C-HEART: Non-Invasive Prognostic for Coronary Artery Disease

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Breakfast Club  
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Emory C-HEART

CT-based software for coronary artery disease to decide invasive or non-invasive therapy

- Non-invasive
- Near real-time & On-site
- Low rates of false positives & false negatives
- Many uses in emergency & standard healthcare
Coronary Diagnostics Market

Market Opportunity
- Over 8M deaths from coronary artery disease
- Coronary diagnostic market: $20B
- 40M coronary tests ordered annually

Standard of Prognosis
- Must determine extent of artery blockage
- Most tests have high rates of false pos & neg
- FFR is gold standard but invasive (i.e. catheters)
Fractional Flow Reserve (FFR)

• Ratio of blood flow with and without plaque
• 30% decrease in negative outcomes via FFR
  – Number of stents
  – Death
  – Heart attacks
  – Repeat stenting
• FFR Market is over $2B
• Until recently required invasive methods
• FFR determination based on non-invasive, modeling procedures is approved by FDA

Unmet Need
Prognostic that uses completely patient-specific conditions, 3D models, and most accurate FFR that provides results in near real-time
## Emory C-HEART

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>HeartFlow</th>
<th>Siemens</th>
<th>Emory</th>
</tr>
</thead>
<tbody>
<tr>
<td>3D Coronary Model</td>
<td>X</td>
<td></td>
<td>✓</td>
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<tr>
<td>Rapid Turnaround Time</td>
<td></td>
<td>X</td>
<td>✓</td>
</tr>
<tr>
<td>True FFR Ratio</td>
<td>Surrogate</td>
<td>Surrogate</td>
<td>✓</td>
</tr>
<tr>
<td>Patient Conditions Only</td>
<td>Partial</td>
<td>Partial</td>
<td>✓</td>
</tr>
<tr>
<td>Multiple Clinical Uses</td>
<td>Angiography</td>
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*Uses include: Angiography, Virtual stent, Stent planning, & Rapid response to blocked arteries*
C-HEART Advantage

- Improved sensitivity & selectivity
- Near real time (<1 hr)
- On-site
- Based on 3D models & True FFR
- Wide array of uses
- Lowers cost of coronary health care
Commercial Opportunity

Funding
- GRA
- Coulter Foundation
- OTT

Next Steps
- Validation studies
- Software development

Commercialization
- Stand-alone software
- Add-on to device
Thank you!
Coronary Diagnostics

Market Opportunity

• Over 8M deaths from coronary artery disease
• Coronary diagnostic market: $20B
• 40M coronary tests ordered annually
• Sensitive & specific diagnostics are critical
Key Competitors

- CT-based, calculated based on modeling procedures
- HeartFlow *de novo* clearance from FDA in Dec 2014

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Fractional Flow Reserve (FFR)

• Ratio of blood flow with and without plaque
• Triage between invasive & noninvasive therapy

FFR-based therapy decreases negative outcomes by ~ 30%
C-HEART Advantage

**Characteristics**
- CFD Model
- Turnaround Time
- FFR Ratio
- Clinical Uses

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Current Technologies

- Clinical FFR is still a surrogate
- Can be determined non-invasively via CT scan
Stress Echo
Jung, EHJ 2008

cCTA
Min, JAMA 2012
Koo, JACC 2011
Meijboom, JACC 2008
Norgaard 2013

SPECT
Melikian, JACC CV Interventions 2010

Invasive Angiography
Park, JACC CV Interventions 2012
Meijboom, JACC 2008

IVUS
Waksman, JACC 2013

cCTA TAG
Yoon, JACC Imaging, 2012

FFRCT
Norgaard 2013

FFR
Gold Standard

Specificity vs. Sensitivity
Stress Echo
Jung, EHJ 2008

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Specificity vs. Sensitivity

Market of $3B

FFR
Gold Standard

Office of Technology Transfer
Emory University
New Technologies

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