INTRODUCTION

Angina, or commonly called chest pain, holds a major cause for morbidity and mortality worldwide. Angina is the most common symptom of ischemic heart disease. Although chest pain is the most common symptom in patients with ischemic heart disease, it can also be caused by both non-cardiac and cardiac. Without over testing and overtreating patients with less serious causes of chest pain, accurate identification of non-cardiac and cardiac causes can be achieved. It is possible to have a benign self-limiting chest wall pain, but also a serious anxiety disorder, unstable angina, and other life threatening conditions. Incidence and mortality of heart attacks lead to consequences of this disease that require comprehensive investigation of chest pain.

General practitioners face the daily challenge of reliably detecting serious heart disease and protecting patients from unnecessary tests and hospitalizations. History and physical examination remain the primary diagnostic tools due to the limited utility of ECG and cardiac troponin testing in primary care. This article was written to provide an overview of the different variations of chest pain and the development of predictive scores for use in the emergency department, primarily for the diagnosis of acute coronary syndromes. This helps rule out cardiac and non-cardiac chest pain in primary care setting.

METHODS

An online search method was used to obtain academic papers related to the current topic. The search process included multiple keywords such as ‘chest pain’, ‘excluding cardiac chest pain’, ‘excluding non-cardiac chest pain’, and ‘primary care chest pain’ in academic sites such as Google Scholar and PubMed. We have received 43 articles on the current topic. Fifteen of these were excluded because articles published before 2000 were redundant or did not focus on current topics. Only 28 articles published between 2000 and 2022 were included.

RESULTS AND DISCUSSION

General practitioners are the primary point of access to medical care for most patients suffering from chest pain. Therefore, knowing the different varieties of the cause of chest pain is considered to be a crucial first step in diagnosing. The various causes of chest pain summarized in Table 1. Based on these studies, we could conclude that 5% presented with acute cardiac ischemia, 11% presented with stable angina, 44% presented with musculoskeletal disorders related chest pain and <1% presented with pulmonary embolism (PE). There were no cases of aortic dissection that have been reported in these following primary care outpatients.

Recognizing patient risk and initiating diagnostic procedures are challenges that general practitioners must face. As general practitioners, one must do their job by protecting patients from overdiagnosis, unnecessary and inappropriate treatment. It is very crucial in distinguishing the cause of chest pain from the less common yet urgent chest pain to the more common yet less urgent. A general practitioner in a primary care must be able to distinguish such things by taking a detailed current medical and past history. In establishing a working diagnosis, one must evaluate the location, quality, duration, mitigating and exacerbation factors of the chest pain.

Chest compressions with dyspnea suggest acute coronary syndromes (myocardial infarction, unstable angina), pulmonary embolism or pain of the chest wall. In identifying the type of angina,
### Table 1. Cause of chest pain in the primary care settings

<table>
<thead>
<tr>
<th>Cases of chest pain</th>
<th>United States</th>
<th>Germany</th>
<th>Switzerland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute myocardial ischemia</td>
<td>1.5</td>
<td>3.7</td>
<td>1.5</td>
</tr>
<tr>
<td>Stable angina</td>
<td>10.5</td>
<td>11.3</td>
<td>11.2</td>
</tr>
<tr>
<td>Respiratory condition</td>
<td>5.1</td>
<td>-</td>
<td>10.3</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>-</td>
<td>-</td>
<td>0.3</td>
</tr>
<tr>
<td>Psychogenic pain</td>
<td>7.5</td>
<td>-</td>
<td>11.5</td>
</tr>
<tr>
<td>Musculoskeletal disorder-related chest pain</td>
<td>36.2</td>
<td>46.6</td>
<td>48.7</td>
</tr>
<tr>
<td>Gastrointestinal disorder-related chest pain</td>
<td>18.9</td>
<td>-</td>
<td>8.2</td>
</tr>
<tr>
<td>Non-ischemic cardiac chest pain</td>
<td>3.8</td>
<td>-</td>
<td>3.1</td>
</tr>
<tr>
<td>Unspecified chest pain</td>
<td>16.1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Other or no diagnosis</td>
<td>-</td>
<td>-</td>
<td>5.3</td>
</tr>
</tbody>
</table>

*— A study in Michigan: 399 patients from 12 primary care practices.
†— A study in Germany: approximately 1,200 patients in 74 general clinics.
‡— A study in Switzerland: 672 patients from 59 primary care practices.
§— Traumatic chest pain patients (3.9%) were included (according to references 2 – 4).

*Summarized from Bösner S et al, Becker A et al, Verdon F et al and Alharthi R et al.

### Table 2. CAD related chest pain identification score

<table>
<thead>
<tr>
<th>Variable</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1</td>
</tr>
<tr>
<td>Male ≥ 55 years old</td>
<td></td>
</tr>
<tr>
<td>Female ≥ 65 years old</td>
<td></td>
</tr>
<tr>
<td>Presence of CAD/cerebrovascular disease</td>
<td>1</td>
</tr>
<tr>
<td>Unreproducible palpation pain</td>
<td>1</td>
</tr>
<tr>
<td>Worsening pain on exertion</td>
<td>1</td>
</tr>
<tr>
<td>Patient considers cardiogenic pain</td>
<td>1</td>
</tr>
</tbody>
</table>

**Total points:**

<table>
<thead>
<tr>
<th>Score</th>
<th>CAD patients</th>
<th>Non-CAD patients</th>
<th>Ratio of Likelihood</th>
<th>Predictive value (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 1</td>
<td>3</td>
<td>542</td>
<td>0.0</td>
<td>0.6</td>
</tr>
<tr>
<td>2 - 3</td>
<td>91</td>
<td>659</td>
<td>0.9</td>
<td>12.1</td>
</tr>
<tr>
<td>4 - 5</td>
<td>94</td>
<td>56</td>
<td>11.2</td>
<td>62.7</td>
</tr>
</tbody>
</table>

*CAD = coronary artery disease.

Adapted from reference 5.

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as stated before, one must evaluate the chest pain. Evaluate the chest pain using the following three features: substernal, exercise-induced, or relief with rest or nitroglycerin. In cases of typical angina pain, all three features are present. An atypical angina pain are present with two out of three features, and non-anginal pain has only one feature. A sign and symptom assessment is inadequate to rule out stable angina and diagnose the case with a sensitivity and specificity of 69% and 89%. The likelihood of MI is increased with low blood pressure, pain radiating to both arms, sweating, or S3 gallop. Age over 60 years, male sex, and previous MI are also predictors of MI. MI is unlikely, and in cases of reproducible painful pleurisy or sharp pain, is relieved by palpation of specific tender areas. Chest wall pain can also be found in patients with a history of rheumatoid arthritis or osteoarthritis. Although there are no signs or symptoms specific to diagnosing PE, a simplified and validated scoring system is available to determine the likelihood of PE. Heart failure alone rarely causes chest pain. However, it may be associated with myocardial infarction, valvular heart disease, or acute coronary syndrome. A history of myocardial infarction and a displaced apical impulse can support the diagnosis. Dyspnea on exertion is common in patients with heart failure. A disease cause by the gastrointestinal can also cause chest pain, usually in cases where an inaccurate history taking and physical examination have been done to prevent serious gastrointestinal pathology. Ruling out and preventing life-threatening causes of chest pain (cardiovascular and pulmonary causes) is the key point. Because laboratory tests help narrow the differential diagnosis, diagnostic tests help determine whether a patient has a serious condition. A crucial approach for all adult patients that present with chest pain is ordering an electrocardiogram and chest x-ray, unless a very obvious non-threatening cause of chest pain have been ruled out by both the history taking and physical examination. Due to the challenge of ruling out coronary
Assessment of patients with chest pain

- Risk of CAD (Table 2)
  - Low risk (0 - 1 point)
  - Moderate risk (2 - 3 points)
  - High risk (4 - 5 points)
- Non-cardiac related chest pain must be evaluated, unless arrhythmia, heart murmur or dyspnea are present.
- Persistent findings of ischemic heart disease shown as ST-segment elevation more than 1 mm, new LBBB, Q/T-wave
  - Normal ECG/non-specific ST-T wave changes are present?
    - No
    - Yes
     1st choice: Order troponin testing. Normal results six hours after onset of chest pain indicates a risk for cardiac event in the next 30 days at only 1%.  
     2nd choice: Plan immediate evaluation, schedule a cardiac stress testing by a cardiologist, especially at least two of the following risk factors are present: Aged ≥60, pressure-type pain; or pain radiating to arm, shoulder, neck, or jaw
  - Abnormality of ECG that shows non-ischemic
- Evaluate and treat etiology

Figure 1. Chest Pain Algorithm in Primary Care Setting Patients.

CONCLUSION

Non-life-threatening and life-threatening causes can lead to chest which requires immediate treatment. An accurate diagnosis requires consideration of a physical examination and medical history. However, in some cases, some diagnostic tests are required. Using simple predictive rules based only on symptoms and signs, coronary artery disease can be ruled out in primary care setting patients presenting with chest pain, thereby distinguishing between cardiac and non-cardiac chest pain.

The score does not replace the clinical judgment of a GP, due to the inapplicability of the score when encountering a patient with findings strongly suggesting acute coronary syndrome or requiring emergency hospital care. Rather, it targets the majority of remaining patients who present with chest pain and for whom coronary artery disease may still be the underlying cause. We expect predictive rules to help avoid overdiagnosis and unnecessary investigation.

AUTHOR CONTRIBUTION

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CONFLICT OF INTEREST

No conflict interest was involved, all authors understood and agreed to the publication of the final manuscript.

REFERENCES