.0

	<u>Full-Featured Mechanical Ventilators (FFV) Owned/Part of Long-Term Lease in NYC Hospitals (Baseline: 2,711)</u>	<u>25% of pandemic patients require ICU care, with 50% of those patients requiring mechanical ventilation ("MODERATE NEED FOR VENTILATORY CARE")</u>		
		15% attack rate	25% attack rate	35% attack rate
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Impact 754 Uni-Vent Ventilator



Impact 73X Ventilator (Pending FDA Approval)



Training Overlap



Ventilator Cost Estimate

<u>Explanation</u>	<u>Cost of single item</u>	<u>Number needed for 8 week period</u>	<u>Cost per single Vent for 8 week use</u>
Cost to purchase portable vents consistent with the Vents in the SNS @ \$7500 per vent estimated-- one time cost per vent	\$7,500.00	same vent used for all patients	\$7,500.00
Includes 1-90 degree elbow, 1-6 inch aerosol hose, 1-ventilator exhalation valve with drip chamber, 1-proximal airway pressure adapter with port cap, 1-72 inch aerosol hose with cuttable cuffs, 1-72 inch green pressure sensing line with connector, 1-72 in	\$11.15	estimated change every 10 days or duration of patient treatment on vent (6 changes during 2 month period)	\$66.90
10 days--insp filter=\$4.00, exp filter=\$7.00	\$11.00	one of each filter for duration patient is on vent. (6 changes during 2 month period)	\$66.00
Heat moisture exchanger-changed daily	\$0.70	change daily for 56 days	\$39.20
One in-line per day--keeps circuit closed for infection control	\$9.00	change daily for 56 days	\$504.00
Ambu bag=\$14.00 with peep valve=\$13.00===\$27.00 per patient	\$27.00	one per patient--estimated change of patient every 10 days (6 changes during 2 month period)	\$162.00
Cost for meds to be given to patient = \$10.00	\$10.00	one per patient--estimated change of patient every 10 days (6 changes during 2 month period)	\$60.00
Cost includes the initial cost of purchase of ventilator and the durable medical equipment used on the patients who would be ventilated by a single vent over the 8-week period.			\$8,398.10
Additional cost for each 10-day period (single patient on vent. (only durable equipment costs)			
Total cost for purchase of 1 vent per hospital (71 facilities); total of 71 vents with durable equipment provided for 8-week use			\$596,265.10

Summary (1)

- The DOHMH survey clarified the total number of full-featured ventilators in NYC hospitals
- Hospitals were not experienced with ventilators contained in the SNS
- Most hospitals agreed to store, maintain, and train staff on portable ventilators if purchased externally

Summary (2)

- DOHMH survey/use of Flu Surge identified potential need for additional ventilatory and ICU capacity in NYC hospitals
- The number of ventilators needed in a pandemic depends on population attack rate, severity of illness, number of ventilators already in use for non-pandemic patients, and criteria for ventilator utilization.
- The major issues with developing any ventilator cache are staff familiarity with equipment, maintenance, and staff training

Future Directions

- Develop a working group of critical care specialists, including:
 - Physicians
 - Respiratory therapists
 - Nursing staff
- Work with NYSDOH in developing practice guidelines for ICU care in the event of limited supplies of beds and equipment
- Make recommendations for future equipment purchases to try to develop a standard of interchangeability
- Analyze the oxygen delivery system in NYC and assess vulnerabilities

Questions?