I test di funzionalità respiratoria aiutano nella scelta terapeutica dell'asma?

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AZIENDA OSPEDALIERA G. RUMMO BENEVENTO

Azienda di rilievo nazionale ad alta specializzazione

Retrospective analysis of evidence base for tests used in diagnosis and monitoring of disease in respiratory medicine

Z Borrill, C Houghton, P Sestini, P J Sullivan

BMJ 2003;327;1136-1138

- **Conclusions** **A large proportion of clinical tests in respiratory medicine are not supported by level 1a-1c evidence.**

A	Exercise oximetry	Presence of lung disease	None
A	Flow volume loop	Upper airway obstruction	4
A	Fine needle aspiration of lung mass (transcutaneous)	Lung cancer	1b
A	Heaf test	Tuberculosis	4
A	High resolution computed tomography	Interstitial lung disease	3
A	High resolution computed tomography	Bronchiectasis	1b
A	Serum immunoglobulin E concentration	To help diagnose asthma	None
A	Overnight pulse oximetry	Sleep apnoea syndrome	1b
A	Peak flow chart	Asthma	1b
A	Pleural fluid protein concentration	To differentiate exudate/transudate	1a
A	Ventilation-perfusion scan	Pulmonary embolus	1b
A	Venogram	Deep venous thrombosis	4
B	Serum angiotensin converting enzyme concentration	To follow activity of sarcoidosis	None
B	Peak flow chart	Asthma: to step down treatment if low variability	None
B	Oral corticosteroid trial	Asthma: to define best possible lung function	None
B	Peak flow chart	COPD: to treat with inhaled steroid if variable	None

Choosing Wisely®

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American Academy of Allergy, Asthma & Immunology

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www.aaaai.org

Five Things Physicians and Patients Should Question

5

Don't diagnose or manage asthma without spirometry.

Clinicians often rely solely upon symptoms when diagnosing and managing asthma, but these symptoms may be misleading and be from alternate causes. Therefore spirometry is essential to confirm the diagnosis in those patients who can perform this procedure. Recent guidelines highlight spirometry's value in stratifying disease severity and monitoring control. History and physical exam alone may over- or under-estimate asthma control. Beyond the increased costs of care, repercussions of misdiagnosing asthma include delaying a correct diagnosis and treatment.

Choosing Wisely

Progetto "CHOOSING WISELY"

"Cinque cose che medici e pazienti dovrebbero chiedersi"

AMERICAN THORACIC SOCIETY DOCUMENTS

Optimal Lung Function Tests for Monitoring Cystic Fibrosis, Bronchopulmonary dysplasia, and Recurrent Wheezing inChildren Less Than 6 Years of Age

Ann Am Thorac Soc Vol 10, No 2, pp S1–S11, Apr 2013

Table 1. Summary table (as of January, 2012)

	Infant RVRTC	Infant Pleth	Preschool Spiro	Preschool sRaw	Preschool Rint	Preschool FOT	MBW
Commercial equipment	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standard operating procedure	Yes	Yes	Yes	No	Yes	Yes	Yes
Safe	Yes*	Yes	Yes	Yes	Yes	Yes	Yes
Feasible	Yes*	Yes	Yes	Yes	Yes	Yes	Yes
Adequate population-based reference data	No†	No†	Yes‡	No	Yes‡	Yes‡	Yes‡
Within-test intrasubject variability measured	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Discriminates disease population from healthy control subjects							
CF	Yes	Yes	Yes§	Yes	No	Conflicting	Yes
BPD	Yes	Yes	Unknown	Unknown	Unknown	Unknown	Probably not
Recurrent wheeze	Yes	No	Yes¶	Unknown	Yes¶	Unknown	Probably
Evidence for clinical utility	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed

Evitare diagnosi e gestione dell'asma senza prima aver effettuato una spirometria.

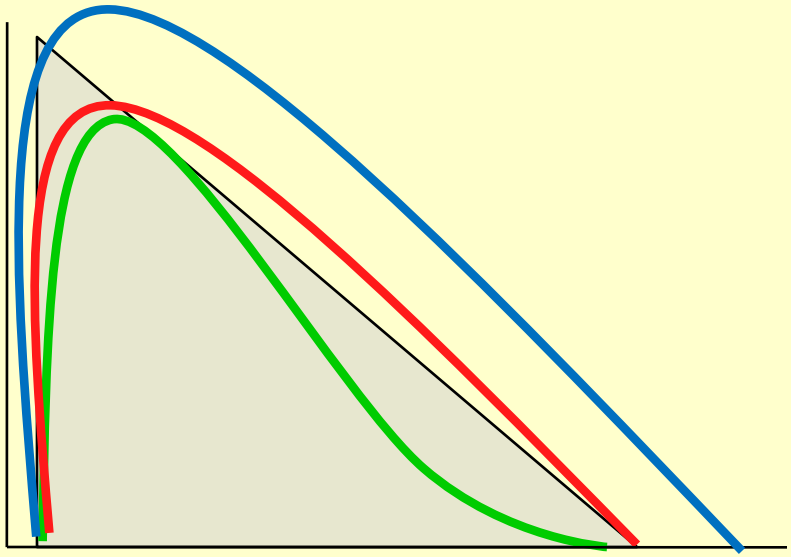
I clinici spesso si affidano alla sintomatologia del paziente per diagnosticare e trattare l'asma, ma tali sintomi possono trarre in inganno e originare da altre cause.

Dunque la spirometria è fondamentale per la diagnosi di asma nei pazientii che riescono ad eseguirla.

Recenti linee guida mettono in evidenza l'importanza della spirometria per poter stratificare la patologia per livelli di gravità e monitorarne il controllo .

L'anamnesi e l'esame obiettivo senza spirometria possono sottostimare o sovrastimare il controllo dell'asma.

Oltre agli aumentati costi del trattamento, le conseguenze di una errata diagnosi comprendono un ritardo della corretta diagnosi e dell'adeguato trattamento.



L'errore di Laennec:

Ronchi= grosse vie aeree

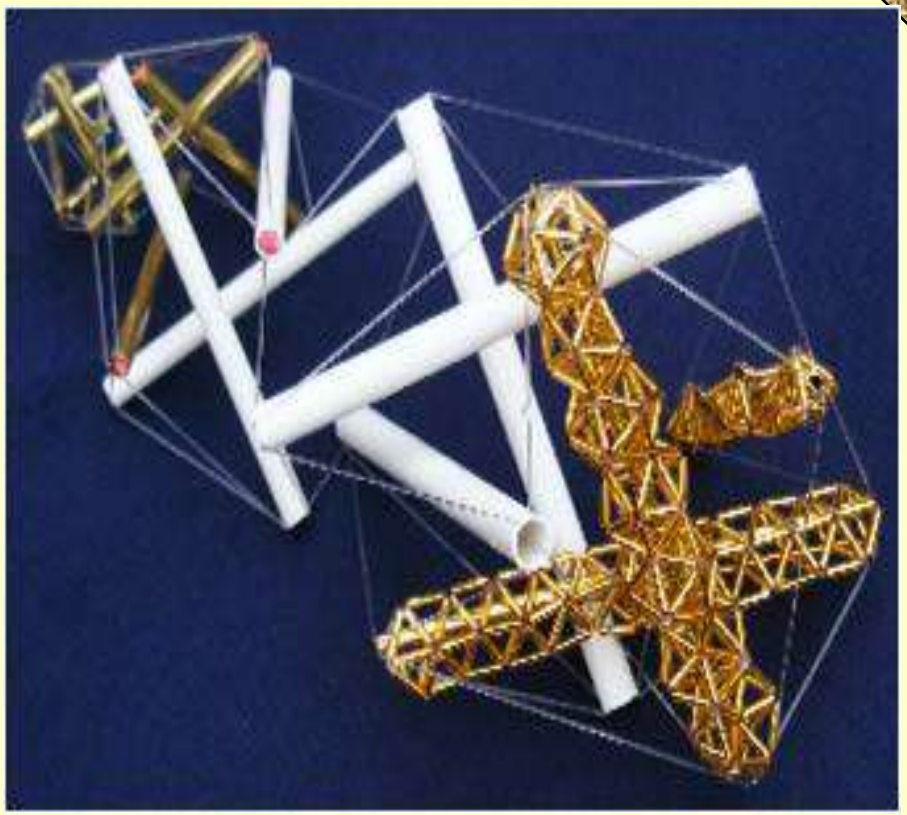
Sibili= piccole vie aeree

Wheezes

Eur Respir J, 1995, 8, 1942–1948

Il fischi non sono necessariamente prodotti da vie aeree periferiche e i ronchi dalle vie aeree centrali, come inizialmente suggerito da Laënnec.

4 litri

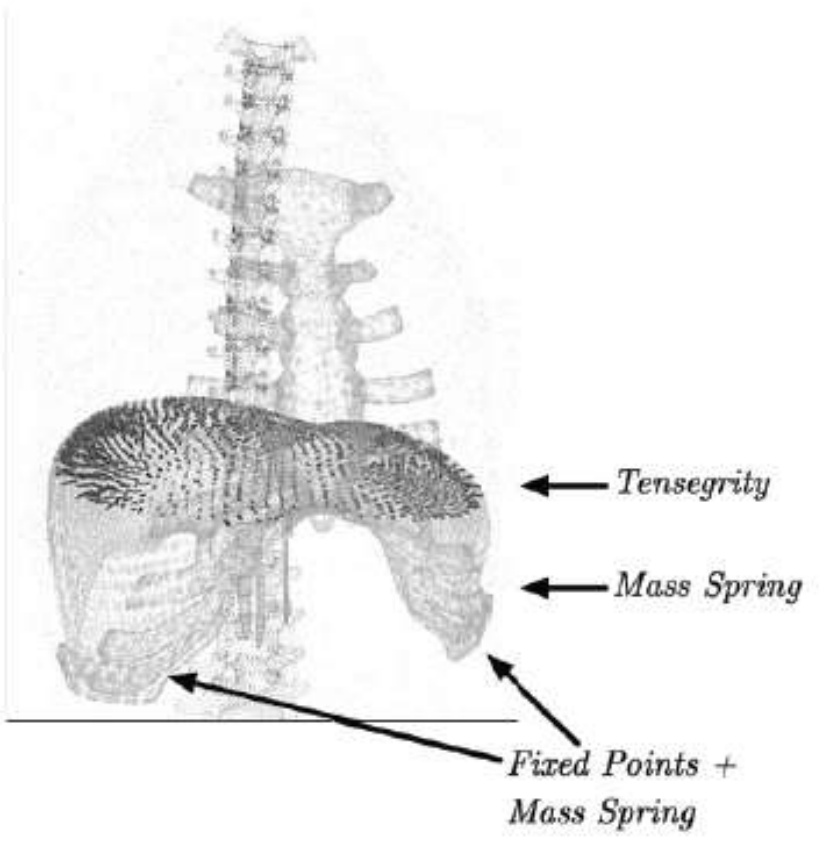


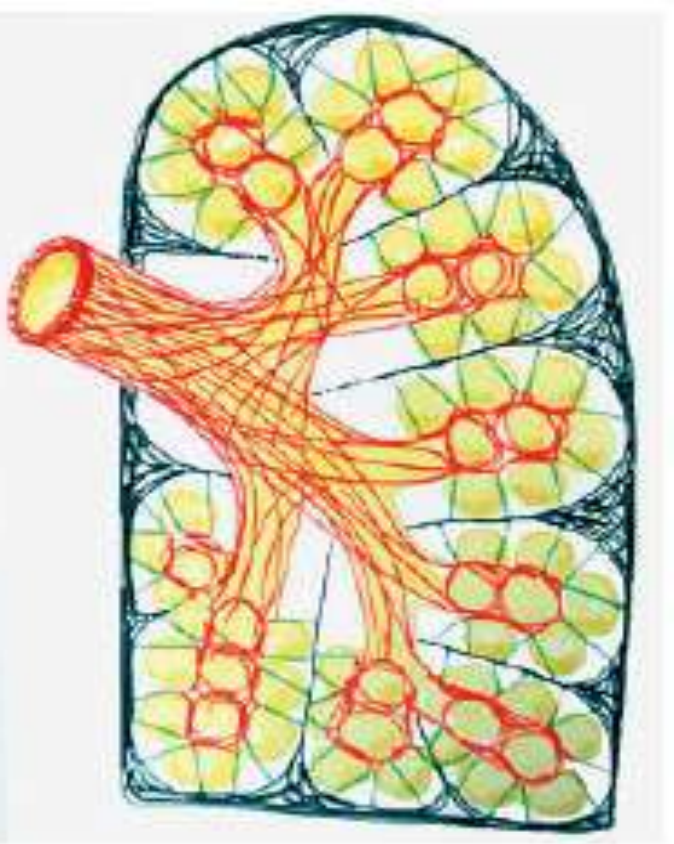
Tensegrità

La tensegrità è un principio dell'architettura sviluppato nel 1948 da R.Buckminster Fuller. Col principio della tensegrità vengono costruite cupole geodetiche, tende, barche a vela, sculture e un'infinità di altri oggetti.

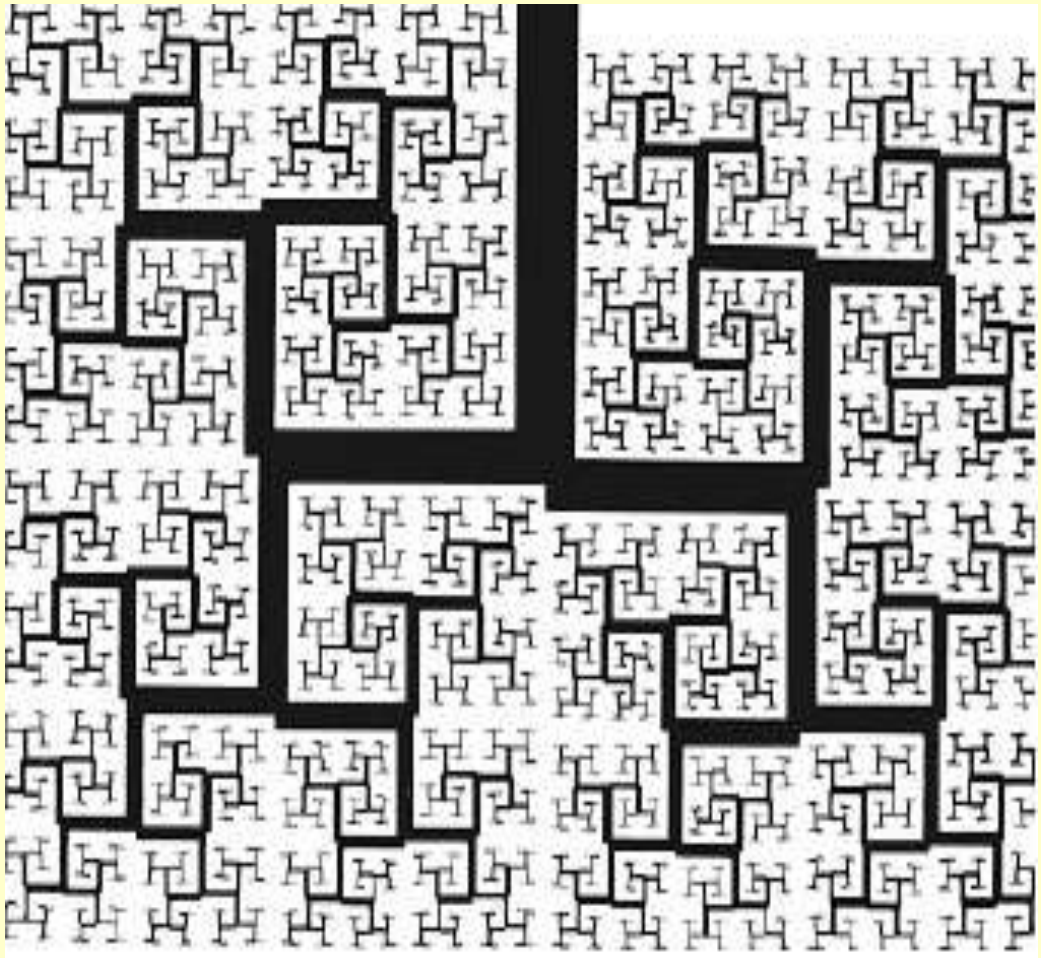
Con il termine "tensegrità" si indica un sistema che acquista stabilità grazie al modo in cui le forze meccaniche di tensione e di compressione sono distribuite e bilanciate all'interno della struttura stessa.

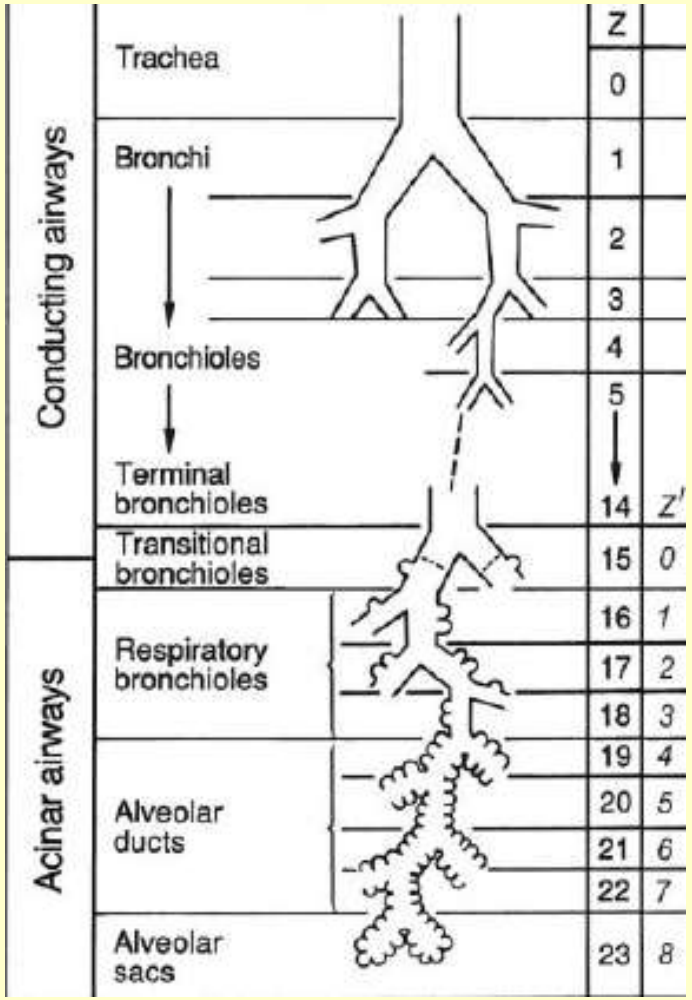
Strutture tensegrili





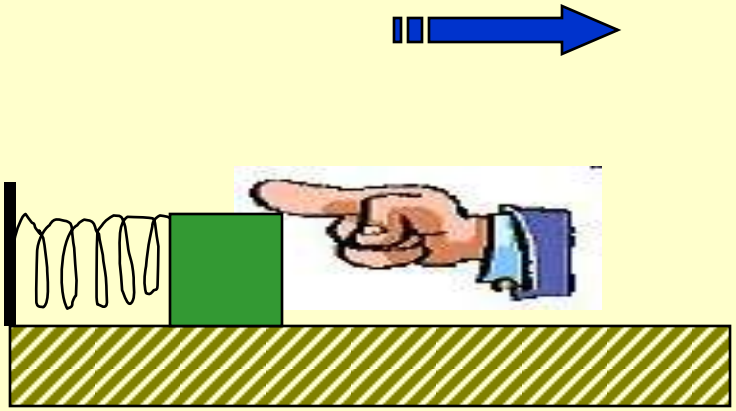
Albero frattalico





Phi=1,681

In assenza di attrito



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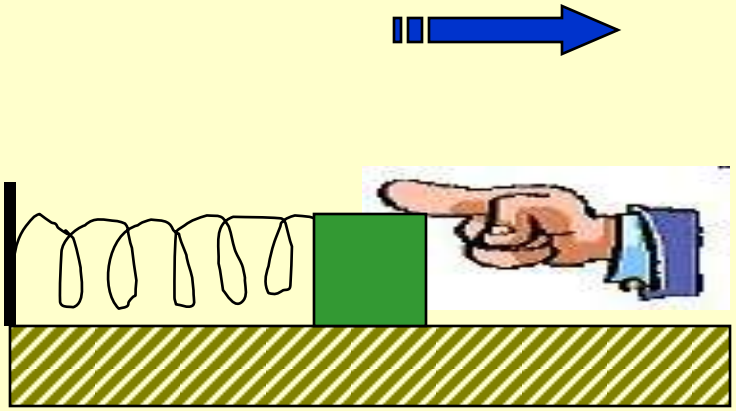

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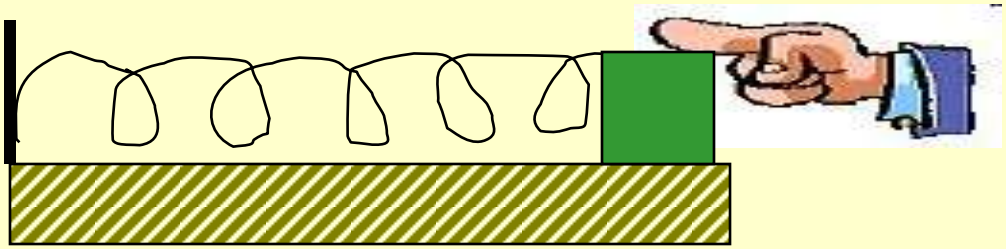

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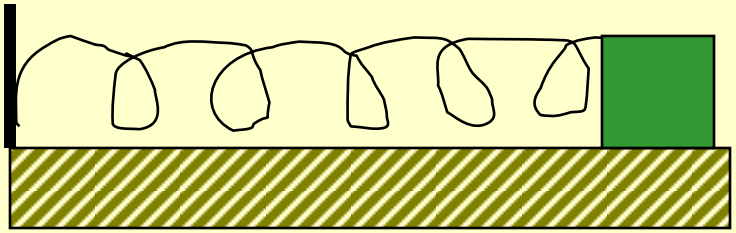

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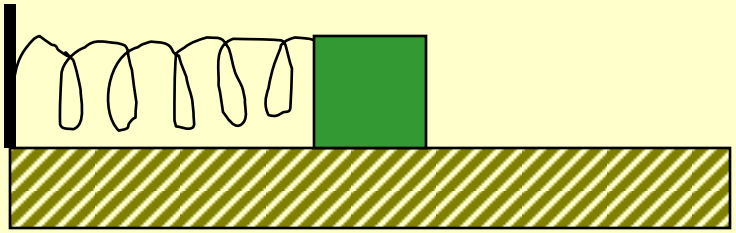

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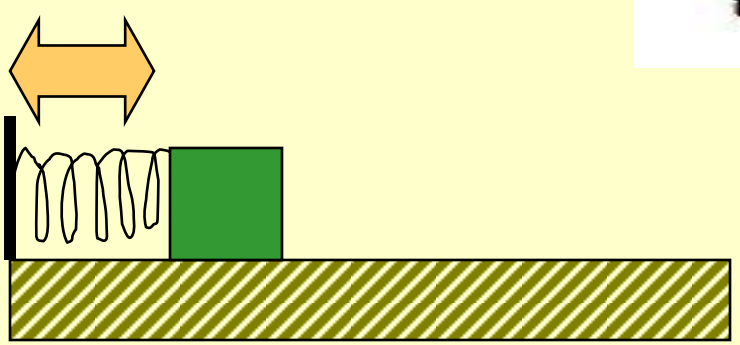

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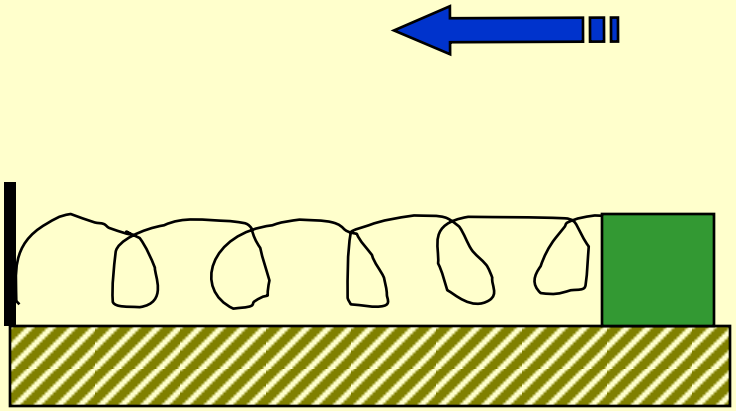

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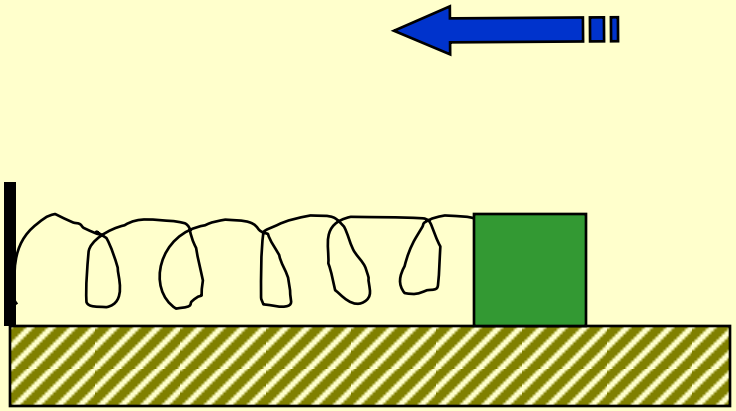

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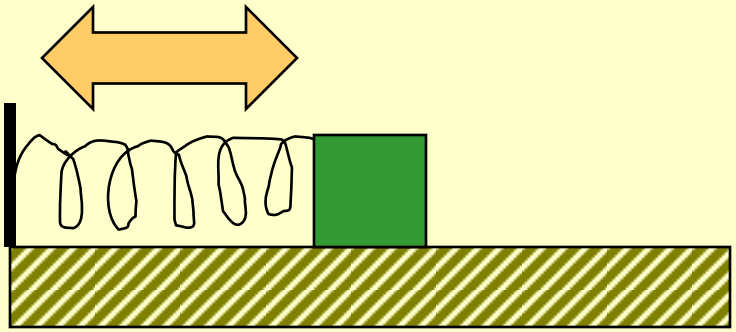

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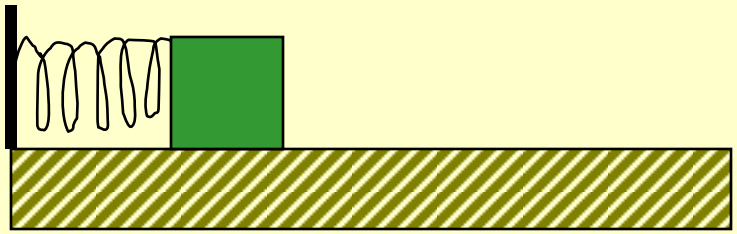

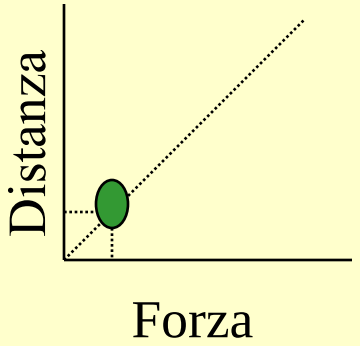

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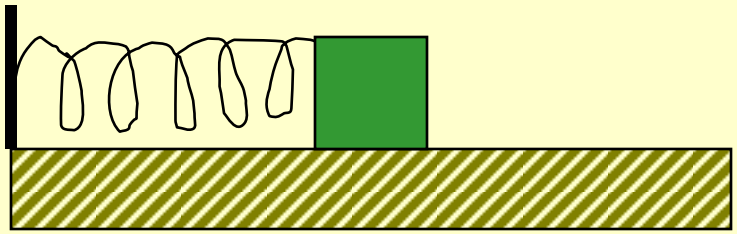

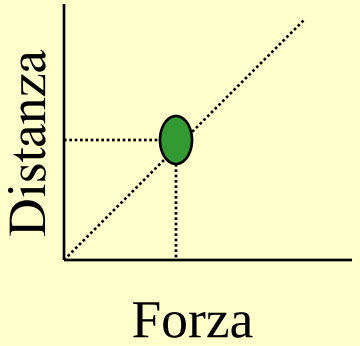

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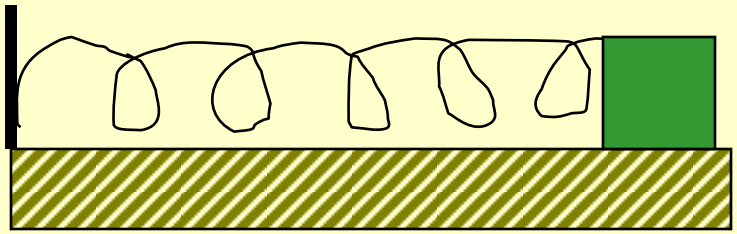
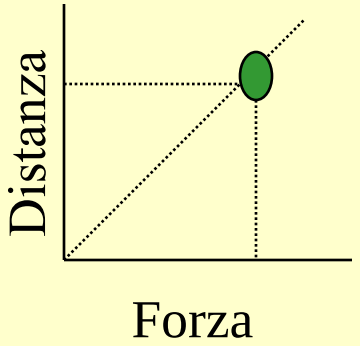
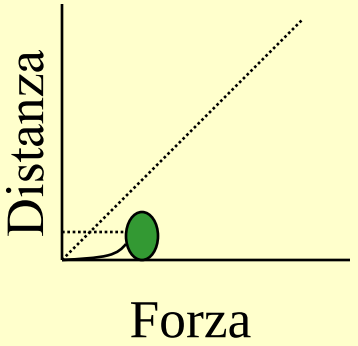




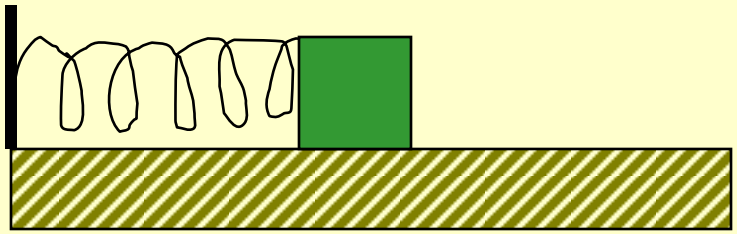
Hysteresis

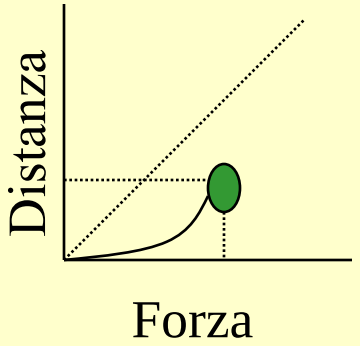
Friction



Hysteresis

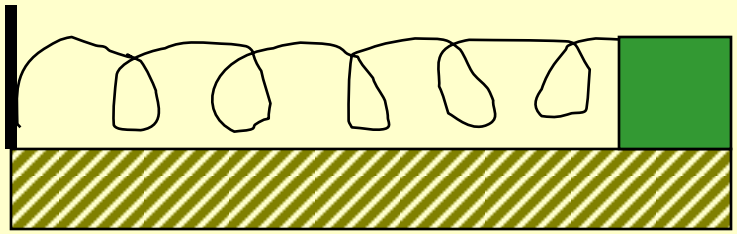
Friction

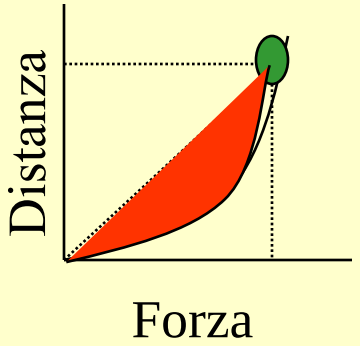




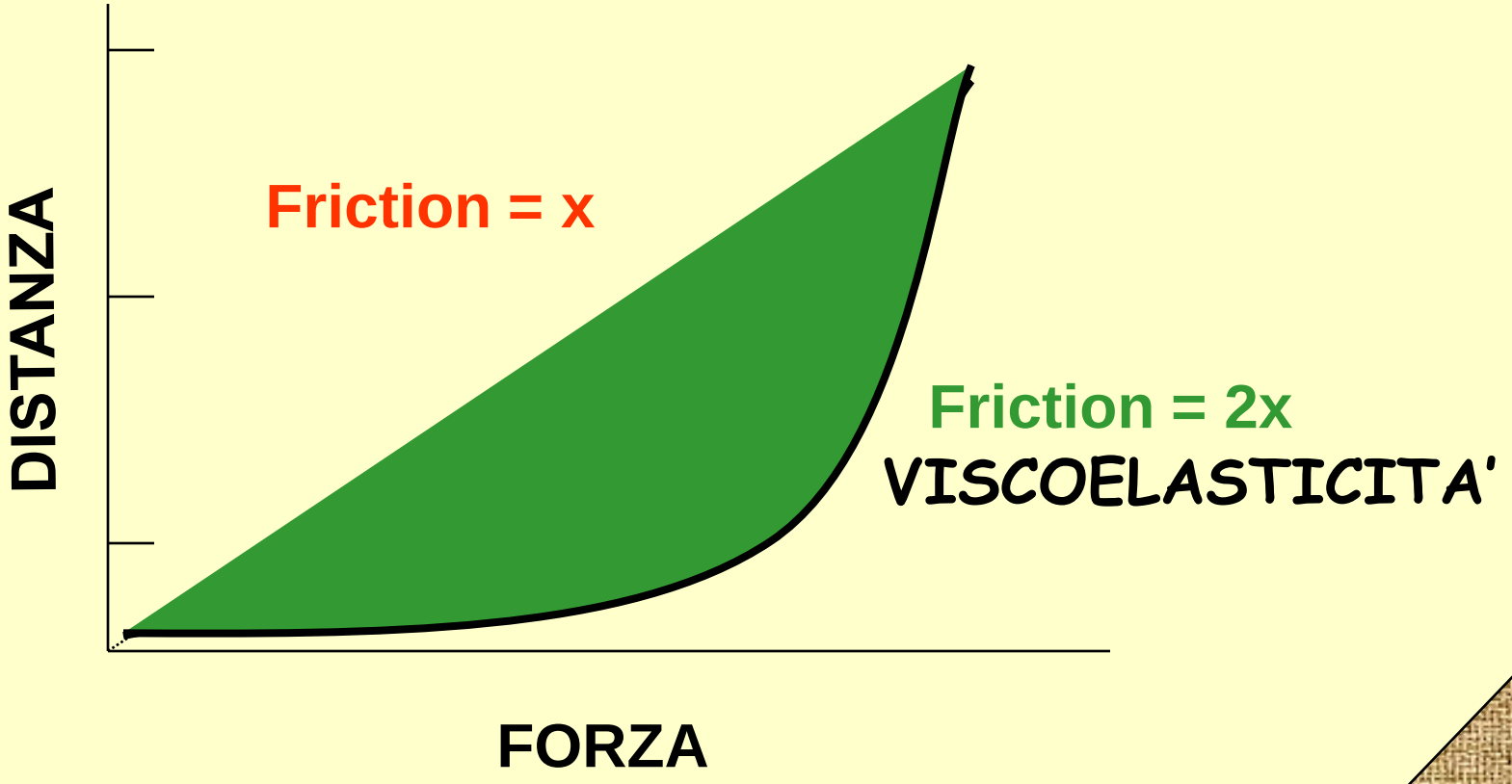
Hysteresis

Friction





Area di isteresi



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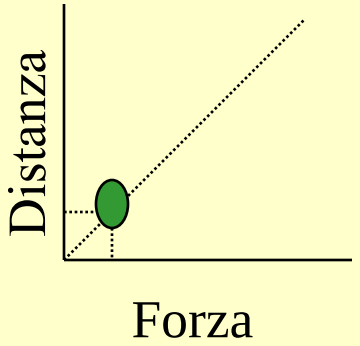

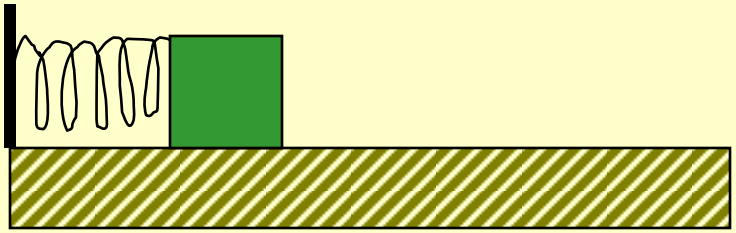

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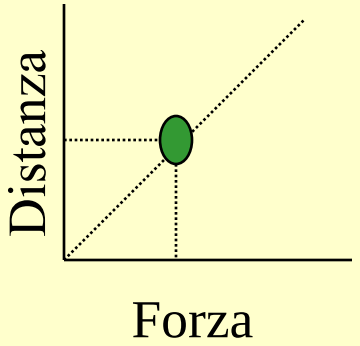

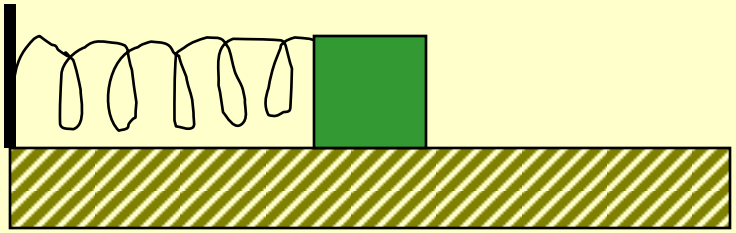

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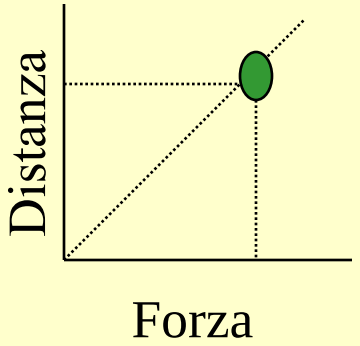
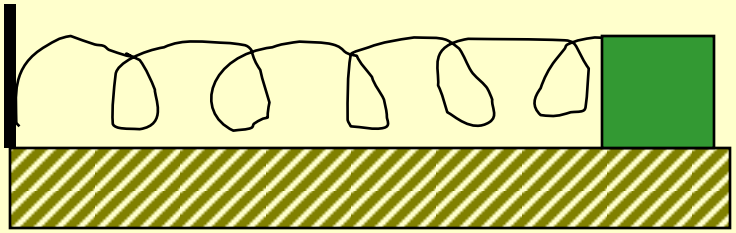
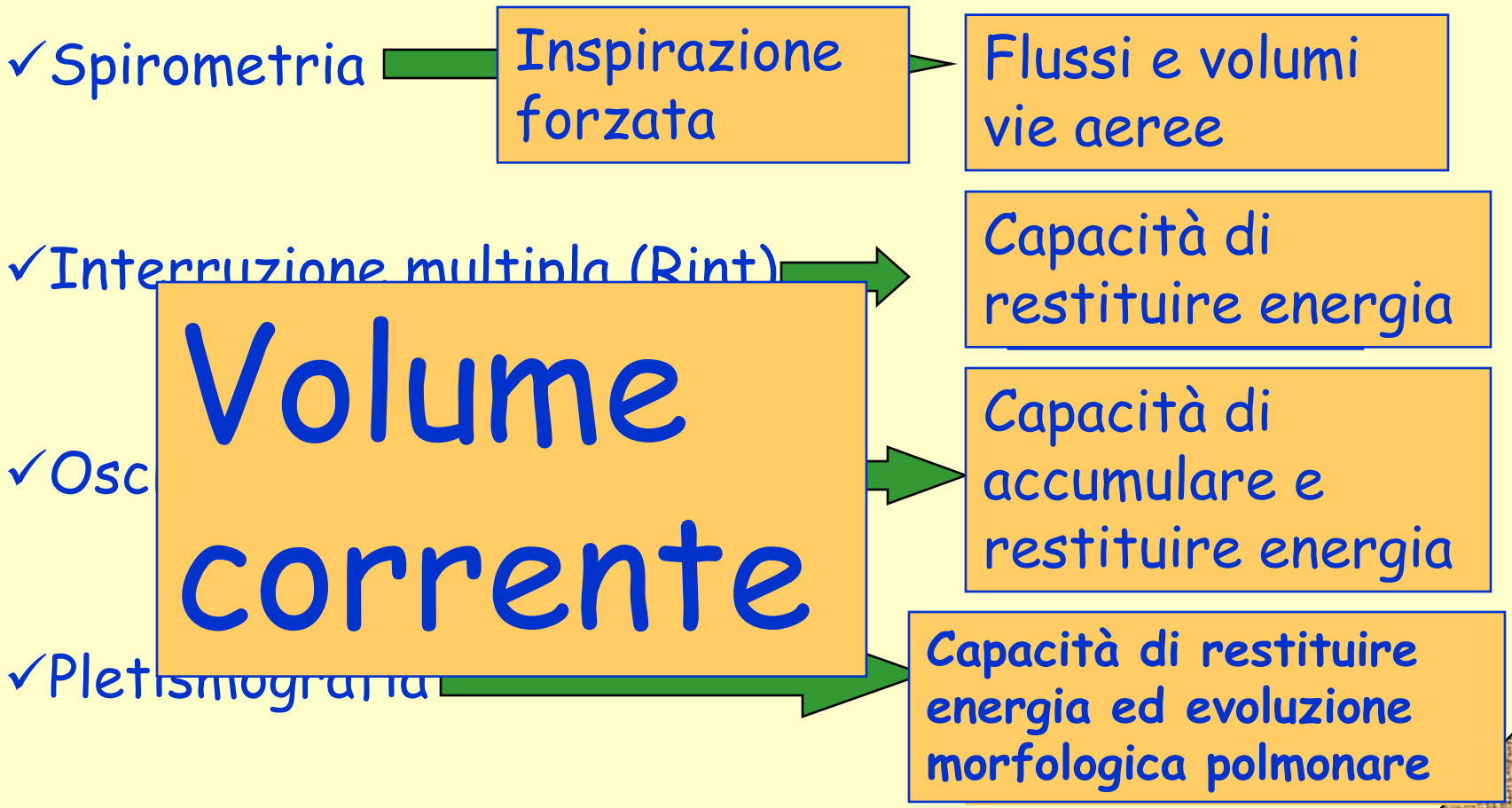
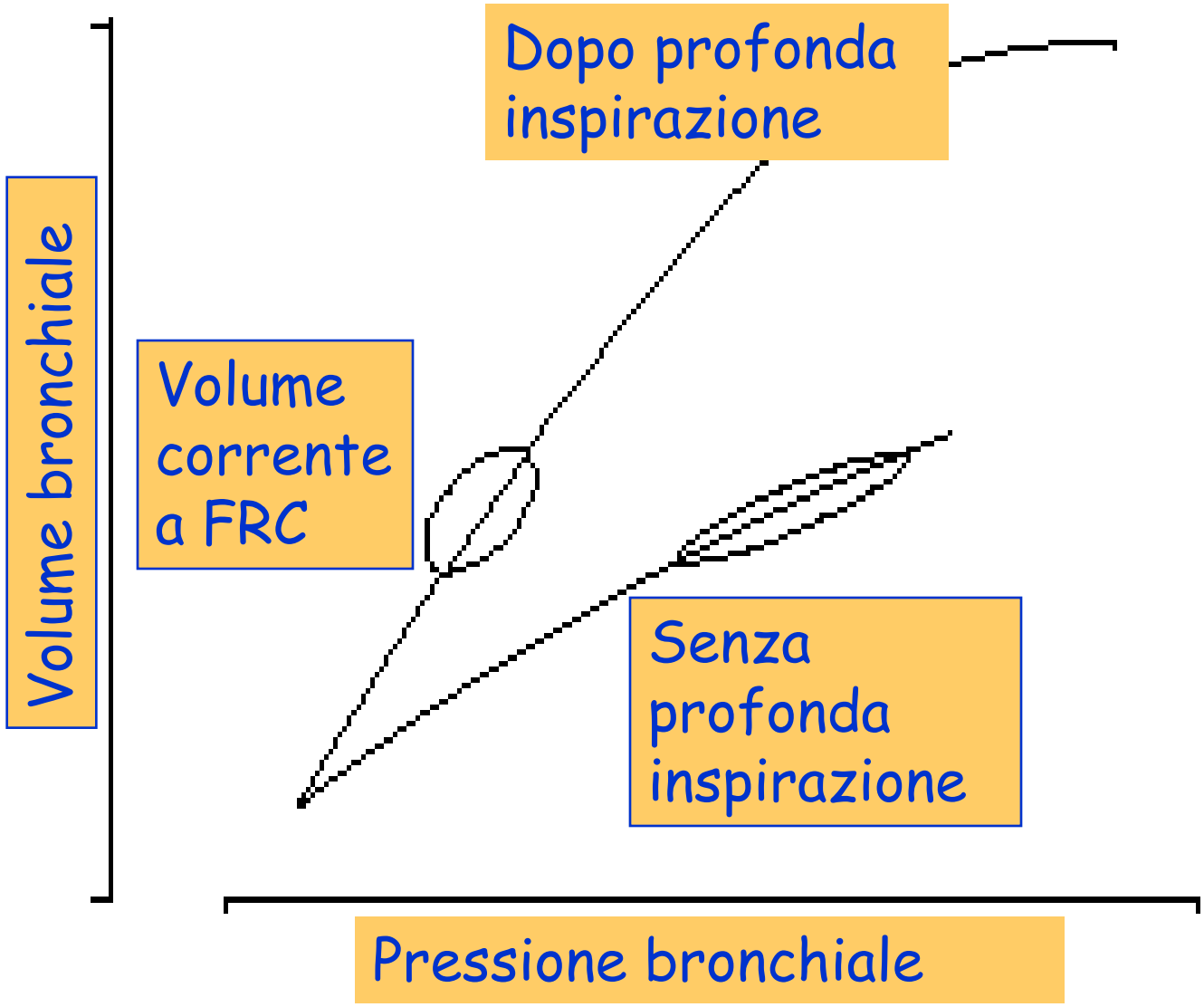


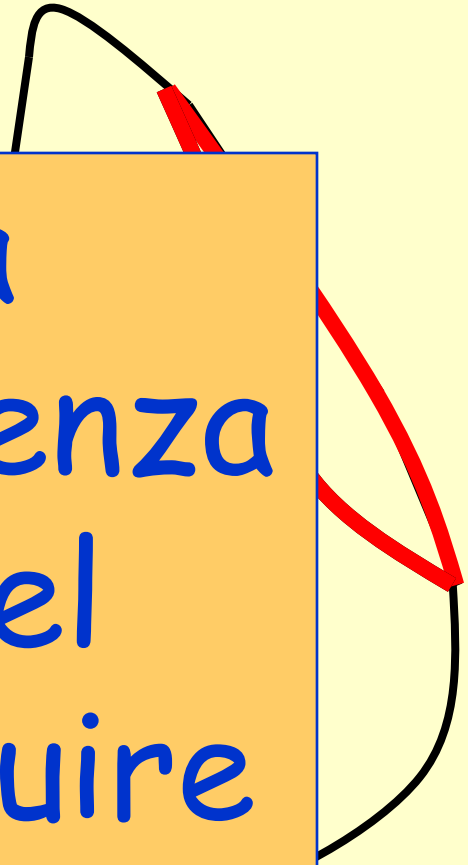


Diagnostica strumentale




Dopo profonda inspirazione
Volume bronchiale
Volume corrente a FRC
Senza profonda inspirazione
Pressione bronchiale

Compressione dinamica delle vie aeree



In un sistema elastico la resistenza è la capacità del sistema di restituire l'energia ricevuta

Fine-Espirazione

Valori normali del FEV1 sono la regola e non l'eccezione nell'asma in età pediatrica

Fuhlbrigge AL - *J Allergy Clin Immunol* 2001;107:61-67
Arch Pediatr Adolesc Med. 2008;162(12):1169-

- 3.626 bambini con asma
- 94% dei valori di FEV1 erano superiori all'80% del predetto
- bambini con FEV1 < 60% avevano il 70% di probabilità di avere un attacco acuto di asma negli anni successivi (57 attacchi in 77 osservazioni)
- Bambini con FEV1> 80% avevano il 30% di probabilità di avere un attacco acuto di asma(6.823 attacchi su 23.209 osservazioni)

Jenkins HA, et al.

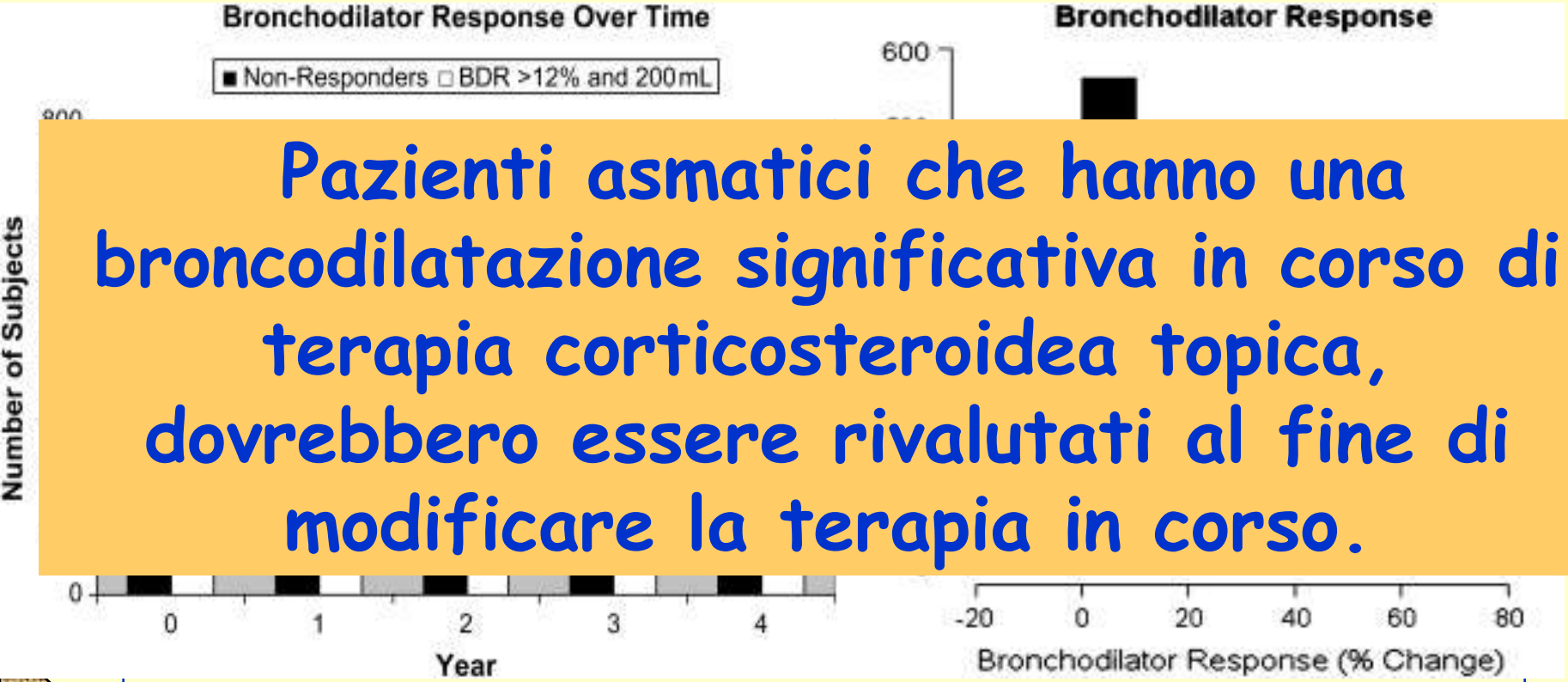
A comparison of the clinical characteristics of children and adults with severe asthma.

Chest 2003;124:1318-1324.

- Confronto tra bambini (n. 125) ed adulti (n. 150) con Asma severo e con la stessa necessità di cortisonici
- Media del FEV1 nei bambini 74% pred.
- Media del FEV1 negli adulti 57% pred.

Clinical predictors and outcomes of consistent bronchodilator response in the childhood asthma management program

Sharma S et al. JACI NOVEMBER 2008



Pazienti asmatici che hanno una broncodilatazione significativa in corso di terapia corticosteroidea topica, dovrebbero essere rivalutati al fine di modificare la terapia in corso.

The Relationship of the Bronchodilator Response (BDR) Phenotype to Poor Asthma Control in Children with Normal Spirometry

Stanley P. Galant et al. J Pediatr. 2011 June ; 158(6): 953–959

The BDR phenotype ≥10% is significantly related to poor asthma control providing a potentially useful objective tool in controller naïve children even when prebronchodilator spirometry is normal.

Suitability of Forced Expiratory Volume in 1 Second/Forced Vital Capacity vs Percentage of Predicted Forced Expiratory Volume in 1 Second for the Classification of Asthma Severity in Adolescents

Christine van Dalen et al.-,Arch Pediatr Adolesc Med. 2008;162:1169-1174

- 224 ragazzi tra i 13 ed i 17 anni (118 asmatici e 106 controlli)
- Valutati con Questionario (NAEEP EPR3) e Spirometria
- L'aggiunta del rapporto FEV1/FVC è l'unico che riesce a cambiare la distribuzione della severità
- FEV1 e FEF 25-75 aggiungono poco all'assestamento clinico

Spirometry Results for Asthma Symptom Severity Groups, Asthmatic and Nonasthmatic

Table 2. Spirometry Results for Asthma Symptom Severity Groups, Asthmatic and Nonasthmatic

	Median (Interquartile Range)				
	Mild (n = 57)	Moderate (n = 34)	Severe (n = 27)	Asthma (n = 118)	Nonasthma (n = 106)
FEV_1, % predicted	96.9 (18.8)	97.8 (14.5)	95.8 (18.3)	96.9[a] (17.1)	101.2 (15.1)
FVC, % predicted	98.7 (18.8)	100.2 (18.7)	101.6 (13.0)	99.3 (16.5)	100.4 (17.9)
FEV_1/FVC, %	84.3[b] (9.3)	83.1 (8.7)	78.5 (10.5)	83.2[c] (10.5)	86.0 (9.1)
$FEF_{25\%-75\%}$, % predicted	90.4[b] (26.8)	87.5 (32.2)	75.8 (41.3)	86.5[c] (32.0)	100.9 (26.8)
PEF, % predicted	100.6 (19.1)	106.1 (23.3)	96.0 (19.9)	100.6 (22.4)	101.1 (20.0)

Abbreviations: $FEF_{25\%-75\%}$, forced expiratory flow, midexpiratory phase; FEV_1, forced expiratory volume in the first second of expiration; FVC, forced vital capacity; PEF, peak expiratory flow rate.

[a] $P < .01$ asthma vs nonasthma.

[b] $P < .05$ mild asthma vs severe asthma.

[c] $P < .001$ asthma vs nonasthma.

van Dalen, C. et al. Arch Pediatr Adolesc Med 2008;162:1169-1174.

ARCHIVES OF PEDIATRICS & ADOLESCENT MEDICINE

Predictors of Symptoms Are Different From Predictors of Severe Exacerbations From Asthma in Children

Ann Chen Wu et al. CHEST 2011; 140(1):100-107

lower FEV 1 /FVC ratio is associated with persistent symptoms and severe exacerbations.

PFR nella Gestione dell'Asma

Sono Utili le PFR ?

- **Nair SJ, et al**
  The influence of pulmonary function testing on the management of asthma in children
  ***J Pediatr* 2005;147:797-801**

- **Holt EW, et al**
  The impact of spirometry on pediatric asthma diagnosis and treatment
  ***J Asthma* 2006;43:489-493**

- **Yawn BP, et al**
  Spirometry can be done in family physicians' offices and alters clinical decisions in management of asthma and COPD
  ***Chest* 2007;132:1162-1168**

THE INFLUENCE OF PULMONARY FUNCTION TESTING ON THE MANAGEMENT OF ASTHMA IN CHILDREN

SUJA J. NAIR, MD, KAREN L. DAIGLE, MD, PETÉ DECUIR, APRN, CRAIG D. LAPIN, MD, AND CRAIG M. SCHRAMM, MD

J Pediatr 2005;147:797-801

- **Objective** To assess how often in a single encounter that pulmonary function tests (PFTs) influenced management decisions in children with asthma, beyond what was obtained from history and physical examination alone

- **Study Design** Children with asthma (n = 367, age 4 to 18 years) performed spirometry before clinical evaluation. Physicians and nurse practitioners in the outpatient pulmonary office evaluated the children and made initial treatment recommendations before reviewing the spirometry results. Any changes based on the test results were documented.

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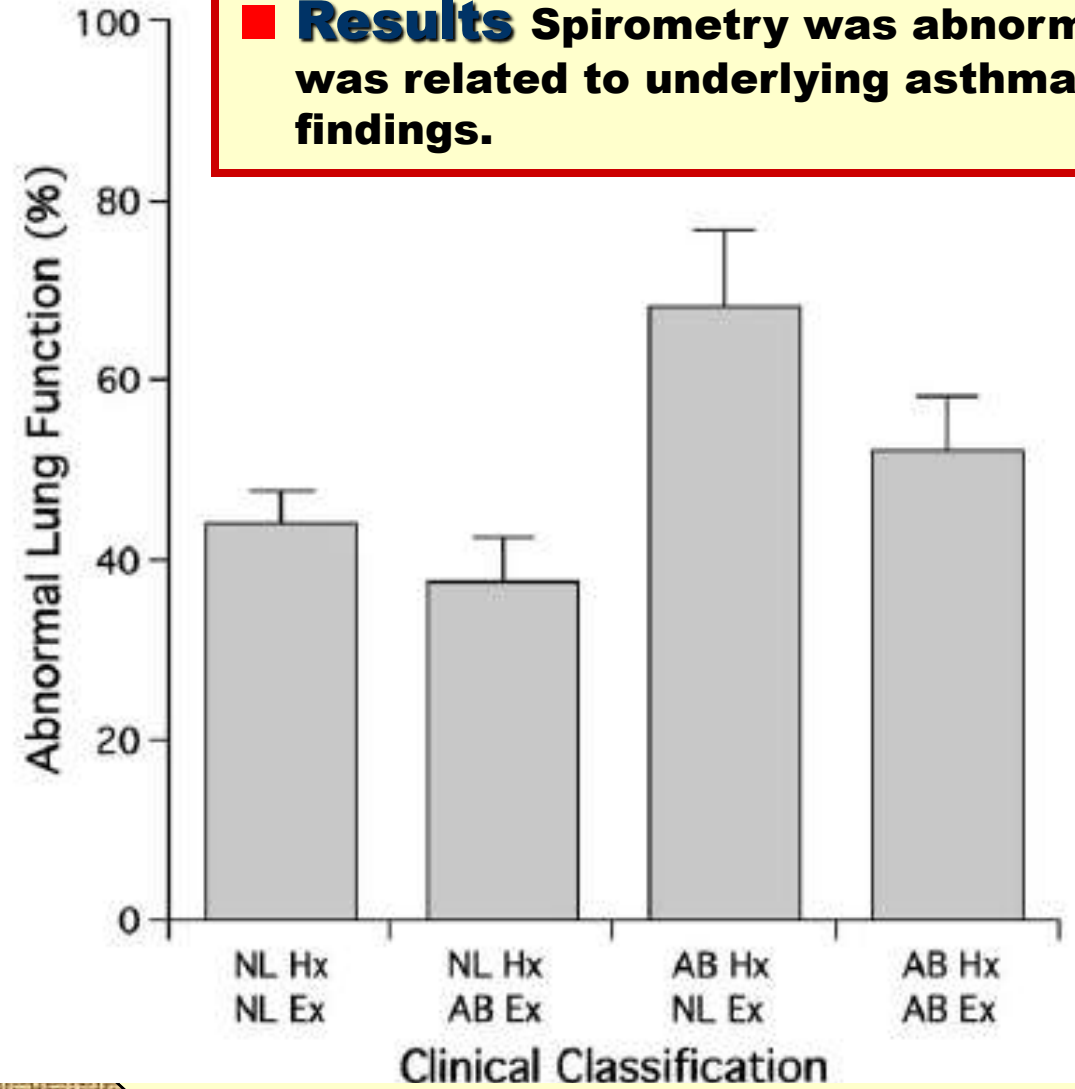
- **Results** Spirometry was abnormal in 45% of the visits. This was related to underlying asthma severity but not to clinical findings.



- **Results** PFT results changed management decisions in 15% of visits. This frequency was not affected by the patient's age, disease severity, symptom control, or exam findings.

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Results

- ✓ **When spirometry did not change treatment decisions, the provider was more likely to maintain therapy (58%) than to increase (17%) or decrease (24%) therapy**
- ✓ **In contrast, when spirometry did change treatment decisions, the provider was more likely to increase therapy (75%) than to maintain (20%) or decrease (5%) therapy**

Conclusions

- ✓ **Without PFTs, providers often overestimated the degree of asthma control**
- ✓ **This incorrect assessment could have resulted in suboptimal therapy**
- ✓ **Thus spirometry is recommended in the assessment and monitoring of children with asthma**

THE IMPACT OF SPIROMETRY ON PEDIATRIC ASTHMA DIAGNOSIS AND TREATMENT

Holt EW, Tan J, Hosgood HD

J Asthma 2006;43:489-493

Study Design

56 children who presented with an acute asthma exacerbation. Physicians recorded patient diagnosis before and after viewing spirometry.

Results

Wheezing was significantly associated with FEV1 in bivariate analysis. Physicians changed 30.4% of patients' treatment plans after viewing spirometry results.

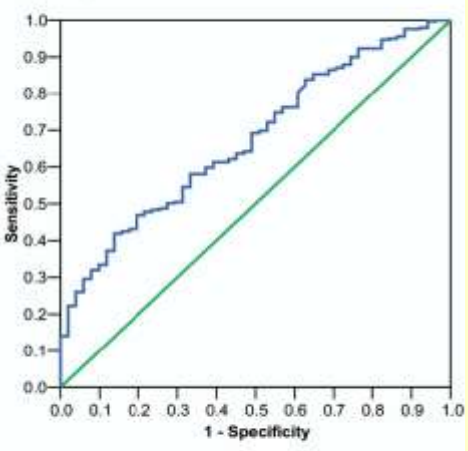
Conclusions

The use of spirometry influenced patient diagnosis and treatment

Value of the Bronchodilator Response in Assessing Controller Naïve Asthmatic Children

Stanley P. Galant, MD, Tricia Morphew, MS, Silvia Amaro, RN, and Otto Liao, MD

J Pediatr 2007;151:457-62



Study Design

346 controller naïve children with asthma and 51 children without asthma, aged 4 to 17 years, performed spirometry and BDR

Results

A BDR >9% best differentiated the two populations with a sensitivity rate of 42.5% and a specificity rate of 86.3%

Conclusions

We recommend that the BDR be performed in all children ≥6 years old who are suspected of having BA as a practical tool that may help the physician decide which therapeutic strategy is most appropriate

Increasing asthma mortality–fact or artifact?

Sears MR. -*J Allergy Clin Immunol* 1988;82:957-60.

Le misure della funzionalità respiratoria dovrebbero inoltre essere usate per monitorare il decorso dell'asma e la risposta del paziente alla terapia. Una scarsa percezione della gravità dei sintomi dell'asma da parte del paziente o del medico curante potrebbe essere uno dei principali fattori che causano un ritardo dell'inizio del trattamento e potrebbe così contribuire all'incremento della morbilità e della mortalità dovute alle riacutizzazioni dell'asma

Effect of pulmonary function testing on the management of acute asthma

Emerman CL et al. Arch Int Med 1995; 155: 2225

In assenza di misurazioni della funzionalità respiratoria può essere sovrastimata la validità del controllo della malattia asmatica

Utilità del test di funzionalità respiratoria

individuare con maggiore precisione e precocemente i non-responders ed i bambini a rischio di crisi asmatica grave.

Relating small airways to asthma control by using impulse oscillometry in children

Yixin Shi et al. J Allergy Clin Immunol 2012;129:671-8.

Uncontrolled asthma is associated with small airways dysfunction, and IOS might be a reliable and noninvasive method to assess asthma control in children.

The utility of forced expiratory flow between 25% and 75% of vital capacity in predicting childhood asthma morbidity and severity

Devika R. Rao et al. J Asthma. 2012 August ; 49(6): 586-592.

Subjects with a low FEF25-75 (Group C) had nearly 3 times the odds (OR 2.8, $p<0.01$) of systemic corticosteroid use and 6 times the odds of asthma exacerbations (OR 6.3, $p>0.01$) compared with those who had normal spirometry (Group A). Using FEF25-75 to define bronchodilator responsiveness identified 53% more subjects with asthma than did using a definition based on FEV1.

Conclusions—A low FEF25-75 in the setting of a normal FEV1 is associated with increased asthma severity, systemic steroid use and asthma exacerbations in children. In addition, using the percent change in FEF25-75 from baseline may be helpful in identifying bronchodilator responsiveness in asthmatic children with a normal FEV1.

Predictors of Remitting, Periodic, and Persistent Childhood Asthma

Ronina A. Covar et al.- *J Allergy Clin Immunol*.

2010 February ; 125(2): 359–366

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Table 2

Baseline predictors of remitting, periodic, or persistent asthma in childhood (N=884)

	Remitting vs. Persistent		Periodic vs. Persistent	
Baseline measures	**Odds Ratio (95% Confidence Interval)**	**P-value**	**Odds Ratio (95% Confidence Interval)**	**P-value**
Mild vs. moderate asthma	2.01 (1.08, 3.74)	**0.03**	1.37 (1.02, 1.85)	**0.04**
Not sensitive or exposed to any indoor allergen*	3.23 (1.69, 6.25)	**<0.001**	1.49 (1.05, 2.08)	**0.02**
IgE<502 ng/mL (median) vs. ≥ 502 ng/mL	1.75 (0.90, 3.45)	0.10	2.08 (1.49, 2.86)	**<0.001**
Age at randomization (years)	1.23 (1.05, 1.43)	**0.01**	1.11 (1.03 1.19)	**0.01**
Pre-BD FEV_1 (% predicted)	1.05 (1.01, 1.09)	**0.02**	1.05 (1.03, 1.07)	**<0.001**
Pre-BD FVC (% predicted)	0.96 (0.92, 1.00)	**0.04**	0.96 (0.95, 0.98)	**<0.001**
log methacholine FEV_1 PC_{20} (mg/ml)	1.39 (1.03, 1.87)	**0.03**	1.24 (1.07, 1.43)	**0.003**

Relating small airways to asthma control by using impulse oscillometry in children

Yixin Shiet al. J Allergy Clin Immunol 2012;129:671-8.

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