CHEST PAIN IN CHILDREN:

"IS MY CHILD GOING TO DIE?"

Thomas C. Martin MD, FAAP, FACC
EMMC Pediatric Cardiology
Eastern Maine Medical Center
Bangor, Maine

DISCLAIMER

- Presentation at the Maine Chapter, American Academy of Pediatrics, Spring Educational Conference, Bar Harbor, Maine May 4, 2013.
- I have no financial relationships or conflicts in relation to the products or services described in this presentation.

CHEST PAIN IN KIDS

- Chest pain is a common complaint, 7th most common reason for seeing a health care provider.
- Chronic in 1/4 to 1/3 of children, 40% miss some school, 70% have activities restricted.
- Adolescents thought they were having a heart attack (44%), had heart disease (12%) or cancer (12%).

THE PROBLEM

Patient/Parent Suspect Cause

- Cardiac 52-56%
- Musculoskeletal 13%
- Respiratory 10%
- Skin infection 3%
- Breast 3%
- Cancer 0-12%
- Unsure 10-19%

Health Provider Suspect Cause

- Idiopathic 21-45%
- Musculoskeletal 15-31%
- Hyperventilation 0-30%
- Breast 1-5%
- Respiratory 2-11%
- Gastrointestinal 2-8%
- Cardiac 1-6%
- Other 9%

MUSCULOSKELETAL CHEST PAIN

- **Costochondritis:** parasternal tenderness, pleuritic.
- **Slipping Rib Syndrome:** lower ribs slip, pinch nerve.
- **Precordial Catch:** brief, sharp, sudden, 1 intercostal space.
- **Muscular pain:** school bag, weight lifting, new sport.

PSYCHOGENIC CHEST PAIN

- More common after age 12 years.
- **Anxiety/Conversion disorder:** stressful event, other somatic complaints, insomnia.
- **Hyperventilation:** sense of dread, lightheadedness, paresthesias.
- Musculoskeletal pain triggering the above disorders.

BREAST & CHEST PAIN

- **Gynecomastia** in adolescent males result in anxiety, pain.
- **Mastitis, fibrocystic disease** in adolescent women.
- **Thelarche** in preadolescent women.
- **Tenderness** during pregnancy.
- Often cancer worries undely complaints.

RESPIRATORY CHEST PAIN

- **Infections:** pneumonia and bronchitis.
- **Asthma:** exercise induced or undertreated.
- **Pleuritis/Effusion:** pleuritic, positional.
- **Pneumothorax:** trauma or underlying lung disease, Marfan syndrome.

GASTROINTESTINAL CHEST PAIN

- **Esophagitis:** most common GI disorder (70%).
- **Gastritis:** 20% on endoscopy.
- **Esophageal dysmotility:** spasm or achalasia may be seen with esophagitis.
- **Others:** strictures, foreign body, caustic ingestions.

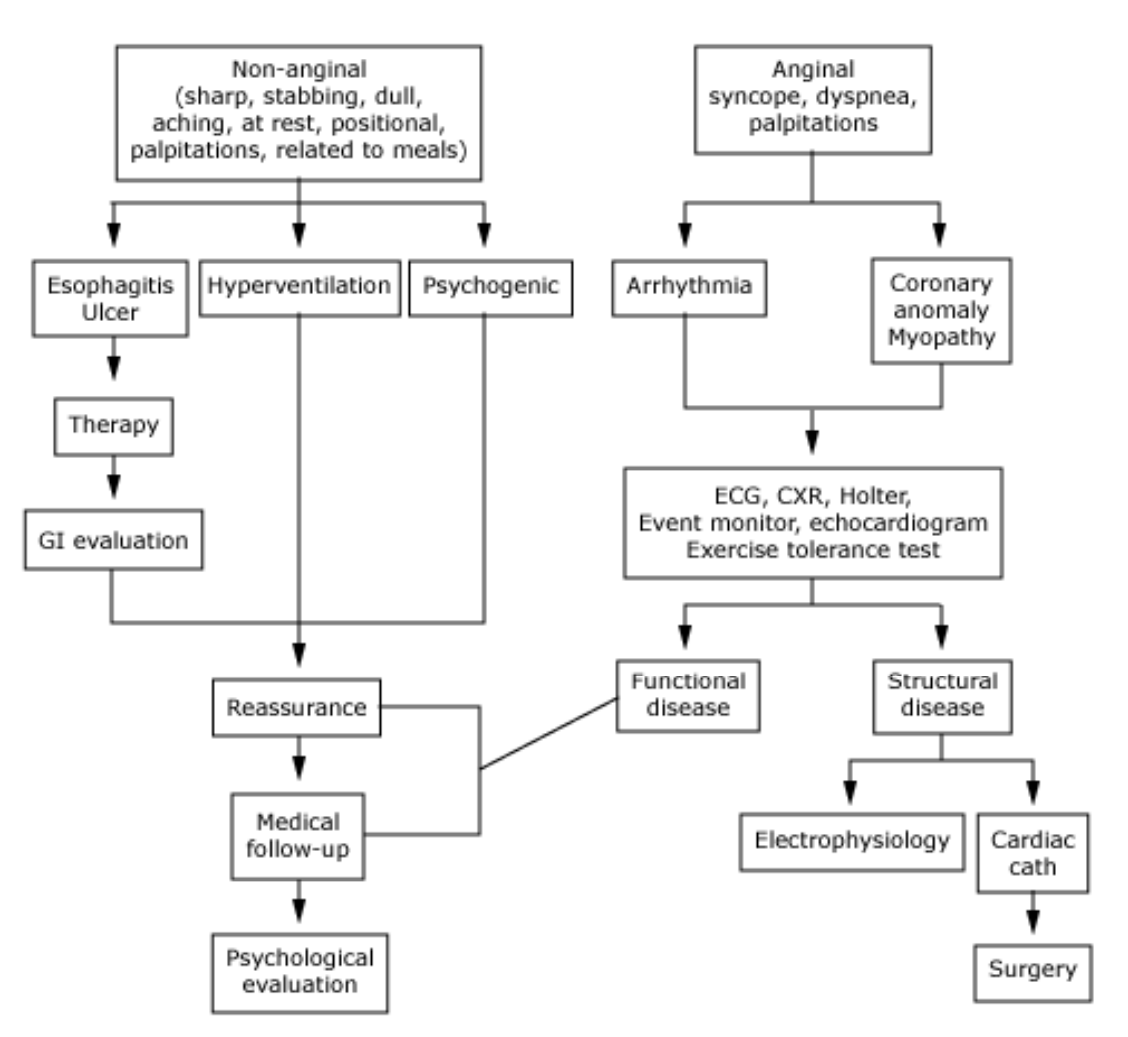
CARDIAC CHEST PAIN

- **Pulmonary embolus**, pulmonary hypertension, acute chest syndrome (sickle cell).
- **Pericarditis & myocarditis:** infection, autoimmune.
- **Coronary artery anomalies:** congenital or acquired.
- **Aortic root dissection:** Marfan, Ehlers-Danlos IV , Turner syndrome.

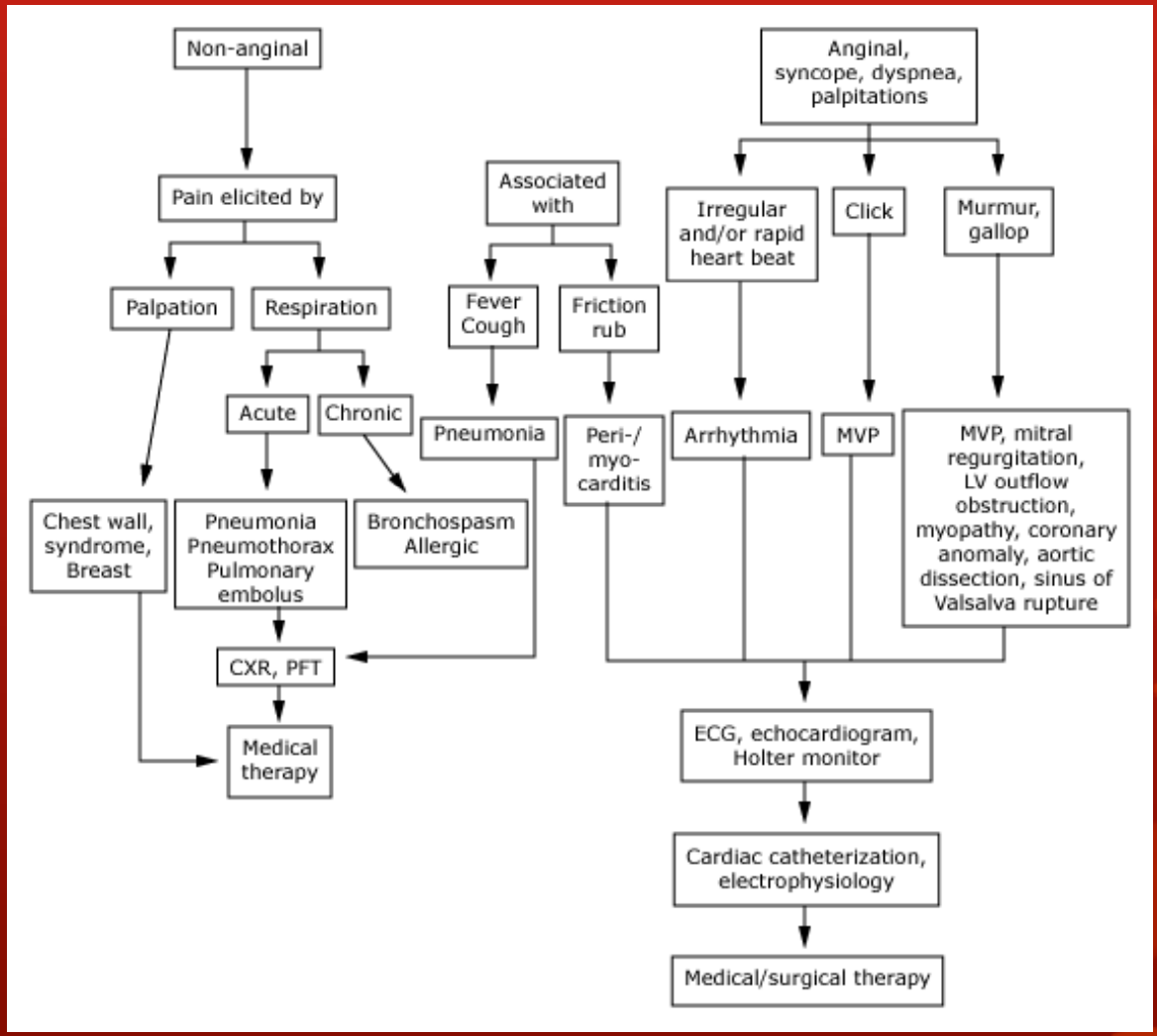
CARDIAC CHEST PAIN

- **Left ventricular outflow obstruction:** hypertrophic cardiomyopathy, supra-, sub- or valvar aortic stenosis, coarctation.
- **Coronary artery vasospasm.**
- **Mitral valve prolapse.**
- **Ruptured sinus of Valsalva aneurysm.**
- **Arrhythmias.**

CHEST PAIN WITH A NORMAL PHYSICAL EXAM



CHEST PAIN WITH AN ABNORMAL EXAM



WHO DIES DURING SPORTS?

- 2 to 4 young athletes per 100,000 per year. African ethnicity higher.
- Hypertrophic cardiomyopathy (2-36%).
- Congenital coronary artery anomalies (12-33%).
- Arrhymogenic right ventricular hypertrophy (4-22%).
- Myocarditis (6-7%).

WHO DIES DURING SPORTS?

- Mitral valve prolapse (4-6%)
- Aortic root dissection (2-3%).
- Premature coronary disease (2-3%).
- Channelopathy (2-3%).
- Idiopathic dilated cardiomyopathy (2%)
- Drugs, WPW syndrome, commotio cordis.

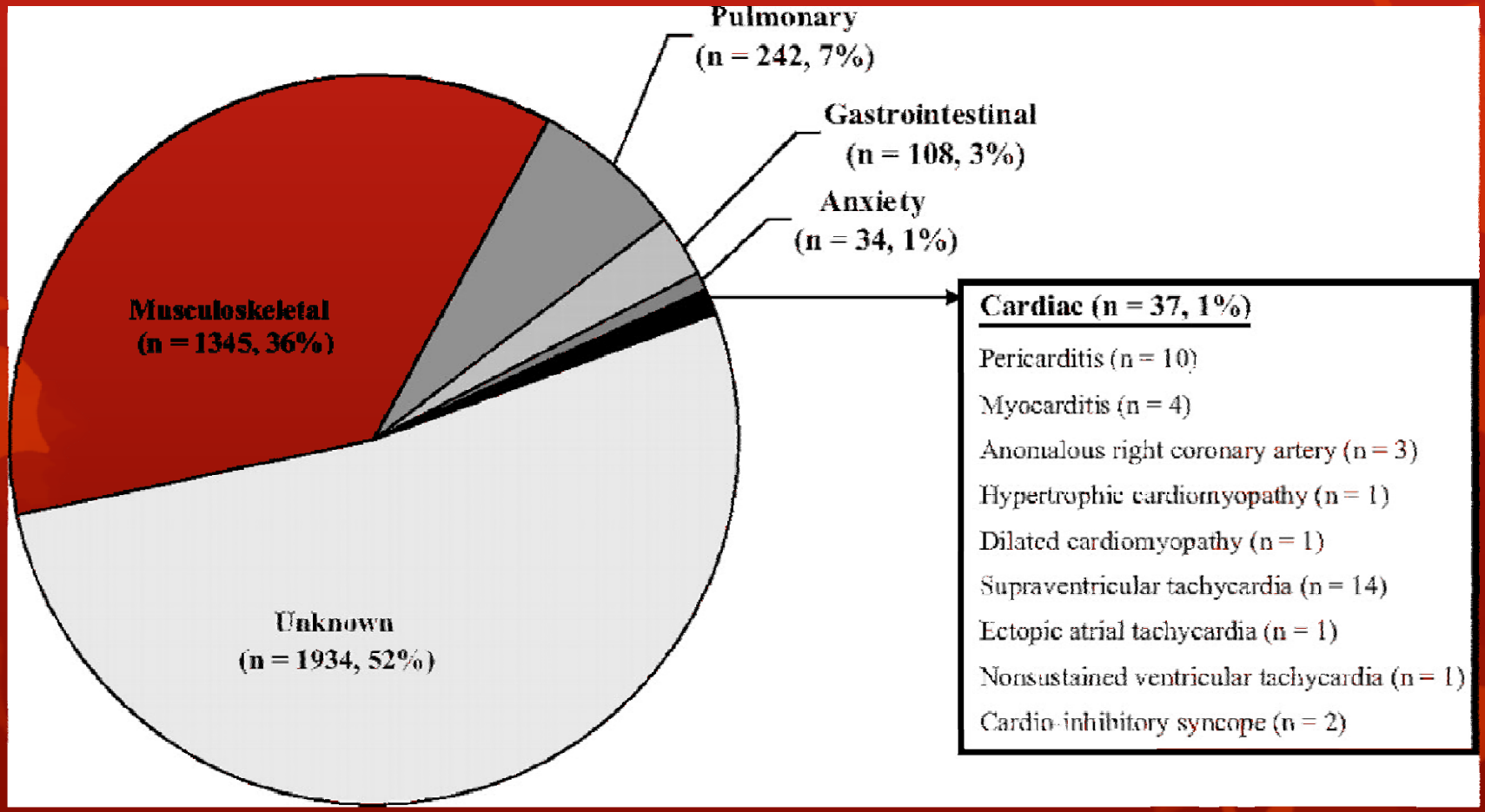
REASSURANCE AND EXPENSE

- How do we relieve the worry associated with chest pain without doing every test on everybody?
- A quality improvement initiative at Children's Hospital Boston called Standardized Clinical Assessment and Management Plan (SCAMP) tries to answer this question.

CHEST PAIN & THE HEART

- Records of children over 6 years old with chest pain seen at CHB from 2000 to 2009 were reviewed.
- 3,700 children (7 to 22 yo, m 13 yo) with chest pain (33% exertional) were evaluated.
- 37 (1%) had heart issue, 0 cardiac deaths in nearly 18,000 patient years of follow-up.

CHEST PAIN CHB 2000-09



CHEST PAIN EVALUATION

- **History** (medical 21%, family 6% positive) and physical examination (4% abnormal) in 100%.
- **Electrocardiogram** in 100%, 4.5% abnormal.
- **Echocardiogram** in 38%, 11.9% abnormal.
- **Exercise stress tests** in 21%, 0.1% abnormal.
- **Prolonged ECG monitoring** in 30%, 1.1% abnormal.

SIGNIFICANT HISTORY:

- Association with exertion or exertional syncope.
- Radiation to back, jaw, left arm, or left shoulder.
- More pain with supine position.
- Temporal association with fever.
- History of systemic inflammatory disease, malignancy, hyper-coagulable state, myopathy or prolonged immobilization.

SIGNIFICANT FAMILY HISTORY:

- Sudden or unexplained death.
- Aborted sudden death.
- Cardiomyopathy.
- Severe familial hyperlipidemia.
- Pulmonary hypertension.

SIGNIFICANT PHYSICAL FINDINGS:

- Pathologic murmur, gallop, rub, abnormal second sound, distant heart sounds, hepatomegaly, decreased peripheral pulses, peripheral edema, tachypnea, fever over 38.4 degrees C.

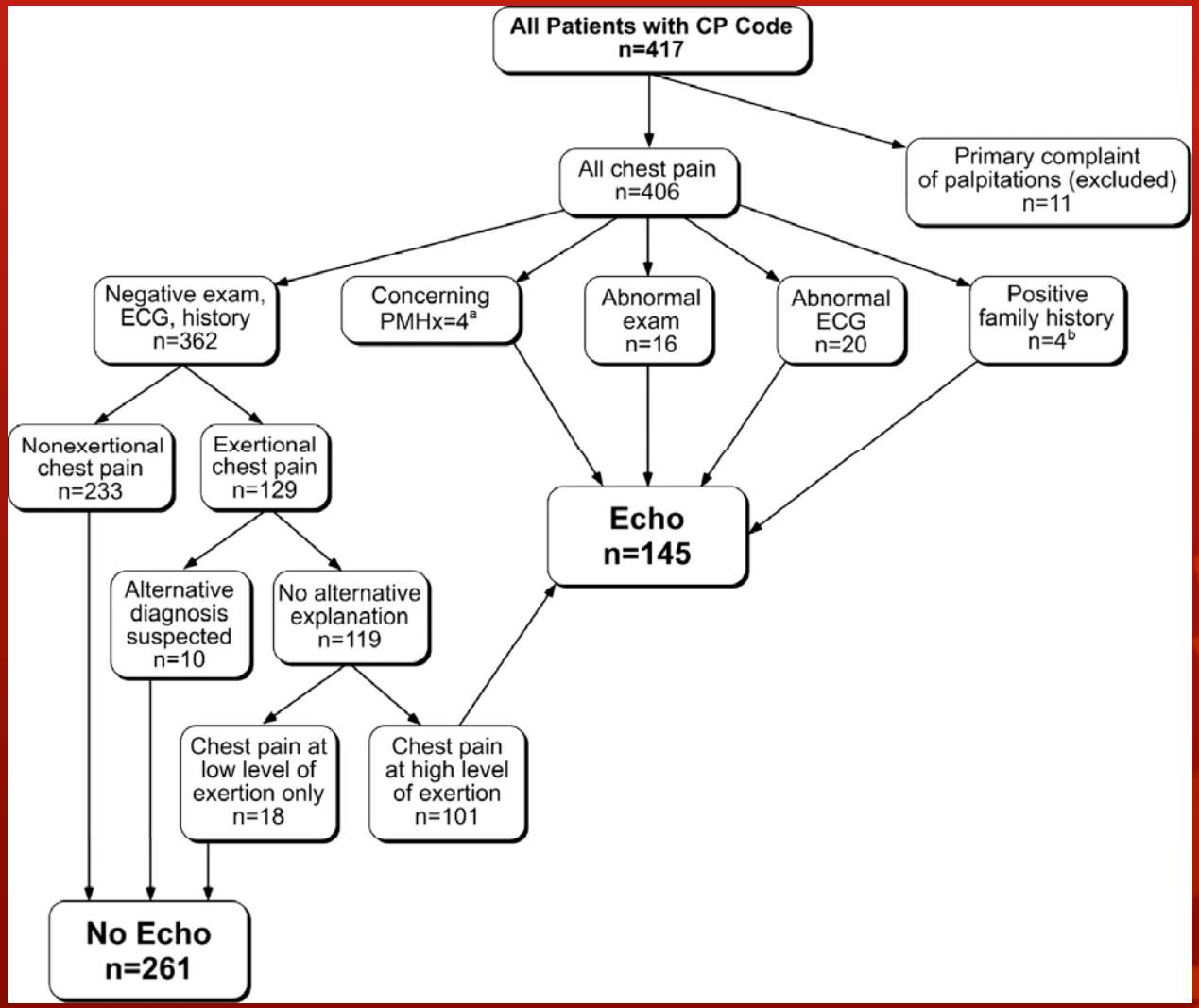
SIGNIFICANT ECG FINDINGS:

- Ventricular hypertrophy, atrial enlargement, ST-T abnormalities, high grade A-V block, ventricular or supraventricular ectopy, axis deviation, ventricular pre-excitation (IRBBB/early repolarization = normal variants).

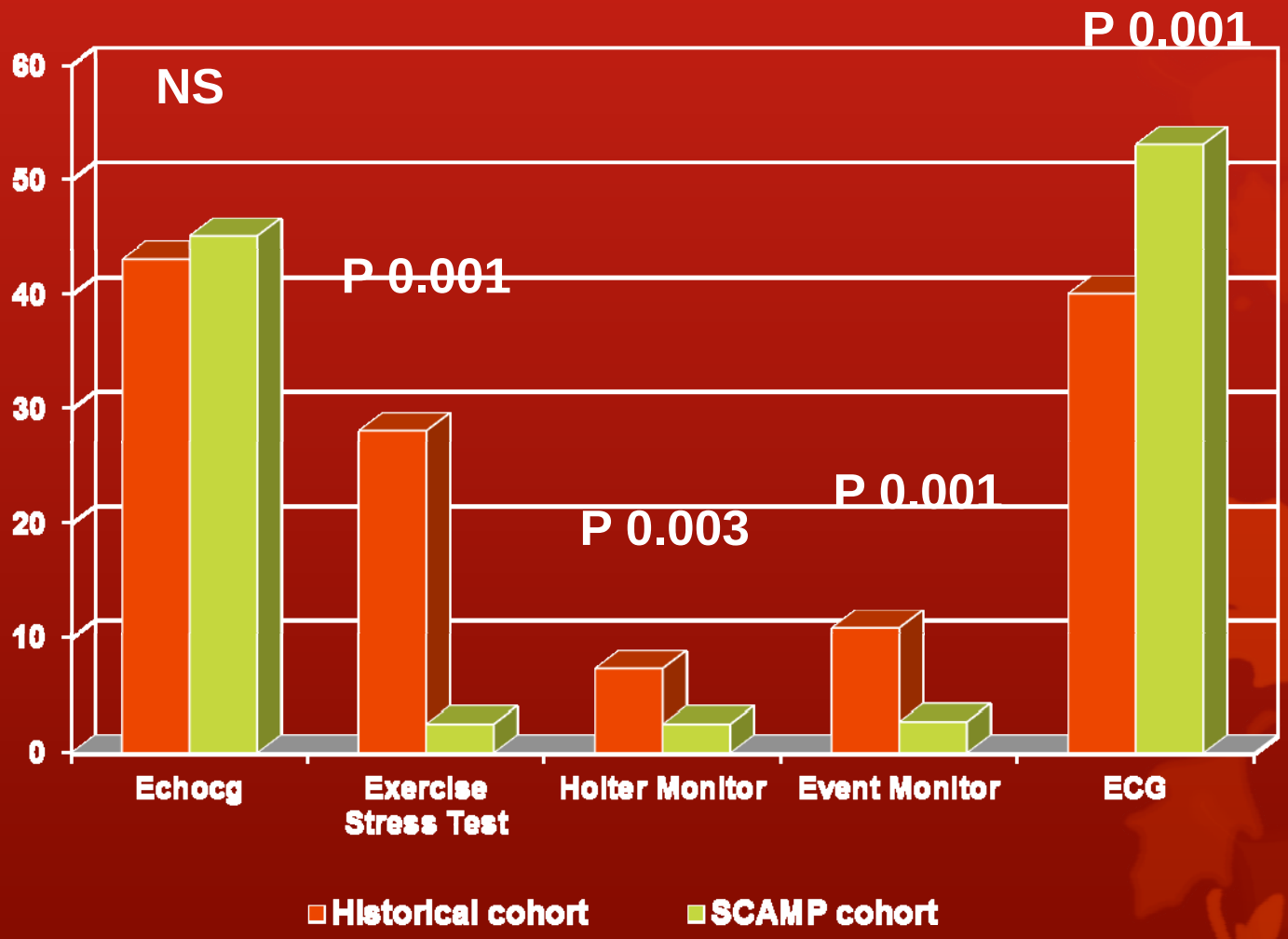
THE SCAMP CHEST PAIN ALGORITHM

- 406 patients with chest pain in 2009 at CHB had charts reviewed.
- 5 of 406 (1.2%) had cardiac etiology (2 pericarditis, 3 arrhythmia).
- 44/406 (11%) had significant medical or family history, an abnormal exam ± an abnormal ECG.
- Limiting additional testing to these could save about 20% of costs.

SCAMP CHEST PAIN ALGORITHM



SCAMP & RESOURCE USE: CHEST PAIN CHB 2010-11



SUMMARY

- Careful history, physical exam and ECG can identify most non-cardiac causes of chest pain.
- Chest pain at rest with normal ECG and echocardiogram is nearly always non-cardiac in origin.
- A cardiac cause of chest pain in children is rare (1%).

SUMMARY

- Exercise stress tests and prolonged ambulatory ECG monitoring do not add yield to assessment of exertional chest pain with normal ECG & echocardiogram.
- Use of the chest pain SCAMP algorithm may decrease practice variation, resource utilization and cost without missing life-threatening chest pain in children.

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