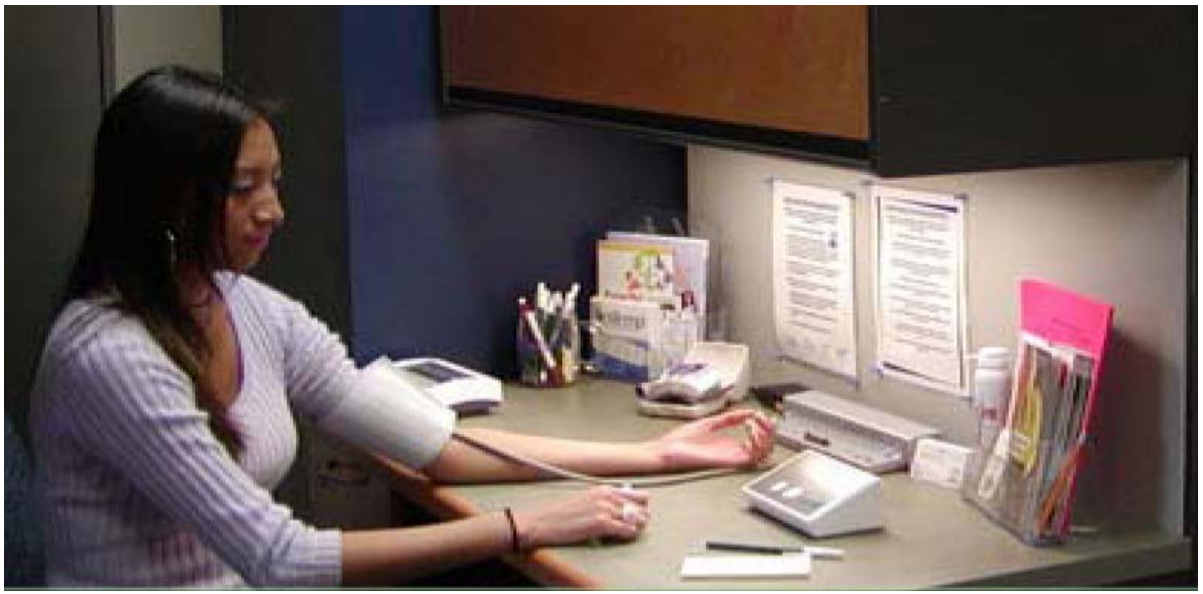
Self-Blood Pressure Monitoring to Improve Hypertension Control in New York City

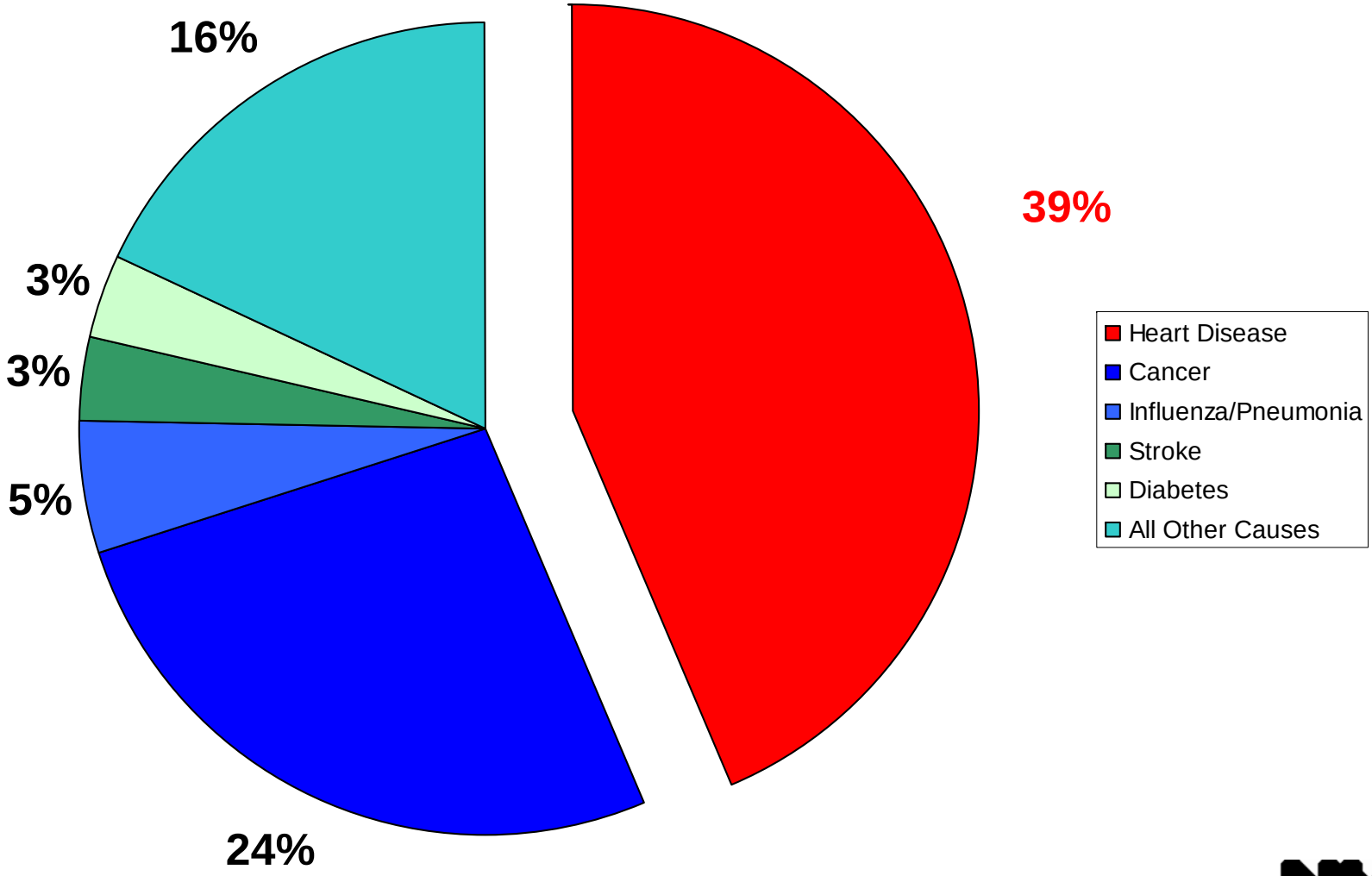


Cheryl P. Rozario, MPH
Clinical Initiatives Coordinator
Cardiovascular Disease Prevention and Control Program
NYC Department of Health and Mental Hygiene
September 10th, 2008

NYC Health

The Challenge

Heart disease is NYC's leading cause of death



Data Source: *NYCDOHMH Bureau of Vital Statistics, 2006*

NYC Health

Hypertension in NYC

- One in four NYC adults have HTN[1]
- Even for those diagnosed and in treatment, levels of control are poor[2]
- In the US, HTN is the leading cause of black white disparities in the number of life years lost[3]

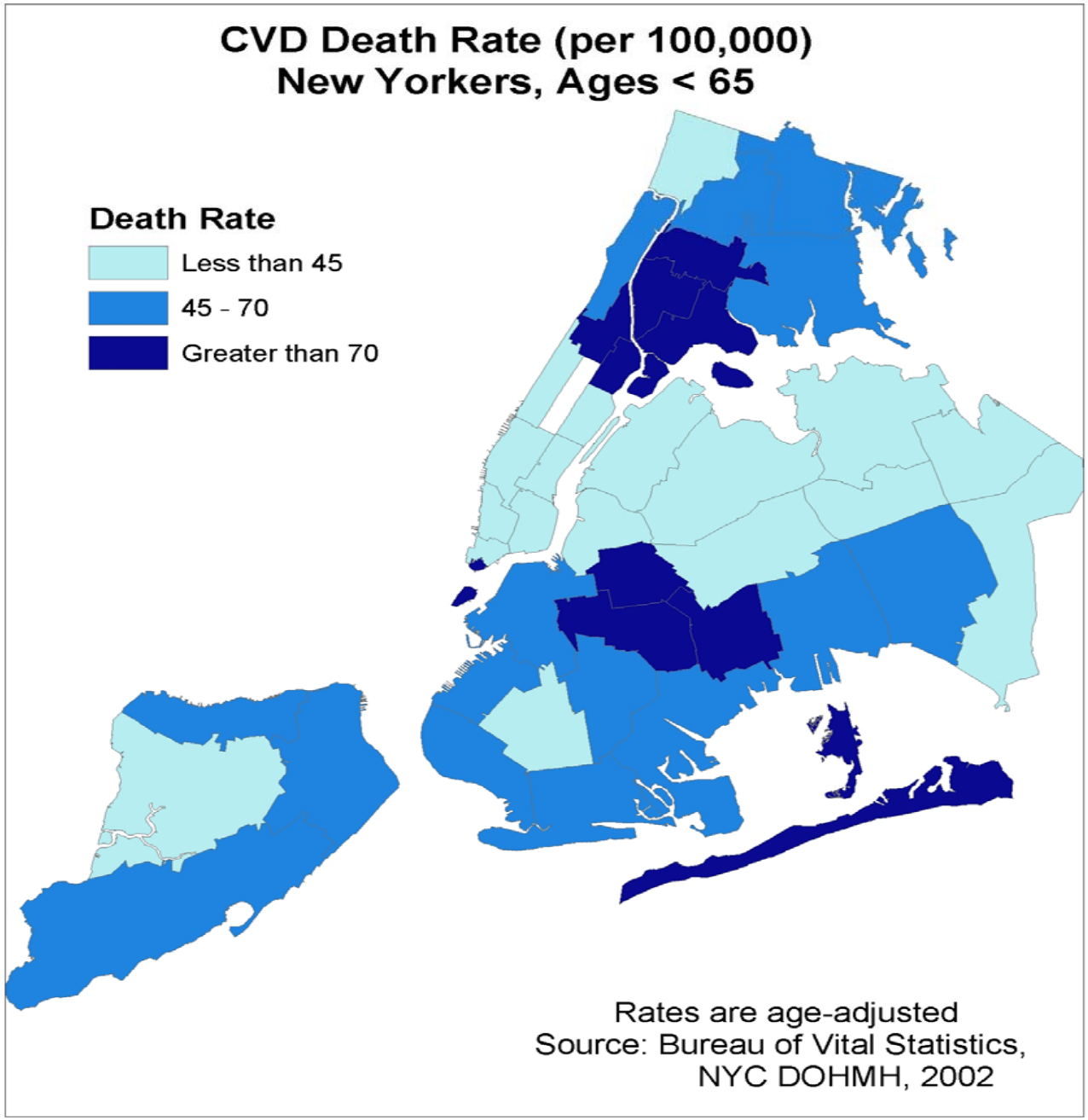
(1) NYC Community Health Survey, 2005 (2) Angell et al, In publication, 2008 (3) Wong et. al, 2002

NYC Health

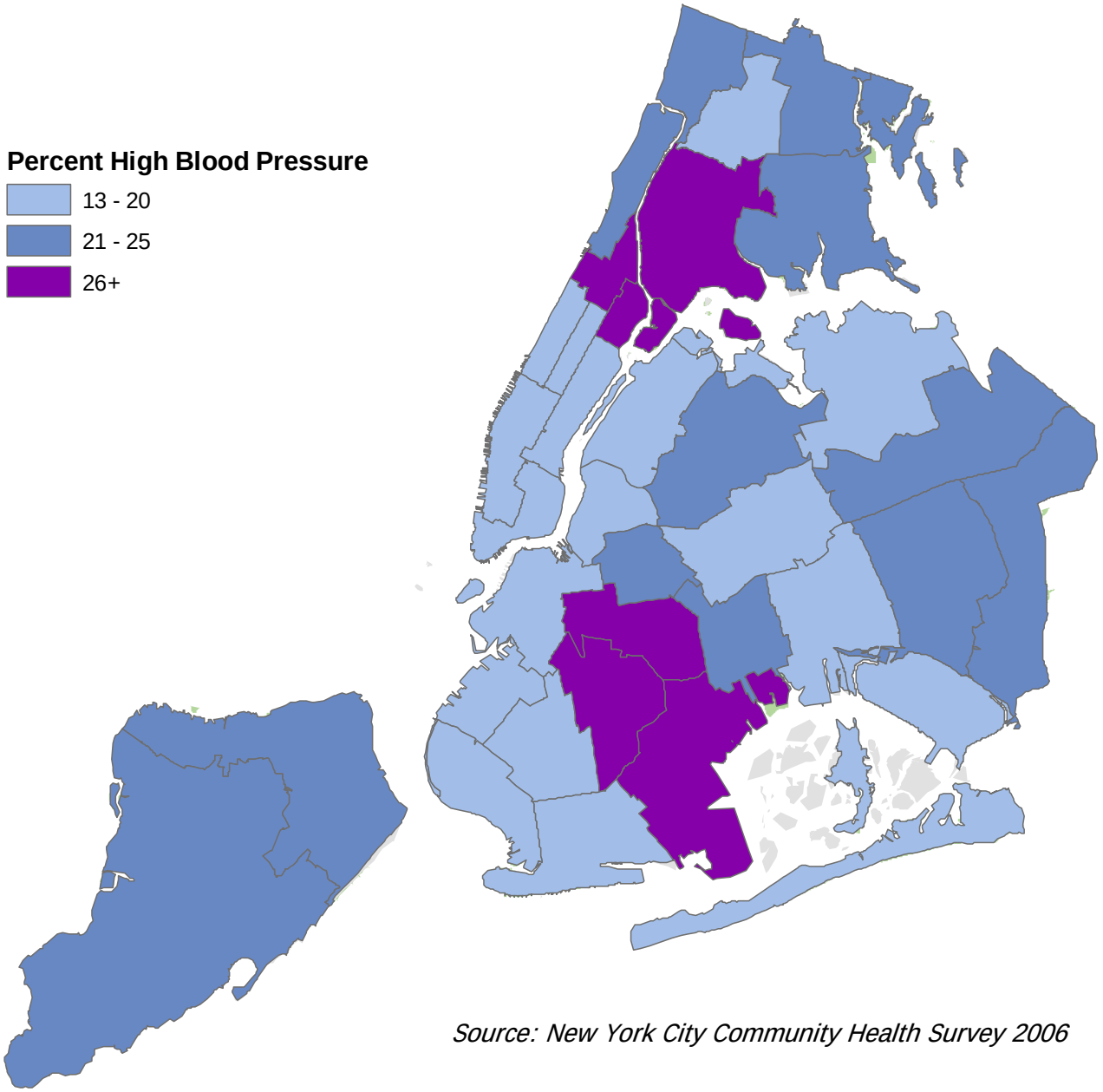
Identifying the target population: Who should we reach and how?

- **Who**:
  - Determine communities at greatest risk
    - Map CVD mortality and hypertension prevalence
- **How**:
  - Explore DOHMH resources within these areas
    - District Public Health Offices (DPHOs)
    - DOHMH Public Health Detailing Program

NYC Health


CVD Death Rate (per 100,000)
New Yorkers, Ages < 65
Death Rate
Less than 45
45 - 70
Greater than 70
Rates are age-adjusted
Source: Bureau of Vital Statistics,
NYC DOHMH, 2002

High Blood Pressure Prevalence



Source: New York City Community Health Survey 2006

NYC Health

Identify intervention appropriate for target population

- Identify factors related to uncontrolled HTN
- Review the evidence for evaluated interventions affecting key contributing factors

Factors Related to Uncontrolled Hypertension

- **Patient-related**
  - Lack of access to care[1]
  - Medication cost[1]
  - Lifestyle/environment[2]
  - **Medication Non-adherence**[3]

- **Provider-related**
  - Medication Non-adherence[3]
  - **Clinical Inertia**[4]

(1) Ahluwalia 1997. (2) Hill 1999. (3) Borzecki 2005. (4) O'Connor 2005.

NYC Health

Self-Blood Pressure Monitoring (SBPM)

- Patient out-of-clinic use of a portable blood pressure measuring unit to take and record blood pressure

- Also called ‘Home Blood Pressure Monitoring’ (HBPM)

NYC Health

SBPM and HTN Control: Evidence

- Lower SBP, DBP and mean BP, improving blood pressure control[1]
- Equal or better predictor of CV events or mortality[2,3] and target organ damage[4] than office readings
- Screen for white coat hypertension[5,6] and masked hypertension[7]
- May increase patient involvement in their own care[6] and may improve treatment adherence[8]

(1) Cappuccio 2004. (2) Bobrie 2004. (3) Ohkubo 1998. (4) Mule 2002.
(5) Stergio 1998. (6) Chobanian 2003. (7) Stergio 2007 (8) Taylor 2007.

NYC Health

Home Blood Pressure Monitoring Call to Action

Joint scientific statement by AHA, American Society of HTN, and Preventive Cardiovascular Nurses Association.

Recommendations:

- HBPM should be part of routine management of HTN patients
- Patients should be reimbursed for BP monitors
- Providers should be reimbursed for services related to HBPM (ie. patient training)

Pickering et. al, 2008

NYC Health

Barriers to SBPM Use for Targeted Population

- **Limited provider SBPM use in routine HTN care**
  - Evidence-base is recently established, so providers are yet to routinely use SBPM in management of HTN
- **Cost**
  - Insurance coverage for monitor not universal
    - e.g. Medicaid, Medicare
  - Out-of-Pocket Cost of Blood Pressure Monitor Prohibitive
    - Limits patient purchase and therefore use
- **Lack of supporting clinical systems in place**
  - Limited best practice models to facilitate easy integration

NYC Health

Intervention Design: Key Elements

- **Increase adoption of SBPM into routine HTN care**
  - Change the culture of clinical practice
    - Involve patients in management of their HTN to reinforce provider practice
- **Address cost**
  - Conduct evaluation to determine if changes in Medicaid coverage justified
  - If so, advocate for change
- **Identify best practices**
  - Assess and disseminate best related practice organization models

NYC Health

Program Objectives

To demonstrate:

1. *Self-blood pressure monitoring improves blood pressure control*
2. *Systems that effectively and efficiently integrate SBPM into disease management*

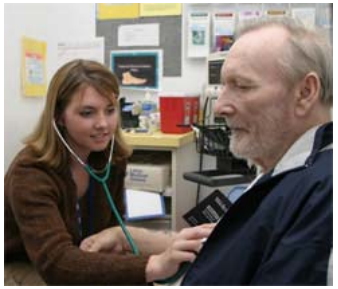
NYC Health

General Intervention Design

- Providers
  - identify eligible patients from clinic population
  - offer participation in SBPM program (free monitor)
- Clinic Support Staff
  - Enrolls patient into program (fills out log book)
  - Reviews patient education materials
  - Trains patient on monitor use
- Home readings used in HTN management

NYC Health

Inclusion Criteria



- ✓ Greater than age 18 yrs, and
- ✓ Have had a HTN diagnosis for at least 6 months, and
- ✓ Have an elevated blood pressure on their **current** and **last** clinic visit

HTN defined as:

SBP ≥140 or DBP ≥90 for most patients *or*
SBP ≥130 or DBP ≥80 for patients with diabetes or kidney disease

NYC Health

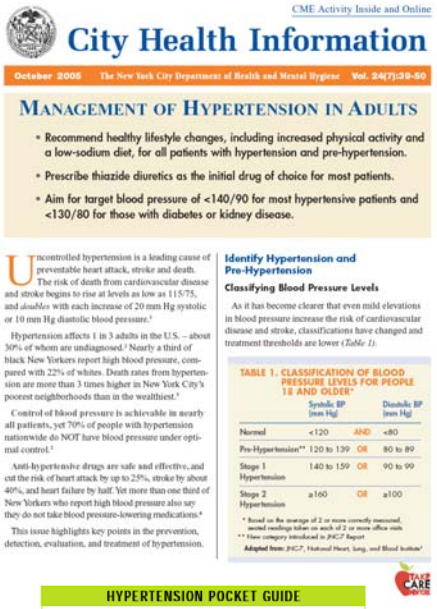
Exclusion Criteria

- Physically or mentally unable to use a monitor or record measurements
- Arm size too large or small for blood pressure monitor cuffs
- Already using SBPM

NYC Health

Materials Provided: For Providers

- Free Clinical Decision Support Materials
- Free Patient Management and Clinical Tools



CME Activity Inside and Online

City Health Information

October 2005 The New York City Department of Health and Mental Hygiene Vol. 24(7):39-50

MANAGEMENT OF HYPERTENSION IN ADULTS

- Recommend healthy lifestyle changes, including increased physical activity and a low-sodium diet, for all patients with hypertension and pre-hypertension.
- Prescribe thiazide diuretics as the initial drug of choice for most patients.
- Aim for target blood pressure of <140/90 for most hypertensive patients and <130/80 for those with diabetes or kidney disease.

Uncontrolled hypertension is a leading cause of preventable heart attack, stroke and death. The risk of death from cardiovascular disease and stroke begins to rise at levels as low as 115/75, and *doubles* with each increase of 20 mm Hg systolic or 10 mm Hg diastolic blood pressure.[1]

Hypertension affects 1 in 3 adults in the U.S. – about 30% of whom are undiagnosed.[2] Nearly a third of black New Yorkers report high blood pressure, compared with 22% of whites. Death rates from hypertension are more than 3 times higher in New York City's poorest neighborhoods than in the wealthiest.[3]

Control of blood pressure is achievable in nearly all patients, yet 70% of people with hypertension nationwide do NOT have blood pressure under optimal control.[1]

Anti-hypertensive drugs are safe and effective, and cut the risk of heart attack by up to 25%, stroke by about 40%, and heart failure by half. Yet more than one third of New Yorkers who report high blood pressure also say they do not take blood pressure-lowering medications.[4]

This issue highlights key points in the prevention, detection, evaluation, and treatment of hypertension.

Identify Hypertension and Pre-Hypertension

Classifying Blood Pressure Levels

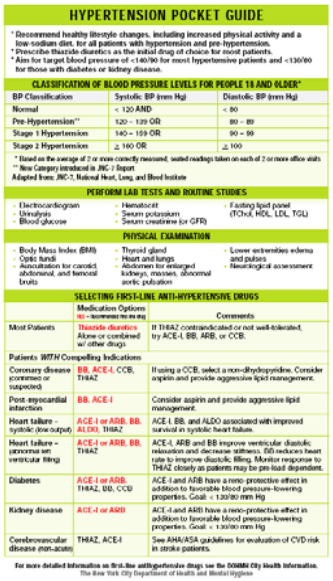
As it has become clearer that even mild elevations in blood pressure increase the risk of cardiovascular disease and stroke, classifications have changed and treatment thresholds are lower (*Table 1*).

TABLE 1. CLASSIFICATION OF BLOOD PRESSURE LEVELS FOR PEOPLE 18 AND OLDER*

	Systolic BP (mm Hg)		Diastolic BP (mm Hg)
Normal	<120	AND	<80
Pre-Hypertension**	120 to 139	OR	80 to 89
Stage 1 Hypertension	140 to 159	OR	90 to 99
Stage 2 Hypertension	≥160	OR	≥100

* Based on the average of 2 or more correctly measured, seated readings taken on each of 2 or more office visits
** New category introduced in JNC-7 Report

Adapted from: JNC-7, National Heart, Lung, and Blood Institute



HYPERTENSION POCKET GUIDE

* Recommend healthy lifestyle changes, including increased physical activity and a low-sodium diet, for all patients with hypertension and pre-hypertension.
* Prescribe thiazide diuretics as the initial drug of choice for most patients.
* Aim for target blood pressure of <140/90 for most hypertensive patients and <130/80 for those with diabetes or kidney disease.

CLASSIFICATION OF BLOOD PRESSURE LEVELS FOR PEOPLE 18 AND OLDER*

BP Classification	Systolic BP (mm Hg)	Diastolic BP (mm Hg)
Normal	< 120 AND	< 80
Pre-Hypertension**	120 – 139 OR	80 – 89
Stage 1 Hypertension	140 – 159 OR	90 – 99
Stage 2 Hypertension	≥ 160 OR	≥ 100

* Based on the average of 2 or more correctly measured, seated readings taken on each of 2 or more office visits
** New Category introduced in JNC 7 Report
Adapted from: JNC-7, National Heart, Lung, and Blood Institute

PERFORM LAB TESTS AND ROUTINE STUDIES

- Electrocardiogram
- Urinalysis
- Blood glucose
- Hematocrit
- Serum potassium
- Serum creatinine (or GFR)
- Fasting lipid panel (TChol, HDL, LDL, TGL)

PHYSICAL EXAMINATION

- Body Mass Index (BMI)
- Optic fundi
- Auscultation for carotid, abdominal, and femoral bruits
- Thyroid gland
- Heart and lungs
- Abdomen for enlarged kidneys, masses, abnormal aortic pulsation
- Lower extremities edema and pulses
- Neurological assessment

SELECTING FIRST-LINE ANTI-HYPERTENSIVE DRUGS

	Medication Options (BB – recommend for this drug)	Comments
Most Patients	Thiazide diuretics Alone or combined w/ other drugs	If THIAZ contraindicated or not well-tolerated, try ACE-I, BB, ARB, or CCB.
Patients *WITH* Compelling Indications		
Coronary disease (common or suspected)	BB, ACE-I, CCB, THIAZ	If using a CCB, select a non-dihydropyridine. Consider aspirin and provide aggressive lipid management.
Post-myocardial infarction	BB, ACE-I	Consider aspirin and provide aggressive lipid management.
Heart failure – systolic (low output)	ACE-I or ARB, BB, ALDO, THIAZ	ACE-I, BB, and ALDO associated with improved survival in systolic heart failure.
Heart failure – diastolic (abnormal ventricular filling)	ACE-I or ARB, BB, THIAZ	ACE-I, ARB and BB improve ventricular diastolic relaxation and decrease stiffness. BB reduces heart rate to improve diastolic filling. Monitor response to THIAZ closely as patients may be pre-load dependent.
Diabetes	ACE-I or ARB, THIAZ, BB, CCB	ACE-I and ARB have a reno-protective effect in addition to favorable blood pressure-lowering properties. Goal: < 130/80 mm Hg
Kidney disease	ACE-I or ARB	ACE-I and ARB have a reno-protective effect in addition to favorable blood pressure-lowering properties. Goal: < 130/80 mm Hg
Cerebrovascular disease (non-acute)	THIAZ, ACE-I	See AHA/ASA guidelines for evaluation of CVD risk in stroke patients.

For more detailed information on first-line antihypertensive drugs see the DOHMH City Health Information.
The New York City Department of Health and Mental Hygiene

Patient Self-Monitoring of Blood Pressure: A Provider's Guide

Patient self-monitoring of blood pressure is a valuable addition to the management of hypertension, supported by the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC-7), the American Heart Association and the American Society of Hypertension.

- Self-monitoring is especially useful for patients with poorly controlled hypertension.
- It can be used to titrate medications, improve control, and screen for white-coat hypertension.
- Home readings may be an equal or better predictor of cardiovascular risk and of target organ damage than office readings.
- Self-monitoring can enable and motivate patient participation in managing a condition that is often asymptomatic.

While self-monitoring can be done by most patients, it may be contraindicated for those with certain conditions: cardiac arrhythmias, and certain physical and mental disabilities. Because home monitors are not covered by most insurance plans, cost may be a barrier.

INTRODUCING SELF-MONITORING TO YOUR PATIENT

1. **Explain the value of the home monitor in controlling high blood pressure. Encourage patients to "know their numbers," and describe what the numbers mean.**
2. **Provide guidance on selecting a monitor.** Recommend:
   - A validated monitor only. For a list, see: http://www.dableducational.org/sphygmomanometers/devices_2_sbpm.html#UpperArm
   - A brachial cuff model. Wrist and finger models are often used incorrectly.
   - A monitor with a fully automated – rather than a manual – inflation cuff.
   - An appropriate sized cuff. (Standard adult cuffs are too small for about a third of patients.)
   - Models equipped with printers or memory may improve reliability in record keeping, though they are also more expensive.
3. **Validate the monitor.**
   Ask your patient to bring it in so you can check it against your office equipment. After that, check for accuracy about every 6 months (or per monitor instructions) and/or if faulty readings are suspected.
4. **Teach patients proper techniques.**
   - Rest 5 minutes before taking your blood pressure.
   - Don't smoke or drink caffeinated beverages for at least 30 minutes before.
   - Take your blood pressure before (not after) you eat.
   - Sit comfortably with your back supported and both feet on the floor (don't cross your legs).
   - Elevate your arm to heart level on a table or a desk.
   - Use the proper sized cuff. It should fit smoothly and snugly around your bare upper arm. There should be enough room to slip a fingertip under the cuff. The bottom edge of the cuff should be 1 inch above the crease of the elbow.
   - Ideally, take 3 measurements at one sitting and record the average.
5. **Provide self-blood pressure monitoring tools for patients to easily keep track of their numbers at home.**

See reverse for more information
The New York City Department of Health and Mental Hygiene

Prescription for Physical Activity

Stamp Provider Information Below

Patient Name _____ Age _____

Address _____ Date _____

Do at least _____ minutes of moderate physical activity (such as a brisk walk) at least _____ days a week.

Rx

Health Care Provider's Signature _____

Date _____

NYC Health

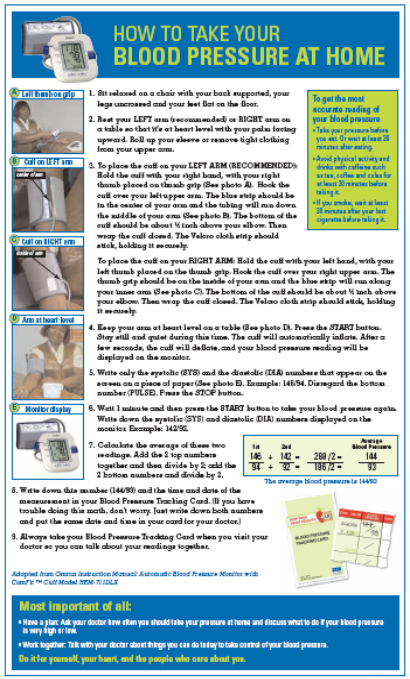
TAKE CARE NEW YORK

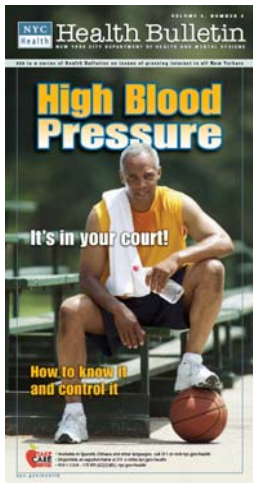
nyc.gov/health

NYC Health

Materials Provided: For Patients

- Free monitor
- Free supporting educational materials
- Free bag





NYC Health

Program Preparation

- Evaluation Developed
  - Data from clinic log (identifiers removed) and voluntary survey from participants
  - DOHMH IRB approved
- CVD Program Staff Resources
  - 1 Project Manager
  - 2 Support staff (1 Intern, 1 Admin staff)
- Funding
  - NYC tax levy dollars
- Monitor Selection
  - Validated, automatic, digital, upper arm model

NYC Health

Program Collaborators

- Maximized internal DOHMH programming synergies
  - Diabetes Program
  - Primary Care Information Project (PCIP)
  - Public Health Detailing Program
- Practice Site Collaborators
  - Public Health Detailing Targeted Clinics
  - NYC Health and Hospitals Corporation (HHC) Network
  - PCIP Clinic Partners
  - Diabetes A1C registry clinics

NYC Health

Methods

- Site selection
  - Characteristics
  - Start up process

- Program phases
  - Patient selection and training
  - Integrating home readings into care
  - Data Collection / Evaluation Plan

NYC Health

Site Selection: Characteristics

- Participating sites included:
  - Outpatient, ambulatory, primary care clinics
  - Located within DPHO neighborhoods
  - Served urban, largely low-income and minority populations
  - Clinic size varied
    - Small practices (1-2 Full Time Providers (FTPs))
    - Mid-sized clinics (3-10 FTPs)
    - Large hospital centers (> 10 FTPs)
  - Site Monitor Allocation
    - 1-2 FTPs: ~ 25 monitors
    - 2-5 FTPs: ~ 50 monitors
    - 5-10 FTPs: ~75 monitors
    - > 10 FTPs: ~ 100 and above (based on site resources)

NYC Health

Site Selection: Start-up Process

- Outreach
  - Contacted site & offered participation in program
- Letter of Agreement
  - Signed by site to confirm interest in participation
- Site Training (for providers + clinic support staff)
  - Conducted at the site (~ 1.5 hrs long)
  - Included: overview of SBPM, review of program phases, materials, and data collection procedures
  - Taught clinic staff how to train patients on monitor use
- Material Receipt (ie. monitors, education materials)

NYC Health

Project Phases

- Phase I:
  - Monitor distribution & Patient training
- Phase II (9-12 months):
  - Integrating SBPM
  - Midpoint clinic process evaluation
- Phase III:
  - Data collection & evaluation

NYC Health

Program Feedback from Sites

Provider Feedback

- Overall, Enthusiastic and Positive
  - Able to offer patients a free & valuable tool
  - Patient education tools valuable
  - 20/23 facilities approached interested in participating (86%)
- SBPM useful in engaging & motivating patients
  - Good buy-in from patients
- Effect on Clinic Flow
  - Varied depending on systems created

NYC Health

Current Program Status

- In 2006 (Preliminary Pilot Sites)
  - Distributed ~2,000 monitors
  - 19 NYC Clinic Sites
  - Data analysis currently underway
- In 2008 (Continuing scale-up)

NYC Health

Lessons Learned SO FAR

- Identify Designated Clinic Project Leader (DCPL) / Key Champion
  - Leads to successful integration of SBPM into clinical practice (i.e. health educator, residents)
- Develop effective patient tracking system
  - Easy prompt to remind providers to ask SBPM patients for home readings (e.g. EHR flagging, SBPM stickers)
- Conduct frequent site visits / site contact
  - To ensure eligible patients are enrolled
  - Provide support to clinic staff in addressing any logistical concerns early on

NYC Health

Next Steps

- Continue spread and evaluation of preliminary pilot sites
- Complete full evaluation
- Support development and continued spread of best practices
- Advocate for full reimbursement for appropriate monitors and provider care as per professional guidelines

NYC Health

Special Thanks to:

NYC DOHMH Core Project Staff:

Sonia Angell, Principal Investigator, Director CVD Program

Seth Guthartz, Primary Pilot Site Project Manager

Gail Goldstein, CVD Program Deputy Director

Jiovelicce Dennis, Program support staff

Marcee McRae and Victoria Foster, Project Interns

NYC DOHMH Collaborating Programs:

Diabetes Program

Clinical Systems Improvement

Public Health Detailing

Collaborating Institutions

NYC Health and Hospitals Corporation

All Participating Clinic Sites

NYC Health