

Τεχνικές αξιολόγησης της αρτηριακής πίεσης: ιατρείο

Ηρακλής Αβραμόπουλος
Παθολόγος
Ιατρείο Υπέρτασης
Νοσοκομείο Υγεία



1733: 1^η μέτρηση ΑΠ

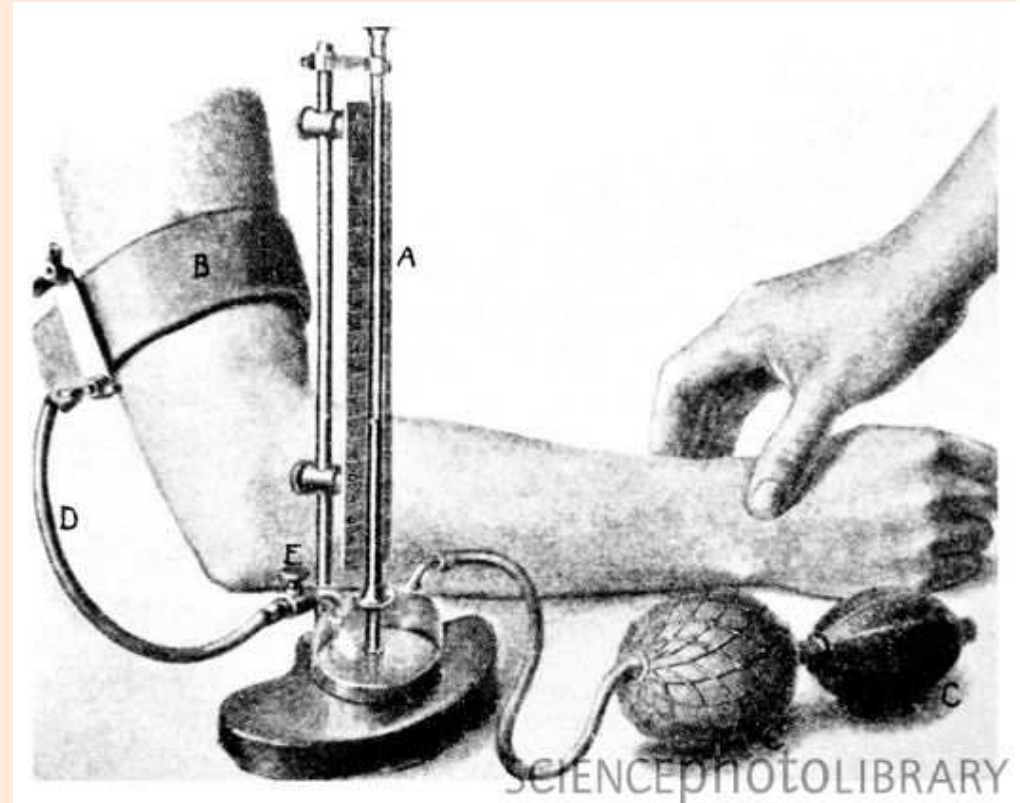


O'Brien E, Fitzgerald D. The history of blood pressure measurement. *J Hum Hypertens.* 1994;8:73–84

1896: σφυγμομανόμετρο



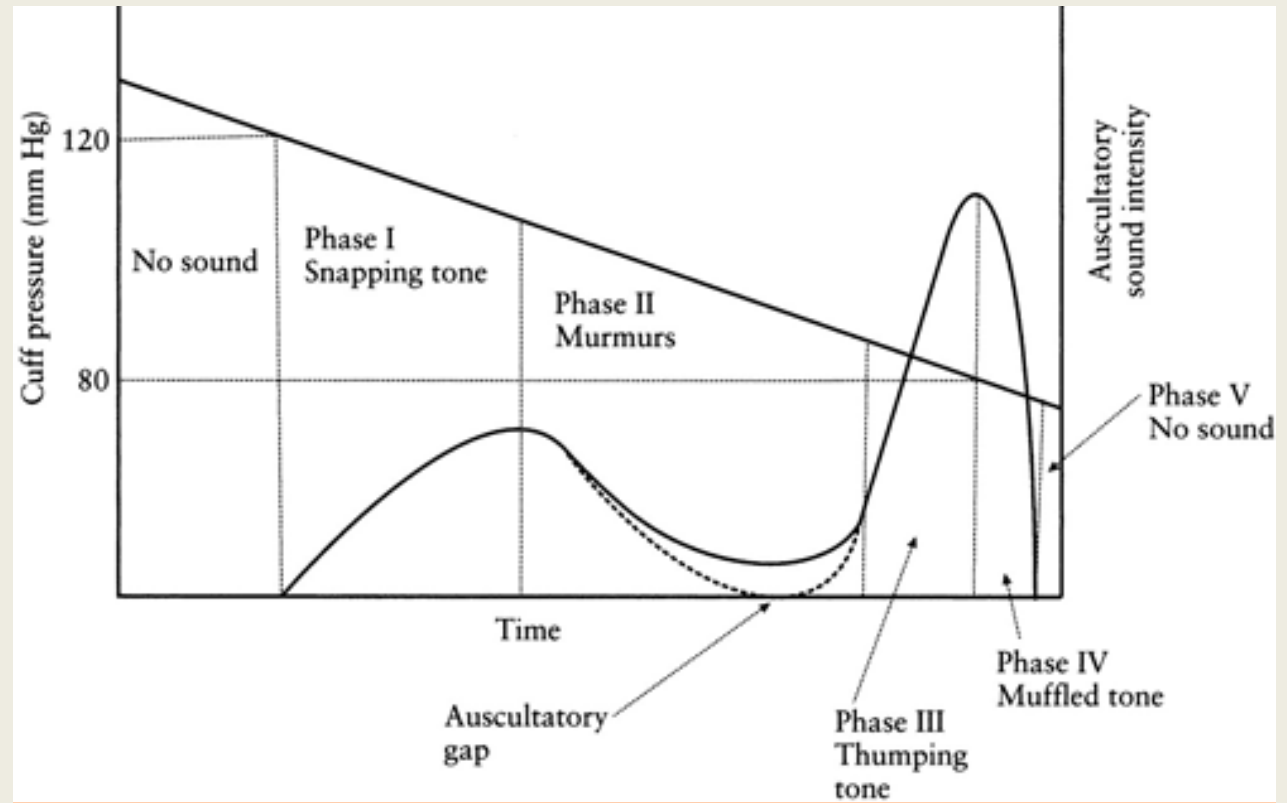
Scipione Riva Rocci
e lo sfigmomanometro di sua invenzione



Scipione Riva-Rocci

Riva-Rocci S. Un nuovo sfigmomanometro. *Gaz Med Torino*. 1896;47:981-96

1905 Nikolai Korotkov



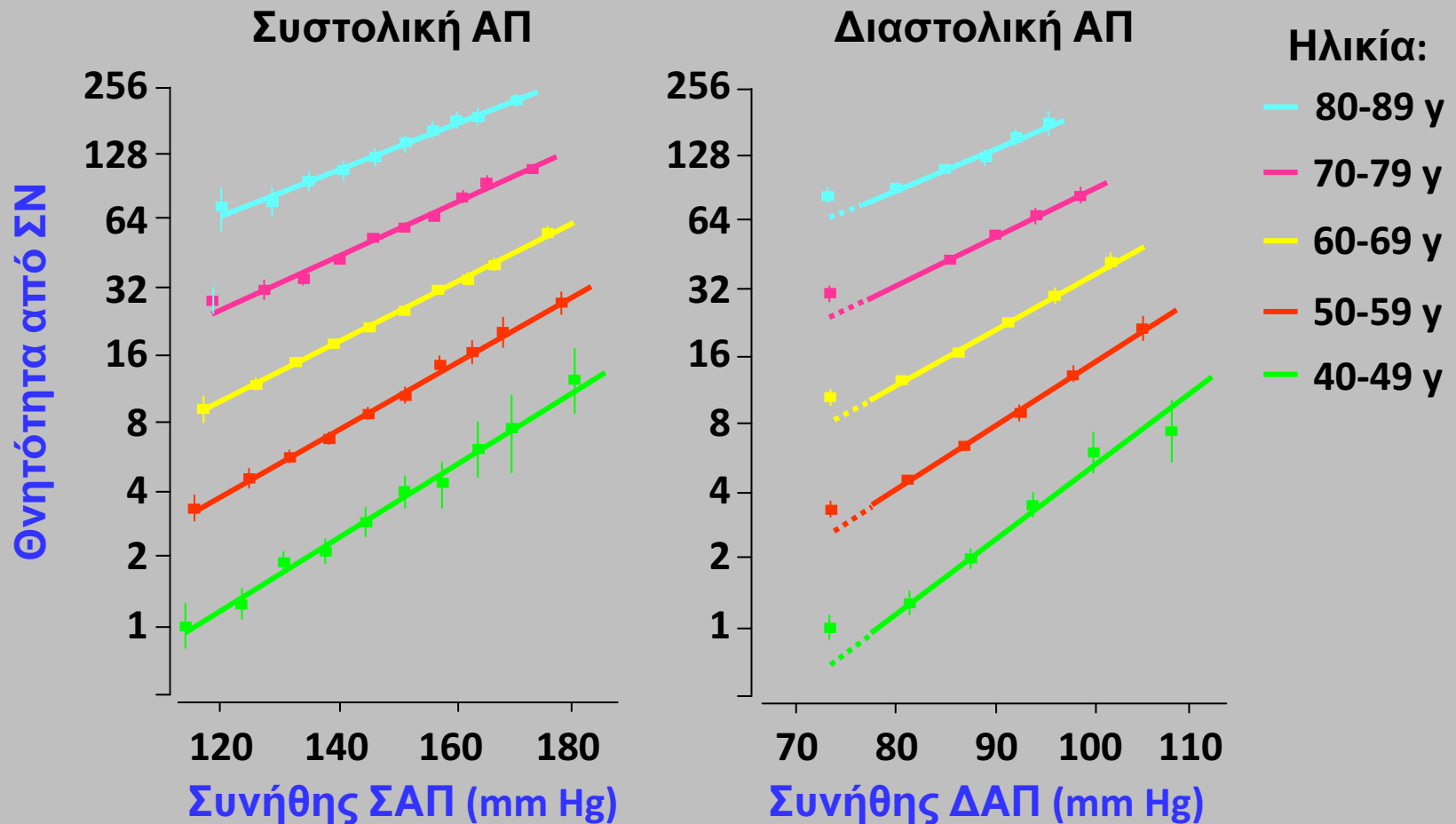
Korotkoff NS. On the subject of methods of measuring blood pressure. Bull Imp Military Med Acad. 1905;11:365-7

Διαγνωστικά όρια για την αξιολόγηση της αρτηριακής πίεσης με βάση μετρήσεις στο ιατρείο

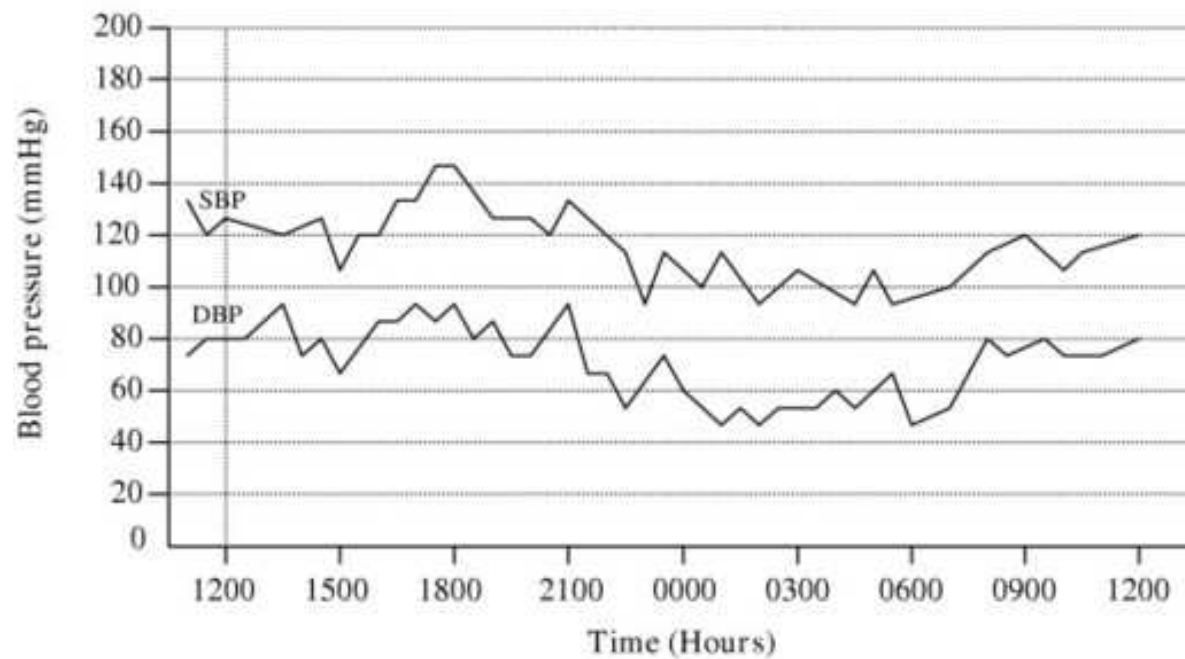
Κατηγορία	Συστολική (mmHg)		Διαστολική (mmHg)
Άριστη αρτηριακή πίεση	<120	και	<80
Φυσιολογική αρτηριακή πίεση	120-129	και/ή	80-84
Οριακή αρτηριακή πίεση	130-139	και/ή	85-89
Υπέρταση			
- Στάδιο 1	140-159	και/ή	90-99
- Στάδιο 2	160-179	και/ή	100-109
- Στάδιο 3	≥180	και/ή	≥110
- Μεμονωμένη συστολική	≥140	και	<90

Mancia G, et al. J Hypertens 2007; 25:1105-1187

Θάνατοι από στεφανιαία νόσο σε κάθε δεκαετία



Μεταβλητότητα της ΑΠ

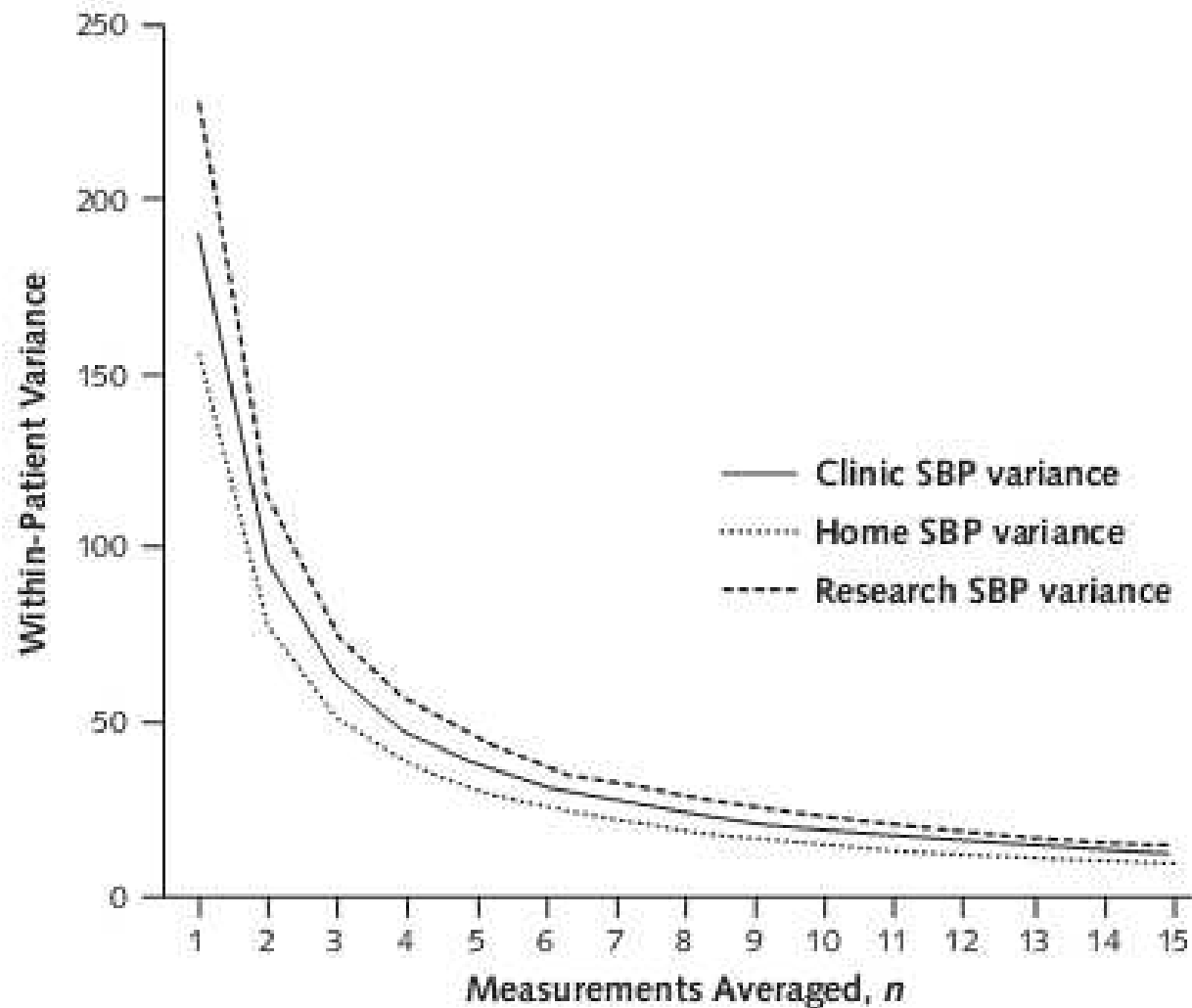


Διακύμανση της ΑΠ ανάλογα με δραστηριότητα

Συνάντηση	+20.2	+15.0	Συζήτηση	+6.7	+6.7
Εργασία	+16.0	+13.0	Καθιστική εργασία	+5.9	+5.3
Μεταφορά	+14.0	+9.2	Διάβασμα	+1.9	+2.2
Βάδιση	+12.0	+5.5	Εργασία στο σπίτι	+1.6	+3.2
Ντύσιμο	+11.5	+9.5	Τηλεόραση	+0.3	+1.1
Μικροδουλειές	+10.7	+6.7	Ανάπαυση	0.0	0.0
Τηλεφώνημα	+9.5	+7.2	Ύπνος	-10.0	-7.6
Γεύμα	+8.8	+9.6			

Clark LA, et al. A quantitative analysis of the effects of activity and time of day on the diurnal variations of blood pressure. *J Chronic Dis* 1987;40:671-679

Διακύμανση της ΣΑΠ σε κάθε ασθενή και αριθμός μετρήσεων



BJ. Powers, et al. Measuring Blood Pressure for Decision Making and Quality Reporting: Where and How Many Measures? Ann Intern Med. 2011;154:781-788.

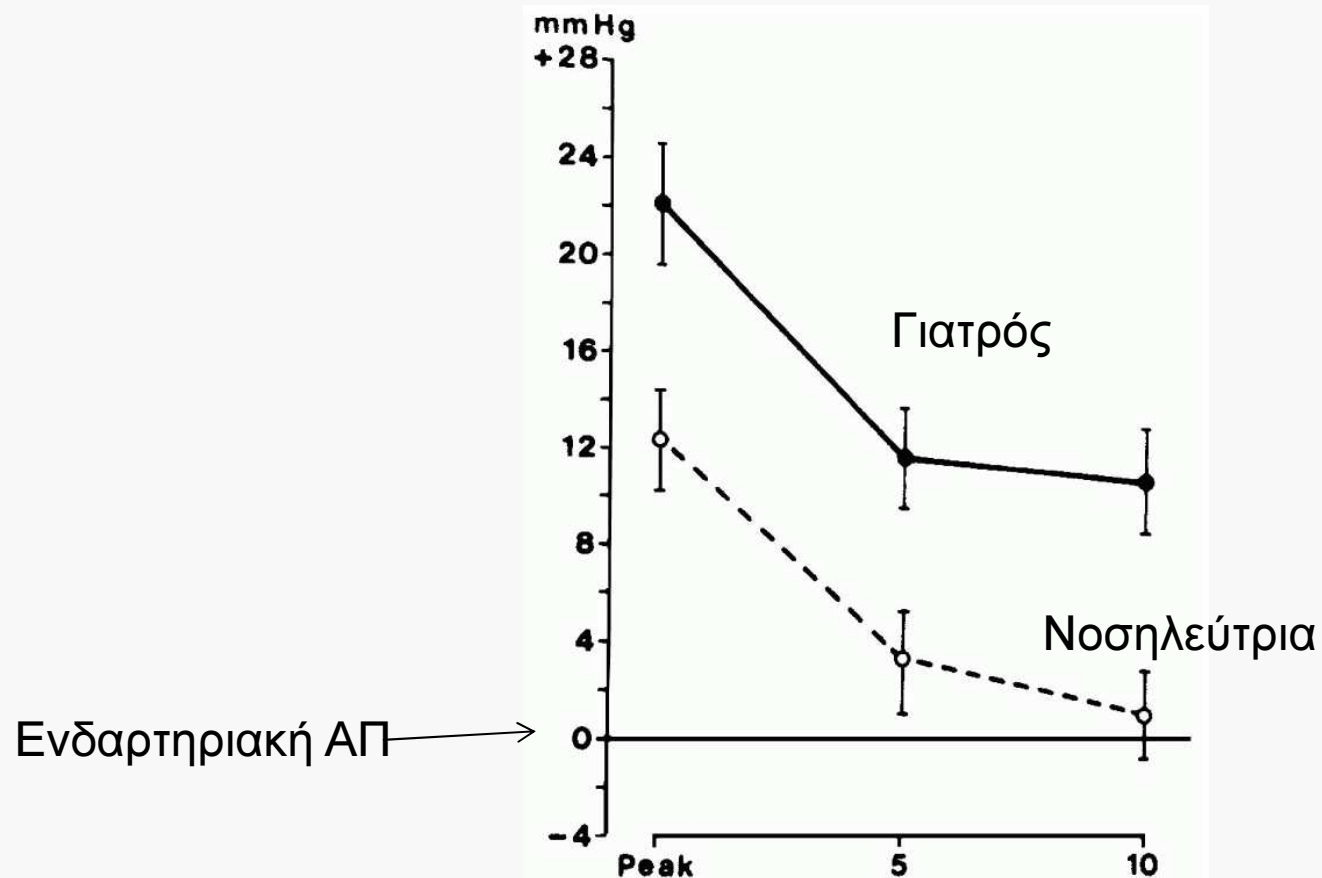
Από ποιόν;



Trust Me, I'm a Doctor



Μέτρηση της ΑΠ από ιατρό και νοσηλεύτρια



Mancia G, Paroti G, Pomidossi G, et al. Alerting reaction and rise in blood pressure during measurement by physician and nurse. Hypertension 1987;9:209-215

Υδραργυρικό πιεσόμετρο



- ❖ The gold standard
- ❖ checking that the upper curve of the meniscus of the mercury column is at 0 mm Hg,
- ❖ that the column is free of dirt, and
- ❖ that it rises and falls freely during cuff inflation and deflation
- ❖ 21% of devices had technical problems that would limit their accuracy
- ❖ Another found >50% to be defective
- ❖ Will not be available in the near future

Mion D, et al. How accurate are sphygmomanometers? J Hum Hypertens. 1998;12:245–248.
Markandu ND, et al. The mercury sphygmomanometer should be abandoned before it is proscribed. J Hum Hypertens.2000;14:31–36

Ακροαστική μέθοδος

- ❖ Λάθη παρατηρητή
- ❖ Προτίμηση ψηφίων
 - Στρογγυλοποίηση
 - Προκατάληψη
- ❖ Έλλειψη προσοχής
- ❖ Πολύ γρήγορο ξεφούσκωμα
- ❖ Προβλήματα ακοής

Μεταλλικό πιεσόμετρο



- ❖ does not necessarily maintain its stability over time
- ❖ require calibrating
- ❖ Wall-mounted devices
- ❖ Inaccuracies ranging from 1% to 44%

Mion D, Pierin AM. How accurate are sphygmomanometers? J Hum Hypertens. 1998;12:245–248

Yarows SA, Qian K. Accuracy of aneroid sphygmomanometers in clinical usage: University of Michigan experience. Blood Press Monit. 2001;6:101–106.

Canzanello VJ, Jensen PL, Schwartz GL. Are Aneroid Sphygmomanometers Accurate in Hospital and Clinic Settings? Arch Intern Med. 2001;161:729–731

Υβριδικά



1. mercury-like column with LCD
 2. aneroid device-like screen with LED technology
 3. LED technology
- ❖ have the potential to become a replacement for mercury

Stergiou GS, et al. A perfect replacement for the mercury sphygmomanometer: the case of the hybrid blood pressure monitor. J Hum Hypertens (e-pub ahead of print 8 September 2011)

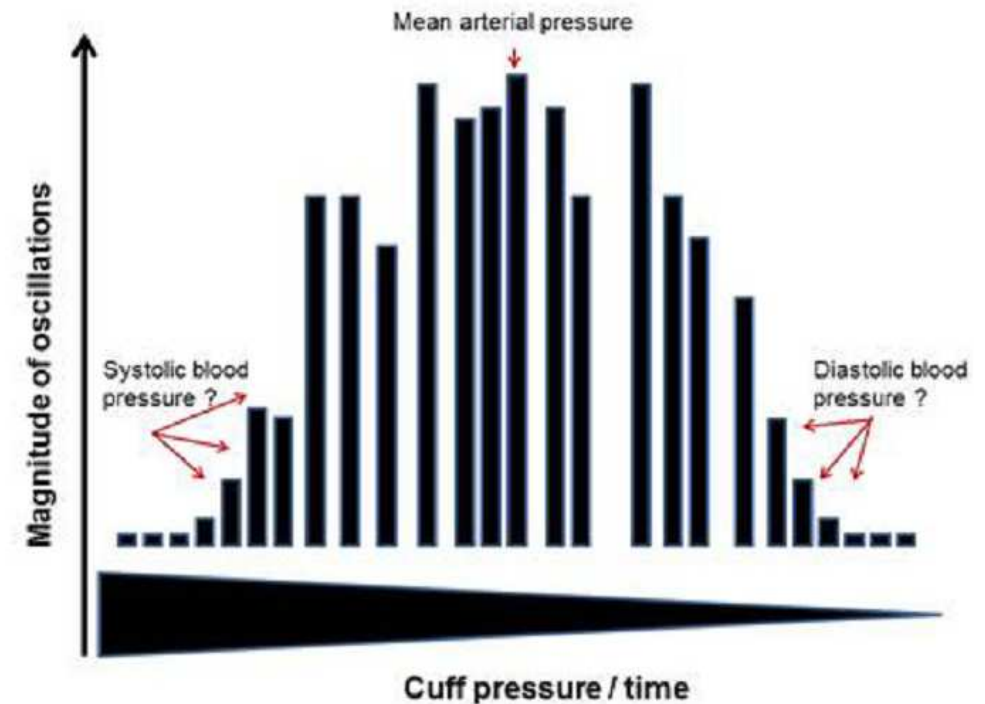
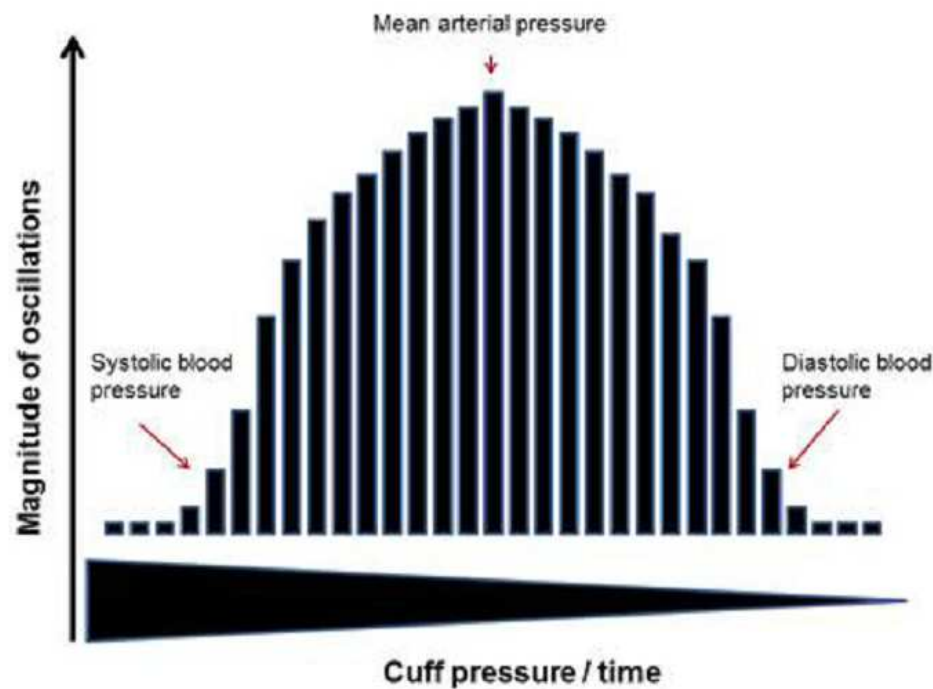
Ημιαυτόματα ηλεκτρονικά (ταλαντωσιμετρικά)



- ❖ require little training
- ❖ devoid of the observer bias
- ❖ require far less maintenance and calibration
- ❖ in older people with stiff arteries and wide pulse pressures the mean arterial pressure may be significantly underestimated
- ❖ patients with arrhythmias, diabetes, pre-eclampsia
- ❖ Require validation

Ταλαντωσιμετρική μέθοδος

Κολπική μαρμαρυγή



www.dableducational.org

www.bhsoc.org

dabl® Educational Trust

Blood Pressure Monitors - Validations, Papers and Reviews

- Home
- About Us
- Validation
- Devices
- Manufacturers
- Library
- Directory
- Disclaimer
- Sitemap

Search

Welcome to dabl® Educational Trust

Information about blood pressure measurement, the devices used to measure blood pressure, along with their accuracy and suitability for measurement in clinical settings, the home and hypertension research.

Informationen über die Blutdruckmessung sowie die Genauigkeit und Eignung von Blutdruck-Messgeräten in der Klinik, in der Praxis, für den Heimgebrauch und in der Hochdruckforschung.

Les informations sur la mesure de pression artérielle, les appareils utilisés pour mesurer la pression artérielle, et leur précision et adaptation à la mesure dans le milieu médical, à domicile et la recherche.

La información sobre la medida de la presión arterial, los dispositivos medía la presión arterial, junto con su exactitud y conveniencia para la medida en los ajustes clínicos, el hogar y la investigación de la hipertensión.

Informazioni sulla misurazione della pressione arteriosa e sugli strumenti utilizzati per misurare la pressione arteriosa, insieme a dati sulla loro accuratezza e sulla loro idoneità per misurazioni da effettuare in ambiente clinico, al domicilio del paziente o nella ricerca.

Informatie over bloeddrukmeting en over de apparaten die worden gebruikt om de bloeddruk te meten, met speciale aandacht voor hun nauwkeurigheid en geschiktheid voor toepassing in de kliniek, bij thuismetingen en bij hypertensieonderzoek.

Services Offered

ESH-IP 2010 Online Service

The dabl Educational Trust ESH-IP 2010 Online system offers a service whereby a validation study for a blood pressure device can be recorded and managed. The system calculates the results according to the ESH-IP 2010 protocol and allows the scientific paper to be generated.


Device Equivalence

Equivalence procedure for device manufacturers allowing manufacturers to submit devices for consideration for validation equivalence - [click for details](#)

Validation Status of Devices

The most comprehensive and up-to-date list of tables on the validation status of all makes of BP devices - [click for details](#)

Founding Sponsor



dabl Ltd provides 24 hour ABPM interpretation software that links to a range of validated devices.

BHS

British Hypertension Society

Registered UK Charity | No. 287635

- More about us
- Working Parties
- Membership
- Information Service
- Contact details
- FAQs
- Jobs
- Links

- Clinical
- BP Monitors
- Guidelines
- BHS Statements Publications
- BHS Live Presentations
- Specific Patient Groups

Search

British Hypertension Society


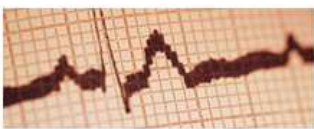
Annual Scientific Meeting

Monday 10th – Wednesday 12th September 2012
Queens' College Cambridge, UK

[Abstract](#) (Abstract Submission deadline: 9.00am 11 May 2012)
[HIP OPPORTUNITIES](#) - [click here](#)

Education

Hypertension Society provides a medical research forum to enable sharing of research in order to understand the origin of hypertension and improve its treatment. An annual scientific meeting is held every September at a campus in the UK and Ireland.



The British Hypertension Society has a track record of producing internationally renowned guidelines for the management of hypertension which are widely adopted in primary care in the UK and elsewhere. As part of our increasing engagement in improving blood pressure measurement we are now undertaking active validation of new blood pressure devices for the measurement of blood pressure.

Latest Guidelines

[Click here for more details](#)

BHS Annual Meeting 2011 Powerpoint Presentations

[Click here to view](#)

BHS/NICE Guidelines Video Presentations 2011

[Click here to view](#)

1st UK Symposium on Renal Denervation

[Click here to view](#)

2012 SPONSORSHIP OPPORTUNITIES

[Click here to view](#)

Friends of the BHS

The following are [Friends of the BHS](#) and have made unrestricted grants to the BHS to support its work:

- [A&D Instruments Ltd](#)
- [Daiichi Sankyo UK Ltd](#)
- [Medtronic Ardian](#)

Oscillometric devices problems

- ❖ The fact that a device passed a validation test does not mean that it will provide accurate readings in all patients.
- ❖ There can be substantial numbers of individual subjects in whom the error is consistently >5 mm Hg with a device that has achieved a passing grade.
 - This may be more likely to occur in elderly or diabetic patients.
- ❖ For this reason, it is recommended that each oscillometric monitor should be validated on each patient before the readings are accepted.

Αυτόματα

❖ BpTRU



- ❖ oscillometric technique
- ❖ 6 measurements to be obtained
- ❖ patients are alone in the examination room
- ❖ discards the first, and displays the average of the next 5 readings
- ❖ Manual mode
- ❖ might be devoid of white-coat effect

Η λύση στο πρόβλημα?

Hypertension

JOURNAL OF THE AMERICAN HEART ASSOCIATION

American Heart
Association® 

Learn and Live SM

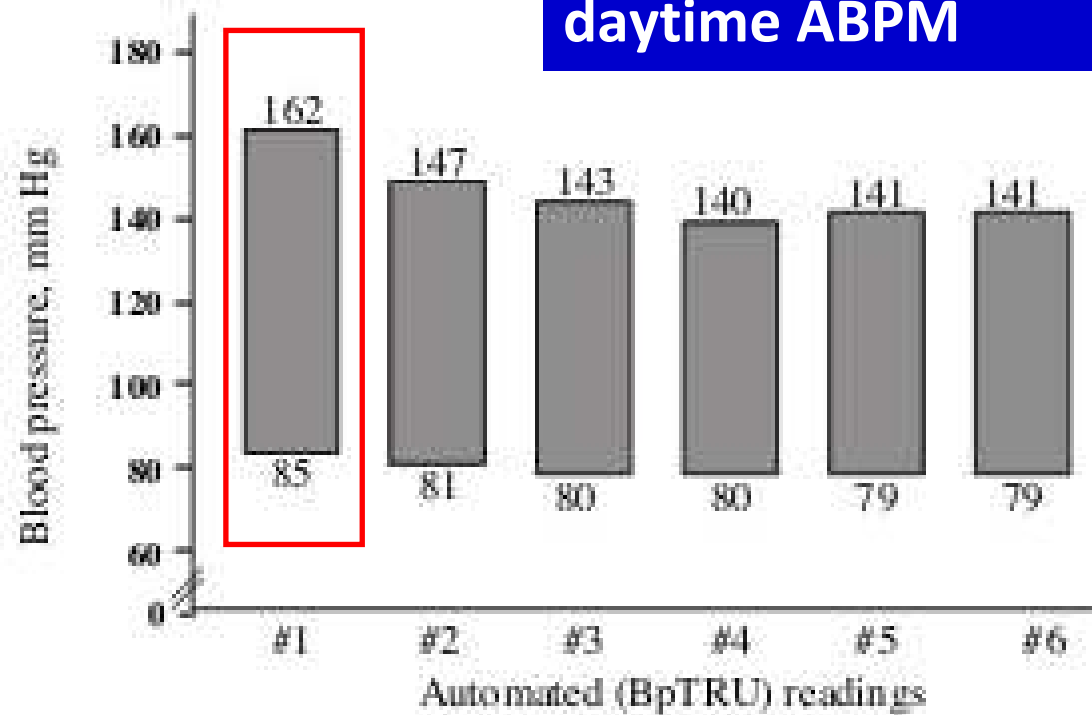
Measurement of Blood Pressure in the Office : Recognizing the Problem and Proposing the Solution

Martin G. Myers, Marshall Godwin, Martin Dawes, Alexander Kiss, Sheldon W. Tobe
and Janusz Kaczorowski

Hypertension 2010, 55:195-200: originally published online December 28, 2009
doi: 10.1161/HYPERTENSIONAHA.109.141879

Αυτόματες μετρήσεις

blood pressure values
similar to those obtained by
daytime ABPM



Martin G. Myers, et al. Automated Measurement of Blood Pressure in Routine Clinical Practice. J Clin Hypertens. 2007;9:267–270

A Novel Approach to Office Blood Pressure Measurement: 30-Minute Office Blood Pressure vs Daytime Ambulatory Blood Pressure

Mark C. van der Wel, MD, MSc¹

Iris E. Buunk, BSc¹

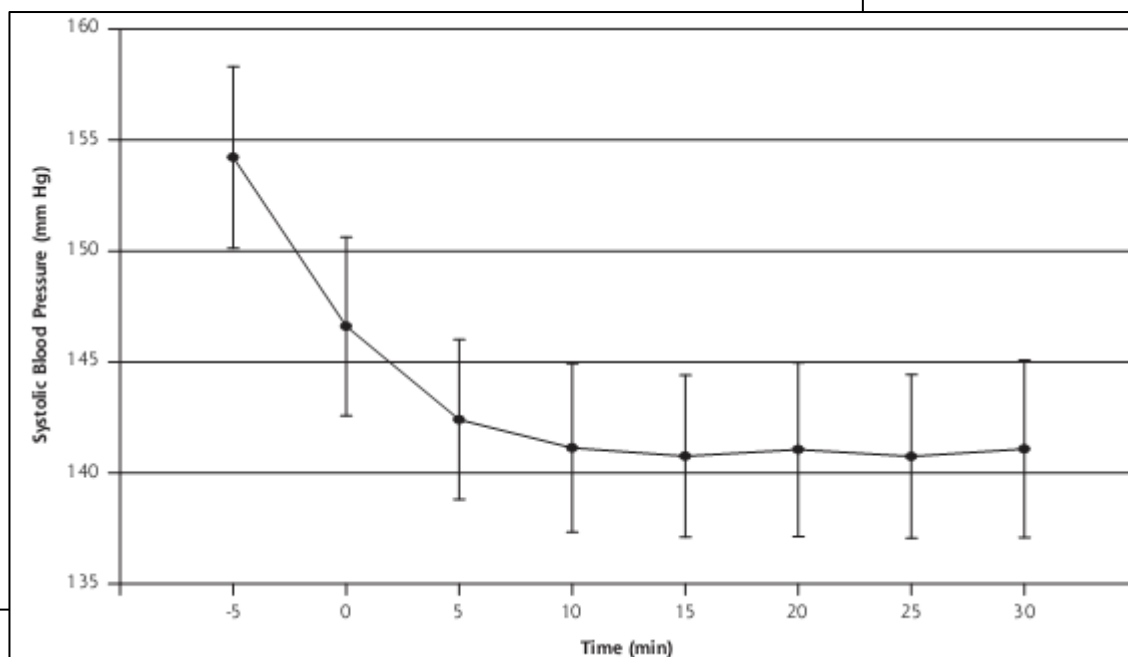
Chris van Weel, MD, PhD¹

Theo A. B. M. Thien, MD, PhD²

J. Carel Bakx, MD, PhD¹

¹Department of Primary and Community Care, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands

²Department of Internal Medicine, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands



Subtype	30-min OBPM No.	Daytime ABPM No.
Normotensive	18	15
White-coat hypertension	13	13
Masked hypertension	1	4
Sustained hypertension	52	52

Measurement	30-min OBPM (SD)	Daytime ABPM (SD)	Δ 30-min OBPM-ABPM (95% CI)	SDD
Mean arterial pressure, mm Hg	104 (12)	103 (11)	2 (0 to 3) ^a	7
Systolic blood pressure, mm Hg	141 (17)	141 (14)	0 (-2 to 2)	10
Diastolic blood pressure, mm Hg	84 (11)	82 (11)	2 (0 to 3) ^a	6

ABPM = ambulatory blood pressure monitoring; CI = confidence interval; OBPM = office blood pressure measurement; SDD = standard deviation of the difference of the mean.

Note: Because of rounding, figures may not add up correctly.

^a $P = .03$.

^b $P = .008$.

Περιχειρίδα

The “ideal” cuff should have a bladder length that is 80% and a width that is at least 40% of arm circumference (a length-to-width ratio of 2:1)

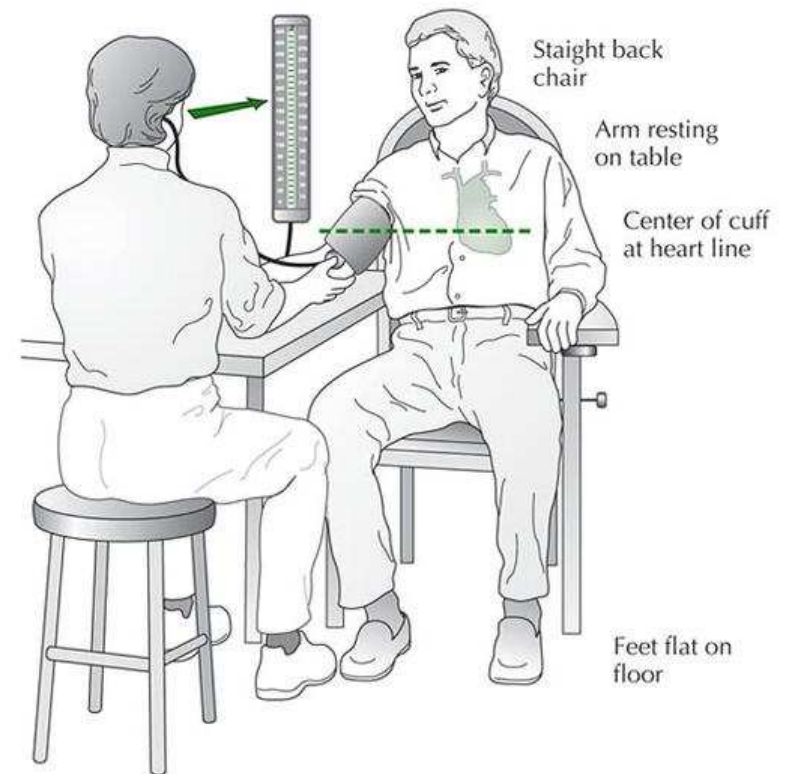
Cuff type	For whom	Cuff size (cm)
British Hypertension Society ^a		
Small	Lean adults and children	12 × 18
Standard	Most adults	12 × 26
Large	Obese patients	12 × 40
Cuff type	Arm circumference (cm)	Cuff size (cm)
American Heart Association ^b		
Small adults	22–26	12–22
Adults	27–34	16–30
Large adults	35–44	16–36
Adult thigh	45–52	16–42

Περιβάλλον



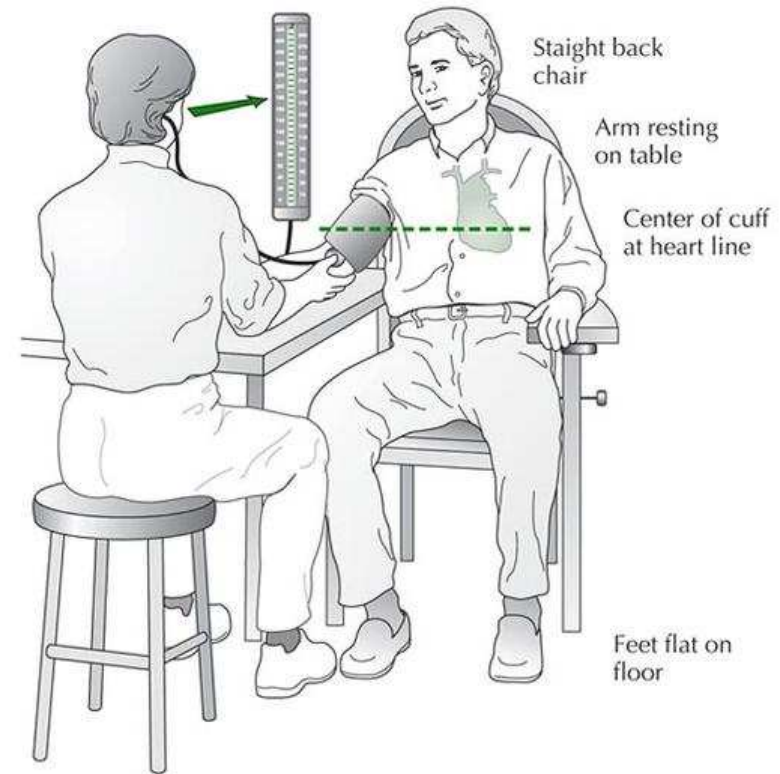
Προετοιμασία

- ❖ Ήσυχο δωμάτιο
- ❖ Εξήγηση διαδικασίας
- ❖ Όχι καφέ, αλκοόλ, κάπνισμα
- ❖ Καθιστός για 5 min

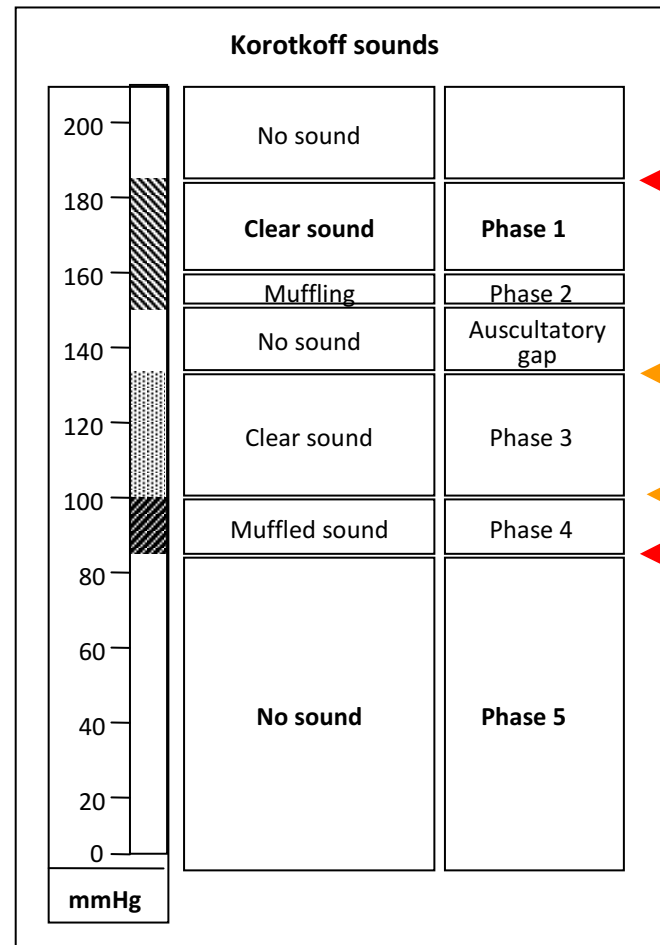


Τοποθέτηση

- ❖ Τα πόδια στο πάτωμα
- ❖ Η ράχη να στηρίζεται
- ❖ Το χέρι να στηρίζεται
- ❖ Κατάλληλη περιχειρίδα
- ❖ Στο ύψος της καρδιάς
- ❖ Στηθοσκόπιο
- ❖ **Κλειστό κινητό**



Ακροαστικό χάσμα



Σε 168 υπερτασικούς
το 21% παρουσίασε
ακροαστικό χάσμα

Systolic BP

Phase 3

Phase 4

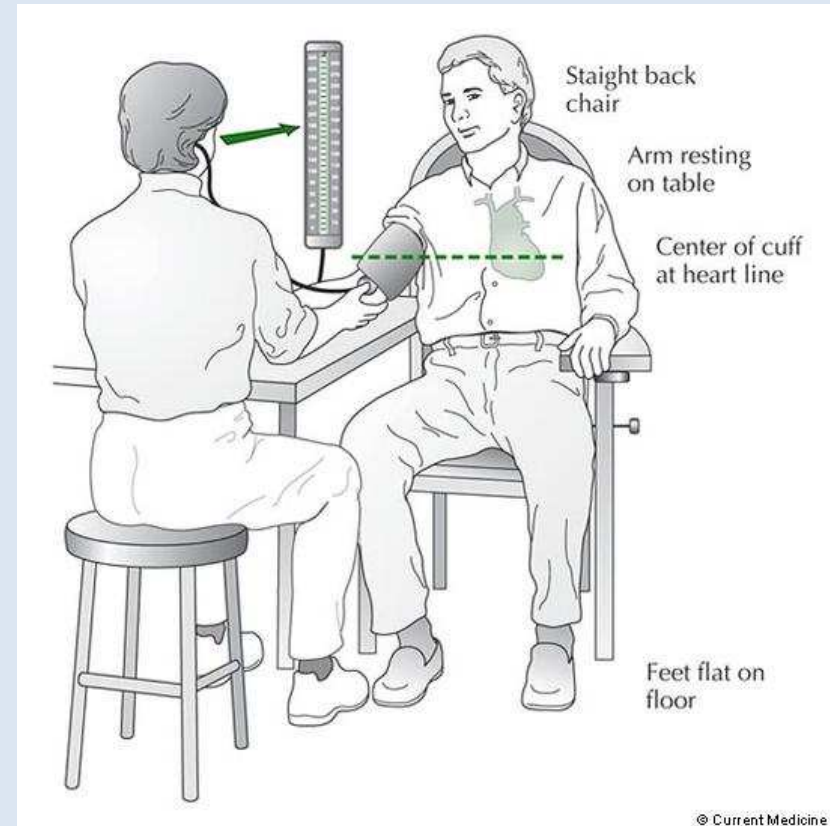
Diastolic BP

Να προηγείται
μέτρηση με
ψηλαφητική μέθοδο

Cavallini MC, Roman MJ, Blank SG, Pini R, Pickering TG, Devereux RB. Association of the auscultatory gap with vascular disease in hypertensive patients. *Annals of Internal Medicine*. 1996; 124(10):877-883

Μέτρηση

- ❖ Γρήγορο φούσκωμα
- ❖ Ξεφούσκωμα με 2 mm/sec
- ❖ Ήχοι I και V Korotkoff
- ❖ 2 μετρήσεις
 - Περισσότερες αν $\Delta > 5$ mmHg
- ❖ 1η επίσκεψη και στα 2 χέρια
- ❖ Όρθια θέση 1 και 5 min
- ❖ Μέτρηση συχνότητας
- ❖ ≥3 επισκέψεις



Original Article

Journal of Human Hypertension , (26 May 2011) | doi:10.1038/jhh.2011.

Effect of respiration, talking and small body movements on blood pressure measurement

D Zheng, R Giovannini and A Murray

It is accepted that accuracy of auscultatory blood pressure (BP) measurement is influenced by measurement conditions. However, there is little comparative quantitative clinical data. The aim of this study was to provide these data. Auscultatory systolic and diastolic BP (SBP and DBP) were measured in 111 healthy

- ❖ βαθιά ανάσα - 4.4/4.8 mm Hg
- ❖ κίνηση αντίθ. άκρου + 3.7/5.0 mm Hg
- ❖ συζήτηση + 5.3/6.2 mm Hg

between repeat breathing and talking were on the order of 4.4 and 5.3 mm Hg, respectively, for SBP and DBP. The within-subject variability for repeat measurement of SBP and DBP under resting condition were 3.7 and 3.2 mm Hg and increased for non-resting conditions (all $P < 0.05$, except for DBP while talking). We have shown that measurement conditions significantly influence manual auscultatory BPs and their measurement variabilities, and we provide quantitative data to allow comparison of the effects.

D Zheng, et al. Effect of respiration, talking and small body movements on blood pressure measurement. *Journal of Human Hypertension* , (26 May 2011)

Πόσο σωστά μετρούν την ΑΠ οι ιατροί;

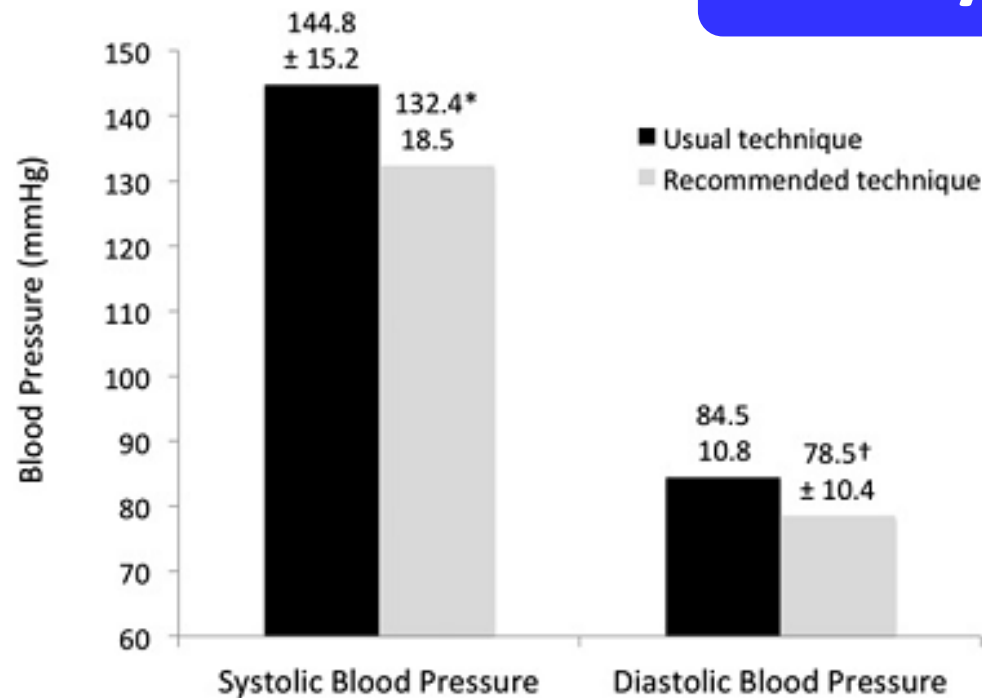
Τεχνική	% τήρηση συστάσεων
Βραχίονας στο επίπεδο της καρδιάς	90%
Αρχική μέτρηση ΣΑΠ με ψηλάφηση αρτηρίας	38%
Μέτρηση και στα δύο άνω άκρα	23%
Προοδευτική αποσυμπίεση περιχειρίδος	18%
Κατάλληλη θέση ασθενούς	10%
Μεσοδιαστήματα τουλάχιστον 30sec μεταξύ των μετρήσεων	4%
Εφαρμογή κατάλληλης περιχειρίδος	3%

McKay DW, Campbell NR, Parab LS, et al. Clinical assessment of blood pressure. J Hum Hypertens. 1990;4:639–645

Συνήθης μέτρηση ιατρείου συγκριτικά προς την προτεινόμενη από American Heart Association

n = 150

$\Delta = 12/6$ mmHg

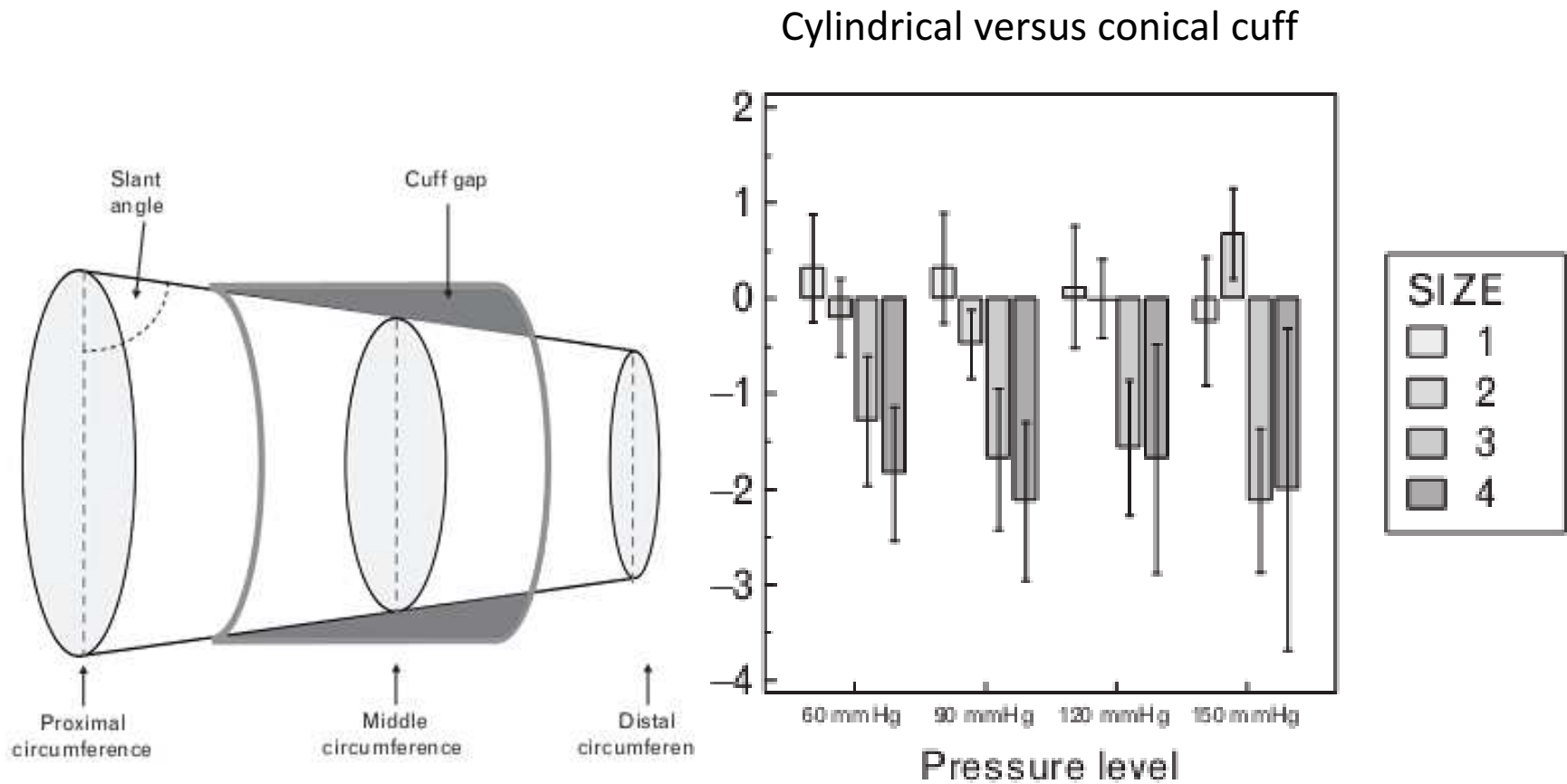


SE Burgess et al. Blood pressure rising: differences between current clinical and recommended measurement techniques. J Am Soc Hypertens 2011;5(6) :484–488

Δυσκολίες στη μέτρηση της ΑΠ

- ❖ Ηλικιωμένοι
 - (Ψευδοϋπέρταση;)
 - Ορθοστατική υπόταση
- ❖ Παιδιά
- ❖ Κύηση
- ❖ Κολπική μαρμαρυγή
- ❖ Παχυσαρκία

Rectangular cuffs may overestimate blood pressure in individuals with large conical arms



Παχύσαρκοι

- ❖ cuff placed on the forearm and listening for sounds over the radial artery
 - this may overestimate systolic blood pressure
- ❖ or use a validated wrist blood pressure monitor held at the level of the heart



Πλεονεκτήματα - Μειονεκτήματα

	Office BP Monitoring	ABPM	Self-BP Monitoring
Predicts events	Yes	Yes	Yes
Diagnostic utility	Yes	Yes	Yes
Evaluation of therapy	Yes	Yes (limited repeat uses)	Yes
Normal limit for average risk patients (mm Hg)	140/90	130/80 (24-hour) 135/85 (awake) 120/75 (sleep)	135/85
Cost	Low	High	Low
Reimbursement	Yes	Partial	No

ΣΥΜΠΕΡΑΣΜΑΤΑ

- ❖ Η μέτρηση της ΑΠ στο ιατρείο παραμένει η βάση για τη διάγνωση και την παρακολούθηση της υπέρτασης
- ❖ Όλες οι γνώσεις μας για τον κίνδυνο της υπέρτασης και τα οφέλη της θεραπείας έχουν βασιστεί στη μέτρηση στο ιατρείο
- ❖ Απαραίτητη είναι η εκτέλεση της μεθόδου με σχολαστική ακρίβεια και με τον σωστό εξοπλισμό
- ❖ Η συμπλήρωσή της με μετρήσεις εκτός ιατρείου είναι απαραίτητη στις περισσότερες περιπτώσεις