Syncope and Chest Pain in Children: To Refer or not to Refer

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Conflicts of Interest

No conflicts of interests or disclosures.
Family live with the fear of death at any moment

Girl died minutes after first kiss with boyfriend

Sports Illustrated

Girl, 17, killed by the sudden noise of her mobile phone

THE DAY MY HEART STOPPED

Until around 2007 when my heart gave me trouble again.
Aims
At the conclusion of this activity, participants will be able to

• identify when to refer a child presenting with chest pain or syncope to cardiology

• recognize the potential charge implications of low probability referrals and testing

• identify the need for new quality improvement initiatives surrounding referral and consultation
Case 1

• 15 year old complained of dizziness during activity
• Mother: depression, MGF: heart attack at 52 years
• Normal examination
Coronary artery anomalies

RCAA

Normal

LCA
Coronary artery anomalies

Normal

RCAA

LCA

RCA

Anomalous origin of LCA from the right sinus
Coronary artery anomalies

Normal

RCAA

LCA

RCA

Anomalous origin of LCA from the right sinus

Anomalous origin of RCA from the left sinus
Chest Pain/Syncope

Cardiac

- Hypertrophic cardiomyopathy
- Coronary artery anomalies
- Aortic stenosis
- Pulmonary hypertension
- Pericarditis/Myocarditis
- Rhythm abnormalities
Chest Pain/Syncope: When to Refer
Items representing red-flag for referrals

• Patient History
  – Chest pain with exertion
  – Exertional syncope
  – Chest pain that radiates to back, jaw, left arm, or left shoulder
  – Chest pain that increases with supine position
  – Chest pain temporally associated with fever (>38.4°C)
  – Syncope with no warning, sudden onset

• Past Medical History*
  – Hypercoagulable state
  – Arthritis/Vasculitis
  – Immobilization

• Family History
  – Sudden unexplained death
  – Cardiomyopathy
  – Hypercoagulable state

Harahsheh et al. Clinical Pediatrics (Phila). 2017 Jan 1
Items representing red-flag for referrals

• **Physical Examination**
  - RR > 40
  - Temperature > 38.4°C
  - Ill-appearing
  - Painful/swollen extremities
  - Non-innocent murmur
  - Distant heart sounds
  - Gallop
  - Pulmonic component of S₂
  - Pericardial friction rub
  - Peripheral edema

Harahsheh et al. Clinical Pediatrics (Phila). 2017 Jan 1
60% of patients with benign (vasovagal) syncope referred to cardiology did not meet any red flag criteria for referral

Tretter et al. J Pediatr 2013;163:1618-23 e1
Cardiac disease
Explaining chest pain
8/3167 (0.25%)
Study 1

• ...to determine if clinical indicators (red-flags) identified a sub-population of children with chest pain, in whom cardiac disease explained their chest pain

• ...to measure the incidence of low-probability referrals, and the magnitude of technical charges from resultant cardiac testing of these referrals

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Methods

• Standardized Clinical Assessment and Management Plans (SCAMPs®)
Cardiac Testing According to Provider Experience.

History of Present Illness

Abnormal patient history

Yes

No

1535

1632
Past Medical History

- Abnormal PMH
  - Yes
  - No

1632
24
1608
Family history

Abnormal Family history

- Yes
- No

1608

66

1542
Physical Examination

Abnormal Physical Examination

- Group 1: 1656/3167 (52.3%)
- Group 2: 1511/3167 (47.7%)
## Results

<table>
<thead>
<tr>
<th>Cardiac cause for chest pain</th>
<th>Group 1</th>
<th>Group 2</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ red-flag for referral</td>
<td>8/1,656 (0.48%)</td>
<td>0/1511 (0%)</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Harahsheh et al. Clinical Pediatrics (Phila). 2017 Jan 1
The presence of any red-flag identified subjects with a cardiac cause of chest pain with

- 100% sensitivity
- 48% specificity
- 0.5% positive predictive value
- 100% negative predictive value
Testing Rate in the benign group (n=1511)
Methods

• Standardized Clinical Assessment and Management Plans (SCAMPs®)

• Pediatric Health Information System (PHIS) database

• National Ambulatory Medical Care Survey (NAMCS)
## Technical charges for diagnostic tests for hospitals in PHIS database (2014)

<table>
<thead>
<tr>
<th>Test</th>
<th>Minimal</th>
<th>1st Quartile</th>
<th>Median</th>
<th>3rd Quartile</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrocardiogram</td>
<td>59</td>
<td>213</td>
<td>260</td>
<td>332</td>
<td>722</td>
</tr>
<tr>
<td>Echocardiogram (congenital)</td>
<td>927</td>
<td>1,731</td>
<td>2,765</td>
<td>3,525</td>
<td>5,318</td>
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<tr>
<td>Echocardiogram (non-congenital)</td>
<td>148</td>
<td>411</td>
<td>665</td>
<td>873</td>
<td>2,507</td>
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<tr>
<td>Exercise stress test</td>
<td>309</td>
<td>521</td>
<td>1,147</td>
<td>1,480</td>
<td>2,298</td>
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<tr>
<td>Holter monitor</td>
<td>214</td>
<td>612</td>
<td>795</td>
<td>1,129</td>
<td>2,001</td>
</tr>
<tr>
<td>Event monitor</td>
<td>241</td>
<td>615</td>
<td>890</td>
<td>1,238</td>
<td>2,102</td>
</tr>
<tr>
<td>Loop monitor</td>
<td>218</td>
<td>934</td>
<td>1,484</td>
<td>2,962</td>
<td>23,332</td>
</tr>
<tr>
<td>Cardiac MRI with contrast</td>
<td>1,391</td>
<td>3,230</td>
<td>4,281</td>
<td>5,366</td>
<td>9,281</td>
</tr>
</tbody>
</table>
Testing Rate and Total Charges (US2014$)

SCAMPs® Group 2 Cohort: $776K/4 years, n=1511
Testing Rate and Total Charges (US2014$)

- SCAMPs® Group 2 Cohort: $776K/4 years, n=1511
- National Estimate: $3.8M/year, n = 7415
Why so much referrals
Why so much referrals/ unnecessary testing

• Parental anxiety/preference was the reason for ordering unnecessary testing in 14% of cases\(^1\)

• Forrest et al. reported that approximately 1 in 6 (16.7%) pediatric referrals involved parental request for specialty care\(^2\)

You are not alone!

- 96% of senior pediatric residents desire more education about the referral process.
- Only 50% of the residents feel well-prepared to incorporate parental perception of the need for referral in their conversations with families.
- Only 45% feel well-prepared to address anxiety causing families to press for an unnecessary urgent referral.

Barriers to achieving fruitful encounters

• Primary pediatricians and gaps in their education
  – ability to identify red flag criteria for referral
  – to counsel and reassure families not requiring such referrals.
  – feel pressured by concerned parents

Referral and consultation is a professional activity that residents should be entrusted to do proficiently by graduation.

New curriculum
An Innovative Pilot Curriculum Training Pediatric Residents in Referral and Communication Skills on a Cardiology Rotation

Ashraf S. Harahsheh, MD, FACC, FAAP; Mary Ottolini, MD MPH; Karen Lewis, PhD; Benjamin Blatt, MD; Stephanie Mitchell, PhD; Larrie Greenberg, MD

From the Department of Pediatrics (Dr Greenberg, Dr Harahsheh, and Dr Ottolini), Division of Cardiology (Dr Harahsheh), Graduate Medical Education (Dr Ottolini), Children’s Research Institute (Dr Mitchell), Children’s National Health System, Clinical Learning and Simulation Skills Center (Drs Lewis, and Blatt), and George Washington University School of Medicine and Health Sciences, Washington, DC. The authors have no conflicts of interest to disclose.

An abstract of this project was presented at the 2014 Northeast Group on Educational Affairs Annual Retreat, New Haven, Connecticut, and another abstract of this project was presented at the Pediatric Academy Society meeting in San Diego, California, in April 2015.

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ACADEMIC PEDIATRICS 2016;16:700–702
Project 2

• To evaluate the effect of a learner-centered syncope curriculum on improving resident confidence in making a referral decision for syncope patients

• To explore if the residents overall self-efficacy and standardized patient (SP) ratings improved post-intervention

Methods

Pre-Test (90 minutes)
- Syncope Medical Knowledge cognitive exam
- Demographics data
- 2 OSCE cases
- SP check list

Mid rotation syncope workshop (90 minutes)
- Interactive, case-based presentation by a cardiologist on syncope
- Short interactive didactic on the principles of communication based on the Kalamazoo consensus and the communication model described by Korsch
- Practice with the SPs.

Post-Test (90 minutes)
- Syncope Medical Knowledge cognitive exam
- Retrospective pre and post self-efficacy questionnaire
- 2 OSCE cases
- SP check list
Results

- Forty eight residents

- Percentage of residents who were confident about their decision to refer or not refer syncope patients to cardiology increased from 28% to 98%, $p<0.001$
Overall self-efficacy of residents

Pre-test: 69.5% ± 8.8%
Post-test: 86.2% ± 6.2%
p < 0.01
Standardized Patient Ratings

Pretest: 61.1% ± 7.9%

Post test: 76.9% ± 5.6%

p < 0.01

Paired t-test = 10.221, p < .001
Results

• 19/46 (41%) residents encountered actual syncope patients during the rotation and outside this curriculum.

• Using one-way ANOVA, there was no significant difference in the degree of improvement in any of the tools used for those who saw and those who did not see a syncope patient.

Project 3

- Expand to all subspecialty rotations
- 4.5 hour workshop (pre, intervention and post)
  Concentrate on communication skills
- Blended model (pre-workshop preparation-online material)

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An Educational Intervention Utilizing Standardized Patients
to Teach Pediatric Residents the Skills of Subspecialty Referral - Ongoing

Pediatric Academic Societies 2017 Meeting, May 6 - 9 San Francisco, CA.
Presenting situation/door chart information

• Patient Name: Shelly Turner and 16-year-old daughter, Jen. This is an established patient of yours. She was diagnosed with a heart murmur as a baby but grew out of it by the time she started elementary school.

• Location: Pediatrician’s office

• Time/Date: 4:00 pm

• Hx: Jen fainted today 40 minutes after a lacrosse game (no SOB, chest pain or palpitation) with reassuring PMH (no history of cardiac or seizures), family history (no SIDS, unexplained death, drowning or car accidents, pacemakers) and normal examination. She has benign vasovagal syncope. Mother is anxious.
Presenting situation/door chart information

• Medical Information: Jen’s physical examination is normal

• Task: You have already met with the family, obtained the history portion and performed the physical examination. During that time the mother’s emotions displayed were fear and surprise. You had to step outside to answer a page and now you will counsel the family.

• Please counsel Jen’s mother, Shelly, as appropriate.

• Time: 10 minutes
Why not send to Cardiology
Red Flags for referral
Presenting situation/door chart information

- Patient Name: Jillian Roper and son Adam. This is an established patient of yours who was seen for a reassuring school physical 3 months ago. He was noted to have sinus arrhythmia, normal variation, in the past.
- Location: Pediatrician’s office
- Time/Date: 3:00 pm, today
- Complaint: Adam "fainted" when the loud buzzer went off at the end of the first half of his basketball game, his older brother drowned at age 21 while at a ROTC boot camp, unclear circumstances. These are very concerning and require a cardiology referral.
Presenting situation/door chart information

• Medical Information: Adam’s physical examination is normal.

• Task: You have already met with the family, obtained the history portion and performed the physical examination. During that time the mother’s emotions displayed were fear and sadness. You had to step outside to answer a page and now you will counsel the family.

• Please counsel Adam’s mother, Jillian, as appropriate.

• Time: 10 minutes
Communication Skills Discussed

• How can you guarantee that my son will not be the next one dropping on the field

• Why not just see the cardiologist

• How can you be 100% sure that he/she does not have heart disease?
Future Direction

• Entire curriculum online

• Quality Improvement at PMD
Thank You

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