Interpreting angina: symptoms along a gender continuum

Catherine Kreatsoulas,1 Mary Crea-Arsenio,2 Harry S Shannon,2 James L Velianou,2,3 Mita Giacomini4

ABSTRACT

Background: ‘Typical’ angina is often used to describe symptoms common among men, while ‘atypical’ angina is used to describe symptoms common among women, despite a higher prevalence of angina among women. This discrepancy is a source of controversy in cardiac care among women.

Objectives: To redefine angina by (1) qualitatively comparing angina symptoms and experiences in women and men and (2) to propose a more meaningful construct of angina that integrates a more gender-centred approach.

Methods: Patients were recruited between July and December 2010 from a tertiary cardiac care centre and interviewed immediately prior to their first angiogram. Symptoms were explored through in-depth semi-structured interviews, transcribed verbatim and analysed concurrently using a modified grounded theory approach. Angiographically significant disease was assessed at ≥70% stenosis of a major epicardial vessel.

Results: Among 31 total patients, 13 men and 14 women had angiographically significant CAD. Patients describe angina symptoms according to 6 symptomatic subthemes that array along a ‘gender continuum’. Gender-specific symptoms are anchored at each end of the continuum. At the centre of the continuum, a remarkably large number of symptoms commonly expressed by both men and women.

Conclusions: The ‘gender continuum’ offers new insights into angina experiences of angiography candidates. Notably, there is more overlap of shared experiences between men and women than conventionally thought. The gender continuum can help researchers and clinicians contextualise patient symptom reports, avoiding the conventional ‘typical’ versus ‘atypical’ distinction that can misrepresent gendered angina experiences.

INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of morbidity and mortality in the western world, and among patients with established CVD, mortality rates among women are equal to1 2 or exceed those in men.3 Despite women’s 50% lifetime risk of dying from CVD,4 5 and higher prevalence of angina,6 there remains a perception that CVD is a ‘man’s disease’.

Over the past half century, this misperception has led to the underappreciation, underrecognition and underdiagnosis of CVD in women, resulting in less medical therapy and fewer invasive procedures compared with men.7-13 This difference in care is often interpreted as the ‘sex/gender bias’, and we posit it is a result of confusion surrounding gender-typical symptomology, secondary to systemic exclusion/poor representation of women in research studies. Historically, early studies of angina were comprised mostly of men, and whether we realise this today or not, our understanding of angina is based on an underlying male construct.16 17 Further fortifying the male-centric construct, women were excluded from many early published...
studies, even among large landmark trials including studies on which the current gold standard for angina classification were developed and validated. While CVD was assumed to progress similarly in women, when discrepancies in the disease presentation occurred, women were characterised as ‘uncomplicated’, or labelled as ‘atypical’, implying, ‘atypical compared to men’. As a result, the term ‘atypical angina’ is used today to describe symptoms common in women; however, this term is framed on exclusion criteria with no clear definition even among clinical guidelines. As a result, this lack of clarity and erroneous assumptions in the historical construction of angina symptomology likely contributes to the contemporary sex/gender bias seen in the cardiac care of women today.

**Sex and gender: what is the difference?**
While the terms sex and gender are often used interchangeably, the concepts they represent are not: sex is defined as ‘the biological differences between females and males, including reproductive, anatomical and physiological differences’, while gender refers to the array of socially constructed roles, relationships, beliefs, norms, attitudes, behaviours, values and relative power that society ascribes to the two sexes on a differential basis. Thus, ‘aspects of sex will not vary substantially between different human societies, while aspects of gender may vary greatly’. Differences in how angina manifests in men versus women depend on bodily sex differences and culturally gendered patient experiences and language expression.

**Study objectives**
To better understand angina in women and men, it is necessary to redefine the angina construct in gender-relevant terms. Qualitative methodology is ideally suited to explore and capture the interplay of individual patient factors and angiographic outcomes were also collected. Data collection continued until analytic saturation was reached. Interviews, ranging 12–50 min in length, were audio-recorded and transcribed verbatim. The interviewer also collected field notes with supplementary observations after each interview.

Following the interview, patients underwent coronary angiography according to standard of care. An experienced angiographer blindly interpreted angiographic images. Only patients with obstructive CAD were included in our analysis, defined as at least one vessel ≥2.0 mm with ≥70% lesion stenosis.

**Inclusion/exclusion criteria**
Eligible participants were referred for coronary angiography for a primary diagnosis of suspected coronary artery disease (CAD) and had at least one prior abnormal test such as exercise stress test, nuclear imaging, electrocardiogram changes or elevated troponin. Patients were excluded if they were referred for valvular disease, arrhythmia, preoperation, had prior evidence of a myocardial infarction, had undergone previous coronary artery bypass graft surgery, percutaneous coronary intervention or were unable to communicate in English.

**Data collection**
Patient symptoms and perceptions of their symptoms were explored using in-depth semi-structured interviews (see online supplementary appendix A). Patient characteristics including demographics, cardiac risk factors and angiographic outcomes were also collected. Data collection continued until analytic saturation was reached. Interviews, ranging 12–50 min in length, were audio-recorded and transcribed verbatim. The interviewer also collected field notes with supplementary observations after each interview.

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**Qualitative data analysis**
NVivo-8 software (QSR International Pty Ltd, Australia) was used for data coding, and the analysis followed staged coding conventions (initial open coding, axial, theoretical coding) consistent with grounded theory. Initial coding was collaborative, involving three investigators (CK, MC, MG). Constant comparison was used to relate emerging categories to the data, checking each coded datum with the rest of the data to establish analytic categories. Analyses were considered ‘saturated’ when sufficient data supported key categories and new data did not further challenge or develop the grounded theory.
STUDY RESULTS
Description of study population
The total study population consisted of 17 women and 14 men, of which 14 women and 13 men had obstructive CAD. The mean age was 66 years (range 44–84 years) for women and 60 years for men (range 38–71 years). Women reported a higher risk factor burden than men, where all women reported at least three CVD risk factors and all men reported at least one CVD risk factor.

Main study findings
When patients freely described their symptoms, symptoms were described along two main themes; 1) physical symptoms and 2) descriptors and hypotheses/analogies, with six sub-themes (table 1). Our gender-centred analysis revealed that cardiac-related symptoms array along a gender continuum. Represented and anchored on one end of the continuum are experiences reported mostly by men, and anchored at the opposite end of the continuum are experiences mostly reported by women. The term ‘shared experience’ is situated in the centre of the continuum to represent the overlap of symptoms expressed by both men and women (figure 1).

Location of chest pain/discomfort
Men and women commonly reported a type of ‘pain’ in the chest region, although they sometimes preferred to use other descriptive terminology to best capture their sensation. Pain/discomfort in the chest region was reported as being localised in the central chest area or to the right of centre (figure 2). There were no differences in the location of chest pain between men and women (figure 1).

Non-chest localised areas of pain/discomfort
Men and women described arm pain as localised at top of the arms, a tingling sensation in the left arm, right arm weakness and/or pain in both arms up to the elbows/bicep area. Pain/discomfort in the back was described as centred in the upper back, spanning across from shoulder to shoulder, or as a backache in the upper mid-back. Women additionally reported neck pain and tightness in the throat. Men in our study did not report any unique localised areas of pain/discomfort (figures 1 and 2).

Other associated symptoms
In addition to localised areas of pain, almost all women and men reported shortness of breath with some difficulty breathing and periods of profuse sweating followed by coldness/clamminess with their localised pain. Men expressed ‘feeling pale’ and ‘feelings of aggravation’. Women provided detailed accounts of many other concurrent symptoms including dizziness, weakness, sweating at night, feeling faint/fainting, fatigue, dry mouth, confusion, anxiety and panic. Women would often recall other associated symptoms throughout the interview, even when discussing other topics (figures 1 and 2).

Functional symptoms
Almost all patients in our study complained of shortness of breath, especially on exertion, often accompanied by chest pain/discomfort. Most patients reported experiencing shortness of breath for some time before seeking medical attention (figure 1). However, patients reported stopping, slowing down, limiting or avoiding physical activity altogether when experiencing or anticipating ‘shortness of breath’. Older patients often decreased overall activity to avoid this symptom (figure 2).

Descriptors of pain/discomfort
Men and women had distinct differences in the terms they used to capture their pain/discomfort. Overall, men used succinct language to report their symptoms. Men would report ‘chest pain’, often qualifying their pain/discomfort with terms such as ‘not severe, uncomfortable’ and ‘not a huge pain’. Women and men commonly emphasised that it was ‘not a sharp pain’, ‘it was more of a tightness’, ‘discomfort’, ‘a very funny pain’. There was some unwillingness to commit to use the term ‘pain’ to describe their sensation, correcting the attending clinician’s use of the term, ‘pain’, opting for more preferred terms such as ‘discomfort’, ‘pressure’, ‘tightness’ and ‘weakness’ (figure 2). Women would spend more time than men searching for a more accurate descriptive term to capture their sensation, and most often described it as a ‘pressure’. The expansiveness of chest ‘pain’ descriptions increase along the gender continuum, with women using a greater number of descriptive terms to describe their pain compared to men (figures 1 and 2).

Symptom hypotheses
Interviews were conducted immediately prior to angiography to explore symptoms prospectively, before potentially influenced by angiographic results. Patients often had a working hypothesis to the cause of their pain and often used hypotheses/analogies to compare their pain to some other pain familiar to them. The most common hypotheses for men and women include

Table 1 Main themes and subthemes of gender-centred angina symptomology

<table>
<thead>
<tr>
<th>Main theme</th>
<th>Subthemes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical symptoms</td>
<td>Location of chest pain/discomfort</td>
</tr>
<tr>
<td></td>
<td>Non-chest localised areas of pain/discomfort</td>
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<td></td>
<td>Other associated symptoms</td>
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<tr>
<td></td>
<td>Functional symptoms</td>
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<tr>
<td>Descriptors and hypotheses/analogies</td>
<td>Descriptors of pain/discomfort</td>
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<td></td>
<td>Symptom hypotheses</td>
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</tbody>
</table>

indigestion, heartburn or muscle strain. In addition, several men thought their symptoms may be attributed to hiatus hernia and several women said it felt like a panic attack (figures 1 and 2).

**DISCUSSION**

Our study sought to gain a deeper understanding of the cardiac-related angina symptoms that patients experience from a gender-centred perspective. When patients freely expressed their symptoms with minimal interview structure, two main themes emerged; 1) physical symptoms and 2) descriptors and hypotheses/analogies. Physical symptoms were subcategorised into four subthemes, including location of chest and non-chest areas of pain/discomfort, other associated symptoms and functional symptoms. We arrayed these symptoms on a ‘gender continuum’ that clarifies how women and men express symptoms in similar ways as well as differently (figure 1). We found considerable overlap in the shared symptomology between men and women. For this reason, we purport that the inflexible categorisation of symptoms according to sex does not accurately reflect the diversity among individuals, and especially within the sexes. Our new ‘gender continuum’ construct of angina symptomology demonstrates that a patient’s sex can differ from their gendered expression of symptoms. More pointedly, the term ‘atypical’ angina to represent symptoms in women is challenged by this empirically grounded continuum: both men and women experience a great number of conventionally ‘atypical’ as well as ‘typical’ angina symptoms.

![Symptomatic subthemes along gender continuum.](image)

<table>
<thead>
<tr>
<th>Men</th>
<th>Shared experience</th>
<th>Women</th>
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</thead>
<tbody>
<tr>
<td><strong>Location of chest pain/discomfort</strong></td>
<td>Centre of chest</td>
<td><strong>Non-chest localized areas of pain/discomfort</strong></td>
</tr>
<tr>
<td></td>
<td>Right side of chest</td>
<td>Neck pain</td>
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<td></td>
<td>Top of arm until elbow/bicep</td>
<td>Tightness in throat</td>
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<tr>
<td></td>
<td>Tingling of left arm</td>
<td></td>
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<td></td>
<td>Right arm weakness</td>
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<td></td>
<td>High back pain</td>
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<td></td>
<td>Shoulder pain</td>
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<tr>
<td></td>
<td>Jaw pain</td>
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<tr>
<td><strong>Other Associated Symptoms</strong></td>
<td>Pale</td>
<td>Shortness of breath</td>
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<tr>
<td></td>
<td>Aggravation</td>
<td>Difficulty breathing/inhalation</td>
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<tr>
<td></td>
<td></td>
<td>Profuse sweating</td>
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<td></td>
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<td>Clanniness</td>
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<td>Headache</td>
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<td>Nausea</td>
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<td>Vomiting</td>
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<td></td>
<td>Dizziness</td>
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<td></td>
<td>Felt fainted/fainted</td>
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<td></td>
<td></td>
<td>Sweating at night</td>
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<td></td>
<td>Weakness</td>
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<td></td>
<td>Confusion</td>
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<td>Panic</td>
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<td></td>
<td></td>
<td>Anxiety</td>
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<td></td>
<td></td>
<td>Dry mouth</td>
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<td></td>
<td></td>
<td>Fatigue</td>
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<tr>
<td><strong>Functional Symptoms</strong></td>
<td>Discomfort with stress</td>
<td>Shortness of breath on exertion</td>
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<td></td>
<td></td>
<td>Chest pain/discomfort on exertion</td>
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<tr>
<td></td>
<td></td>
<td>Limit/avoid physical exertion due to shortness of breath</td>
</tr>
<tr>
<td><strong>Description of Pain/Discomfort</strong></td>
<td>Uncomfortable</td>
<td>Chest pain</td>
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<tr>
<td></td>
<td>Not a huge pain</td>
<td>Not a sharp pain</td>
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<tr>
<td></td>
<td></td>
<td>No heart pain/no chest pain!</td>
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<tr>
<td></td>
<td></td>
<td>Tightness</td>
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<td></td>
<td></td>
<td>Burning chest, not pain</td>
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<td></td>
<td></td>
<td>Discomfort</td>
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<td></td>
<td>Not severe</td>
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<td></td>
<td></td>
<td>Annoying pain</td>
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<td></td>
<td>Strange pain</td>
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<td></td>
<td>Very funny pain</td>
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<td></td>
<td></td>
<td>Soreness</td>
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<td></td>
<td>Weakness, not pain</td>
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<td></td>
<td></td>
<td>Pressure</td>
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<td></td>
<td>Heaviness</td>
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<td>Really bad ache</td>
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<td>Bad pain</td>
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<td>Chest exploding</td>
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<td></td>
<td>Severe chest pain</td>
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<tr>
<td></td>
<td></td>
<td>Crushing but not stabbing</td>
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<tr>
<td></td>
<td></td>
<td>Vague pain, and travels</td>
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<tr>
<td></td>
<td></td>
<td>Pressing</td>
</tr>
<tr>
<td><strong>Symptom Hypotheses</strong></td>
<td>Hiatus hernia</td>
<td>Indigestion</td>
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<tr>
<td></td>
<td></td>
<td>Heartburn/ acid</td>
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<tr>
<td></td>
<td></td>
<td>Pulled a muscle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Panic attack</td>
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</table>
commonly reported by men, while ‘atypical angina’ has come to represent the symptoms most common in women. While the historical gold-standard comparison group of ‘typical’ angina has been represented by white middle-aged males,\(^{16–27}\) it is not surprising that angina symptoms experienced among other groups are referred to as ‘atypical’. Further, there are inherent conceptual limitations embedded within the ‘atypical’ label itself; ‘atypical’ has connotations implying ‘abnormal, uncharacteristic, unusual and uncommon’. Presumably, one who symptomatically presents with ‘typical’ angina symptoms should receive ‘typical’ treatment; might the label ‘atypical’ be more permissive of ‘atypical’ treatment? May this, in part, explain why women are referred less

**Figure 2** Excerpts from Interviews According to Symptomatic Subthemes.
than men for invasive procedures despite having severe symptoms.13 14 41–45 As the label ‘atypical’ has become a catchall phrase for anyone who does not present as a ‘typical’, white, middle-aged male, the term may perpetuate poor classification of diverse angina patients and support sloppy science. We question the continued use of this institutionalised yet imprecise, and potentially misleading term.

What does ‘gender’ have to do with it?

While ‘gender’ has been on the forefront of many cardiac symptom studies, none to our knowledge have undertaken a gender, as opposed to sex, analysis. Most studies use the term ‘sex’ and ‘gender’ interchangeably, while technically referring to sex only. We raise this issue as one that goes beyond semantics: the binary construct of ‘sex’ cannot account for the complexity of gender phenomena. Analytically, this translates to two inherent limitations when analysing cardiac symptomology according to ‘sex’: (1) it underrates symptoms common to both sexes and (2) it cannot capture variation of symptoms within sex. Future studies should account for the role of gender, beyond sex, by capturing the full range of experiences in women and men.

We propose the gender continuum as a new construct to evaluate angina symptoms. When we array angina along the gender continuum, two main findings emerge: (1) men and women share more symptoms in common than conventionally believed and (2) there is great variation both between and within genders in the descriptive terms patients use to describe pain/discomfort, and the reporting of other associated symptoms.

Gender is a complex and non-static social construct that interacts with other dimensions including social status, ethnicity, age, class and power.46 47 An individual’s gendered identity is often expressed through language and narrative,82 46–50 such as a clinical history. It has been well described in the sociolinguistics literature that women tend to use a wider range of linguistic variation marked with a greater emotional vocabulary, conversationally using more of a ‘rapport style’ as opposed to ‘report-style’ common with men.32 46–48 50 51 Most men in our study described their symptoms in brief language than women used. Women provided detailed descriptions of their pain and associated symptoms, trying to capture the exact quality of their experience, fine tuning their choice of words as the interview progressed. These differences of language may reflect men and women’s differing social roles, and language subculture of expressing pain. Nevertheless, an expressive style is not exclusive to women, and this is the strength of the gender continuum: individuals may linguistically express themselves in a gender that differs from their sex. In a sociolinguistic study of patient narratives, significant variation was found within gender groups, especially among men, denoting that higher-status men were more likely to adopt a ‘modern masculinity’ marked by an emotional vocabulary comparable with women’s.52 53 We found this with some men in our study, particularly young men (≤50 years) and two older widowers, whose wives had succumbed to heart disease. We, like others,54 also heard more associated symptoms reported by women, perhaps, in part, due to their ‘rapport-style’.

An important component of language and gender is that linguistic usage varies according to contextual factors,31 32 46–48 51 54 such as the gender or the gendered style of the clinician. While outside the focus of the current study, our field notes included some observations related to clinician gender. Often a clinician would approach the patient with the question, ‘Can you tell me about your chest pain?’ to which patients commonly responded, ‘Well, I wouldn’t call it a pain, it was more pressing’ or ‘It is more of a discomfort than a pain’. The clinician would then in his/her notes write, ‘0 CP’, which stands for ‘No chest pain’. What happened in this interaction, and is the patient experiencing pain or not?

The clinician began their consult posing a question about ‘pain’. From a clinical perspective, ‘pain’ is a component of ‘typical angina’—anything not described as ‘pain’ deviates from ‘typical’. In this interaction, the clinician did not qualify the other terms used by the patient as describing ‘chest pain’. At the same time, each patient has a sensation and reference point of what they qualify as ‘pain’, and since all the patients in our study were being investigated for CAD, patients may also have preconceptions—as well as gendered ideas—of what heart pain should feel like. Like the patient, the clinician is also situated in their gender, within their roles, beliefs, norms, expectations, clinical training and experience not only about their own gender, but also of others’. Experimental studies have tested clinicians’ gender bias using identical vignettes of patients that vary only by sex, and physicians consistently refer female patients less for cardiac catheterisation than their male counterparts.55 56 And while gender bias in patient referral for cardiac catheterisation has been reported irrespective of physician sex,57 almost 90% of cardiologists in the USA and Canada are men,58 and physician gender, to our knowledge, has never been evaluated. To fully consider gender, it is essential to understand that it is dynamic, and is happening simultaneously from the patient and clinician perspectives.

Study limitations

In order to achieve a fresh in-depth exploration of CAD symptoms less influenced by prevailing gender-biased clinical perspectives, we used an experienced interviewer who is not a clinician. Even so, it is possible that the clinical setting of the interview cued interviewers or patients to use what they considered more clinical-sounding terms or ideas. Also, a female interviewer conducted all interviews, and since patients are situated according to their gender, they may respond differently to an interviewer of their own sex versus the opposite sex. It is possible that same-gendered interviewers may elicit slightly different...
language or information than opposite-gendered inter-
viewers. If this bias pertained, however, it would have
favoured the female perspective, which was the under-
represented voice we especially sought to understand.

We recognise that gender is a social construct that
likely interacts with many other factors such as ethnicity
and socioeconomic position (SEP). For example, it is
plausible that a population within a certain SEP may
express more shared experiences, or that cultural
groups with lower expressed emotion may express their
symptoms differently. The next steps in the develop-
ment of the gender continuum should include a similar eval-
uation in populations of diverse SEP and ethnicity.

Conclusions and future directions
We developed a new conceptual framework of angina,
arranging patient experiences and symptoms along a
‘gender continuum’, and uncovered substantial shared
experiences between men and women. This new
‘gender continuum’ of angina symptomology can help
researchers and clinicians contextualise patient symptom
reports. Customary labels of ‘typical’ and ‘atypical’
angina should be abandoned in favour of more descrip-
tive and gender-relevant categories. In future research,
we hope our angina construct is expanded among other
cultural, socioeconomic and ethnic groups.

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Contributors CK conceived and designed the study, recruited patients,
conducted the analysis and interpretation of data, developed the intellectual
content, wrote the submitted manuscript, revised and approved the final
version to be published. CK is also the overall content guarantor of the study,
accepts full responsibility for the work and/or the conduct of the study, has
access to the data, and controlled the decision to publish. This author takes
responsibility for all aspects of the reliability and freedom from bias of the data
presented and their discussed interpretation. MC-A contributed to qualitative
study expertise, including design, analysis and interpretation of data, data
collection guidance, critical revision for important intellectual content and final
approval of the version submitted. MG helped to conceive study design,
refinement of study design, data analysis and interpretation of the data, critical
revision for important intellectual content, supervisory role and final approval
of the version submitted. JLV contributed to content expertise, conception of
study design, read and interpreted the angiograms, critical revision for
important intellectual content and final approval of the version submitted. MC-A
removed patients, recruited patients, performed data collection, generated
manuscript guidance, critical revision for important intellectual content and final
approval of the version submitted.

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