Health-Related Quality of Life in Premature Acute Coronary Syndrome: Does Patient Sex or Gender Really Matter?

Sylvie L. Leung Yinuko, RD, MSc (candidate); Roxanne Pelletier, PhD; Hassan Behlouli, PhD; Colleen M. Norris, PhD; Karin H. Humphries, DSc; Louise Pilote, MD, MPH, PhD; for the GENESIS-PRAXY investigators

**Background**—Limited data exist as to the relative contribution of sex and gender on health-related quality of life (HRQL) among patients with acute coronary syndrome (ACS). This study aims to evaluate the effect of sex and gender-related variables on long-term HRQL among young adults with ACS.

**Methods and Results**—GENESIS-PRAXY (GENdEr and Sex determinantS of cardiovascular disease: from bench to beyond-Premature Acute Coronary SYndrome) is a multicenter, prospective cohort study (January 2009 to August 2013) of adults aged 18 to 55 years, hospitalized with ACS. HRQL was measured at baseline, 1, 6, and 12 months using the Short Form-12 and Seattle Angina Questionnaire (SAQ) among 1213 patients. Median age was 49 years. Women reported worse HRQL than men over time post-ACS, both in terms of physical and mental functioning. Gender-related factors were more likely to be predictors of HRQL than sex. Femininity score, social support, and housework responsibility were the most common gender-related predictors of HRQL at 12 months. We observed an interaction between female sex and social support (β=0.44 [95% confidence interval, 0.01, 0.88]; P=0.047) for the physical limitation subscale of the SAQ.

**Conclusions**—Young women with ACS report significantly poorer HRQL than young men. Gender appears to be more important than sex in predicting long-term HRQL post-ACS. Specific gender-related factors, such as social support, may be amenable to interventions and could improve the HRQL of patients with premature ACS. (J Am Heart Assoc. 2014;3:e000901 doi: 10.1161/JAHA.114.000901)

**Key Words:** angina • cardiovascular diseases • myocardial infarction • sex

---

Health-related quality of life (HRQL) is increasingly being used as an outcome measure for the effectiveness of medical treatment and patient recovery in acute coronary syndrome (ACS). Whereas health outcomes in ACS patients have traditionally been measured using mortality and morbidity as primary endpoints, HRQL is an important outcome measure in that it measures illness perception instead of the disease itself.¹ HRQL has been recognized for defining health from the patients’ perspective, in terms of how individuals feel (distress and well-being) and how they evaluate their health and prospects for the future.²

ACS has been associated with marked impairments in HRQL and considerable loss of productive years.²–⁴ In addition, many studies have demonstrated sex differences in HRQL among patients with coronary artery disease (CAD), with women generally reporting lower HRQL than men.²,⁵–¹⁴ However, inconsistency exists regarding the determinants of HRQL for men and women, and the observed discrepancies in HRQL between sexes are poorly understood.

In addition to biological sex (ie, being male or female), it has been suggested that gender (ie, sociocultural factors related to masculinity and femininity) may influence HRQL.¹⁵ During the past decade, there has been a substantial decrease in gender gap in North America.¹⁶ With more young women gaining access to education and employment, shared household and workplace responsibilities are becoming more common. At the same time, other factors, such as social support and psychological distress, could be equally important in predicting HRQL post-ACS.⁶,¹⁷ However, the role that

---

From the Divisions of Clinical Epidemiology (S.S.L.L.Y., R.P., H.B., L.P.) and General Internal Medicine (L.P.), McGill University Health Centre, Montreal, Quebec, Canada; Faculties of Nursing, Medicine and School of Public Health, University of Alberta, Edmonton, Alberta, Canada (C.M.N.); Division of Cardiology, Department of Medicine, University of British Columbia, Vancouver, British Columbia, Canada (K.H.H.); Providence Health Care Research Institute, St. Paul’s Hospital, Vancouver British, Columbia, Canada (K.H.H.).

A list of GENESIS-PRAXY co-investigators and participating centers can be found in the appendix.

**Correspondence to:** Louise Pilote, MD, MPH, PhD, Division of Clinical Epidemiology, Royal Victoria Hospital, 687 Pine Ave West, V Building, Room 2.17, Montreal, Quebec H3A 1A1, Canada. E-mail: louise.pilote@mcgill.ca Received March 24, 2014; accepted May 30, 2014.

© 2014 The Authors. Published on behalf of the American Heart Association, Inc., by Wiley Blackwell. This is an open access article under the terms of the Creative Commons Attribution-NonCommercial License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.
different gender-related factors may play in HRQL remains to be determined, and, to date, there are no comprehensive studies on this subject.

The aim of this study was to examine trends in HRQL and assess the relative contribution of sex and gender among young male and female patients with ACS.

Methods

Study Population

The study population consisted of patients enrolled in GENESIS-PRAXY (GENdEr and Sex determinantS of cardiovascular disease: from bench to beyond-Premature Acute Coronary Syndrome), a multicenter, prospective cohort study of young adults hospitalized with ACS. The methods of the GENESIS-PRAXY study have been previously described. Briefly, eligible participants included patients aged 18 to 55 years, admitted with a diagnosis of ACS to the coronary care units of participating hospitals, fluent in English and/or French, and able to provide informed consent. The study began in January 2009 and includes 24 sites across Canada, one in the U.S., and one in Switzerland. All participating sites received ethics approval from their respective ethics review board, and all participants provided informed consent.

Data Collection

Study participants were approached by a trained research nurse within 48 hours of hospital admission. Patients who gave their consent were asked to complete a self-administered questionnaire at the time of enrolment. They were also mailed questionnaires at 1, 6, and 12 months. Medical chart reviews were carried out by the research nurse at baseline and 12 months.

HRQL was measured using 2 validated instruments: the Short Form-12 (SF-12) version 2.0 and the Seattle Angina Questionnaire (SAQ). The SF-12 includes 2 subscales: the Physical Component Summary (PCS) and Mental Component Summary (MCS) scores, transformed to a 0 to 100 scale, with higher scores representing better health status. The scores can be compared to the general U.S. population with a mean score of 50 and standard deviation (SD) of 10. Clinically significant differences for the SF-12 range from 3 to 5 points. The SF-12 validity, reliability, and responsiveness have been well documented in patients with CAD. The SAQ is a 19-item disease-specific functional status measure of CAD using 5 dimensions, namely, physical limitation, angina stability, angina frequency, treatment satisfaction, and disease perception. The items are summed within each of the 5 dimensions, and the scale scores are transformed to a 0 to 100 scale. Higher scores represent better health status.

The SAQ is valid, reproducible, and responsive to clinical change. A clinically significant difference in the scores of the SAQ dimensions is between 5 and 8 points.

Our main variables of interest were sex and gender-related variables. According to the Women Health Research Network of the Canadian Institutes of Health Research (CIHR), there are 4 inter-related gender aspects, which are gender roles, gender identity, gender relations, and institutionalized gender. We examined 7 gender-related variables that incorporate these gender aspects, namely, stress level at home, stress management, femininity score, housework responsibility, primary earner status, number of hours worked per week, and social support. Femininity score was measured using the femininity subscale of the Bem Sex Role Inventory (BSRI). Social support was measured using the ENRICHD Social Support Instrument (ESSI), a valid and reliable 7-item tool among populations with CAD. Low social support is determined based on the score of 5 of the 7 items of the ESSI (items 1, 2, 3, 5, and 6). Patients with a score of ≤3 on at least 2 items or with a total score of ≤18 are considered as having low social support.

Data were additionally collected on sociodemographic factors, including age, marital status, ethnicity, education, and various factors that have been linked to HRQL. These included clinical characteristics, such as anxiety, depression, presence of vascular risk factors, a previous cardiovascular (CV) event (CVE), and type of ACS (ST-elevation myocardial infarction [STEMI], non-STEMI, or unstable angina), as well as treatment procedures (thrombolysis, primary percutaneous coronary intervention [PCI], non-primary PCI, and coronary artery bypass grafting [CABG]). Anxiety and depression were measured using the Hospital Anxiety and Depression Scale (HADS). Presence of vascular risk factors was defined as having one or more of the following: diabetes, hypertension, dyslipidemia, currently smoking, obesity, and family history of CV diseases. Previous CVE included previous myocardial infarction, stroke, PCI, or CABG or having peripheral arterial disease.

Statistical Analysis

Descriptive statistics were used to report baseline characteristics stratified by tertiles of PCS and MCS scores. Dichotomous variables were presented in percentages, whereas continuous variables were presented as mean ± SD.

Descriptive and trend analyses were performed to evaluate the trends in HRQL score. Mean HRQL scores were calculated for men and women, respectively, at the 4 time points.
Quality of Life in Acute Coronary Syndrome  Leung Yinko et al

Fewer patients with low education, depression, anxiety, having angina (score <100).  

Multiple linear regression models were created to identify predictors of PCS, MCS, physical limitation, angina stability, treatment satisfaction, and disease perception at 12 months. We used multivariable logistic models to identify predictors of having angina at 12 months. We included sex and the 7 gender-related variables in the multivariable models, together with demographic and clinical variables that were statistically significant at P<0.10 in the univariable analyses. Data with missing values were estimated using multiple imputation procedures. 

We tested for interactions between sex and femininity score or sex and housework responsibility in predicting physical limitation. We did not find an interaction between sex and femininity score or sex and housework responsibility, but found a statistically significant interaction between sex and social support (β=0.44 [95% CI, 0.01, 0.88]; P=0.047). In post-hoc analyses, there was a clinically significant difference in the physical limitation score of high versus low social support.

Predictors of HRQL

In multivariable linear and logistic regressions, gender-related variables were more likely than sex to be significant predictors of HRQL (Figure 2). Femininity score and social support appeared to be particularly important, being statistically significant for 4 (PCS, physical limitation, angina frequency, and disease perception) and 3 (PCS, physical limitation, and disease perception) outcomes, respectively. Housework responsibility was also found to be an important determinant of PCS and physical limitation. Conversely, sex was not a predictor for any of the outcomes, except physical limitation (β=−5.37 [95% CI, −8.94, −1.79]; P=0.003). After adjustment for multiple testing, statistical significance persisted for most variables. In two cases where the variable of interest was no longer statistically significant, similar trends in the results were nonetheless observed. Moreover, in sensitivity analysis, which included Canadian sites only, we obtained similar results.

We tested for interactions between sex and femininity score, sex and social support, and sex and housework responsibility in predicting physical limitation. We did not find an interaction between sex and femininity score or sex and housework responsibility, but found a statistically significant interaction between sex and social support (β=0.44 [95% CI, 0.01, 0.88]; P=0.047). In post-hoc analyses, there was a clinically significant difference in the physical limitation score of high versus low social support.

Trends in HRQL

At every point in time (baseline, 1, 6, and 12 months), the mean PCS and MCS scores of this population of young ACS patients were lower than the mean score of 50 of the general population, and lower in women compared to men (Figure 1). An improving trend was observed for both PCS and MCS among men (P<0.01 and P=0.01, respectively), whereas an improvement was observed only for PCS and not MCS among women (P<0.01 and P=0.55, respectively). Men consistently reported higher scores than women, with the difference in scores being clinically significant (>3 points for SF-12 and >5 points for SAQ). Furthermore, a significantly higher proportion of women compared to men had angina. The proportion of men with angina decreased consistently over time, and in the long-term, women reported more angina than men (48.2% versus 29.4%; P<0.01 at 12 months).

Predictors of HRQL

In multivariable linear and logistic regressions, gender-related variables were more likely than sex to be significant predictors of HRQL (Figure 2). Femininity score and social support appeared to be particularly important, being statistically significant for 4 (PCS, physical limitation, angina frequency, and disease perception) and 3 (PCS, physical limitation, and disease perception) outcomes, respectively. Housework responsibility was also found to be an important determinant of PCS and physical limitation. Conversely, sex was not a predictor for any of the outcomes, except physical limitation (β=−5.37 [95% CI, −8.94, −1.79]; P=0.003). After adjustment for multiple testing, statistical significance persisted for most variables. In two cases where the variable of interest was no longer statistically significant, similar trends in the results were nonetheless observed. Moreover, in sensitivity analysis, which included Canadian sites only, we obtained similar results.

We tested for interactions between sex and femininity score, sex and social support, and sex and housework responsibility in predicting physical limitation. We did not find an interaction between sex and femininity score or sex and housework responsibility, but found a statistically significant interaction between sex and social support (β=0.44 [95% CI, 0.01, 0.88]; P=0.047). In post-hoc analyses, there was a clinically significant difference in the physical limitation score of high versus low social support.

Baseline characteristics are presented by tertiles of PCS and MCS scores (Table). Median age was 49 years (interquartile range, 45 to 53 years). There were more men in the highest PCS and MCS tertiles. There also appeared to be a pattern among gender-related factors. Those in the highest PCS and MCS tertiles had lower levels of stress at home, better stress management ability, and higher social support. Those in the highest MCS tertiles were also less likely to have housework responsibilities, but were more likely to be the family’s primary earners. Femininity score was nonetheless similar across PCS and MCS tertiles. Additionally, there were fewer patients with low education, depression, anxiety, vascular risk factors, and previous CVEs in the highest tertiles. Except for primary PCI, other revascularization treatments (thrombolysis, non-primary PCI, and CABG), as well as type of ACS, did not appear to have any specific pattern across tertiles of PCS and MCS.

Results

Among 1410 eligible patients who were approached, participation refusal rates were 18% in men and 10% in women, for an overall participation rate of 86% or 1213 enrolled patients (68% men). Data at 12 months were available for 65% patients. Of these, there were an average of 11% missing data per outcome.

Baseline characteristics are presented by tertiles of PCS and MCS scores (Table). Median age was 49 years (interquartile range, 45 to 53 years). There were more men in the highest PCS and MCS tertiles. There also appeared to be a pattern among gender-related factors. Those in the highest PCS and MCS tertiles had lower levels of stress at home, better stress management ability, and higher social support. Those in the highest MCS tertiles were also less likely to have housework responsibilities, but were more likely to be the family’s primary earners. Femininity score was nonetheless similar across PCS and MCS tertiles. Additionally, there were fewer patients with low education, depression, anxiety, vascular risk factors, and previous CVEs in the highest tertiles. Except for primary PCI, other revascularization treatments (thrombolysis, non-primary PCI, and CABG), as well as type of ACS, did not appear to have any specific pattern across tertiles of PCS and MCS.

Trends in HRQL

At every point in time (baseline, 1, 6, and 12 months), the mean PCS and MCS scores of this population of young ACS patients were lower than the mean score of 50 of the general population, and lower in women compared to men (Figure 1). An improving trend was observed for both PCS and MCS among men (P<0.01 and P=0.01, respectively), whereas an improvement was observed only for PCS and not MCS among women (P<0.01 and P=0.55, respectively). Men consistently reported higher scores than women, with the difference in scores being clinically significant (>3 points for SF-12 and >5 points for SAQ). Furthermore, a significantly higher proportion of women compared to men had angina. The proportion of men with angina decreased consistently over time, and in the long-term, women reported more angina than men (48.2% versus 29.4%; P<0.01 at 12 months).

Predictors of HRQL

In multivariable linear and logistic regressions, gender-related variables were more likely than sex to be significant predictors of HRQL (Figure 2). Femininity score and social support appeared to be particularly important, being statistically significant for 4 (PCS, physical limitation, angina frequency, and disease perception) and 3 (PCS, physical limitation, and disease perception) outcomes, respectively. Housework responsibility was also found to be an important determinant of PCS and physical limitation. Conversely, sex was not a predictor for any of the outcomes, except physical limitation (β=−5.37 [95% CI, −8.94, −1.79]; P=0.003). After adjustment for multiple testing, statistical significance persisted for most variables. In two cases where the variable of interest was no longer statistically significant, similar trends in the results were nonetheless observed. Moreover, in sensitivity analysis, which included Canadian sites only, we obtained similar results.

We tested for interactions between sex and femininity score, sex and social support, and sex and housework responsibility in predicting physical limitation. We did not find an interaction between sex and femininity score or sex and housework responsibility, but found a statistically significant interaction between sex and social support (β=0.44 [95% CI, 0.01, 0.88]; P=0.047). In post-hoc analyses, there was a clinically significant difference in the physical limitation score of high versus low social support.
Table. Baseline Characteristics According to Tertiles of Physical Component Summary and Mental Component Summary Scores

| Characteristics                              | All Patients (N=1123) | PCS Tertile | MCS Tertile |
|----------------------------------------------|-----------------------|-------------|-------------|
|                                              | ≤40.7                 | 40.7 to ≤50.8 | >50.8       |
|                                              | ≤40.5                 | 40.5 to ≤52.5 | >52.5       |
| Sex (male), %                                | 58.9                  | 70.1        | 74.3        |
| Gender-related factors                       |                       |             |             |
| Femininity score, mean ±SD                  | 5.7 ±1.0              | 5.7±0.9     | 5.7±0.9     |
| Stress level at home, mean ±SD              | 4.8 ±2.6              | 4.5±2.6     | 4.2±2.4     |
| Stress management, %                         | 2.8±0.9               | 3.0±0.9     | 3.1±0.9     |
| Housework responsibility, %                  | 50.6                  | 41.2        | 41.4        |
| Primary earner, %                            | 63.6                  | 69.4        | 66.2        |
| No. of hours worked/week, mean ±SD          | 43.0±15.3             | 44.4±12.7   | 46.0±13.7   |
| Low social support, %                        | 33.8                  | 30.1        | 17.8        |
| Sociodemographic factors                     |                       |             |             |
| Age, mean ±SD                                | 48.6±5.6              | 48.1±5.9    | 47.9±6.0    |
| Marital status (married versus not), %       | 48.2                  | 46.6        | 56.1        |
| Ethnicity (Caucasian vs not), %              | 87.4                  | 89.1        | 91.8        |
| Low education (<post-secondary), %           | 42.2                  | 38.5        | 31.5        |
| Clinical characteristics                     |                       |             |             |
| Depression, %                                | 38.8                  | 19.2        | 12.7        |
| Anxiety, %                                   | 60.2                  | 38.7        | 32.6        |
| Presence of vascular risk factors, %         | 97.0                  | 90.0        | 86.6        |
| Previous cardiovascular event, %             | 35.1                  | 18.1        | 12.5        |
| Type of ACS                                  |                       |             |             |
| STEMI, %                                     | 49.4                  | 64.1        | 61.8        |
| Non-STEMI, %                                 | 35.5                  | 27.3        | 32.9        |
| Unstable angina, %                           | 14.0                  | 4.9         | 3.5         |
| Treatment                                    |                       |             |             |
| Thrombolysis, %                              | 9.2                   | 16.3        | 14.9        |
| Primary PCI, %                               | 32.1                  | 39.6        | 40.2        |
| Non-primary PCI, %                           | 41.7                  | 38.7        | 36.4        |
| CABG, %                                      | 11.0                  | 5.4         | 5.0         |

ACS indicates acute coronary syndrome; CABG, coronary artery bypass grafting; MCS, Mental Component Summary; PCI, percutaneous coronary intervention; PCS, Physical Component Summary; STEMI, ST-elevation myocardial infarction.

Figure 1. Trends in Physical Component Summary and Mental Component Summary scores. Note: Difference >3 points and *P*<0.01 between men and women at all points in time.
among women (82 versus 66; difference >5 points), but not among men (Figure 3).

**Discussion**

Our study found that young male and female patients with ACS had poorer HRQL, compared to the general population, both in terms of physical and mental functioning. Importantly, our findings demonstrated that the long-term impact of ACS on HRQL among young adults depends more strongly on gender than on sex. Even when adjusting for clinical characteristics and treatment, several gender-related factors were found to be significant in predicting HRQL, particularly femininity score, social support, and housework responsibility. Sex was not found to be an important predictor, except for physical limitation. We also found that social support was more important among women than men to increase their physical limitation score.

Our study encompasses extensive measures of gender-related factors among young patients with ACS, which have not been examined in previous studies. Although most studies

**Figure 2.** Multivariable regressions of predictors of health-related quality of life. Note: Figure 2A through 2F indicate \( \beta \) coefficients; Figure 2G indicates odds ratio (OR). Adjustments were made for variables significant at \( P<0.10 \) in univariable analyses: (A) education, presence of vascular risk factors, previous cardiovascular event, depression, anxiety, nonprimary percutaneous coronary intervention, type of acute coronary syndrome, and baseline score; (B) education, previous cardiovascular event, depression, anxiety, and baseline score; (C) education, previous cardiovascular event, depression, anxiety, type of acute coronary syndrome, and baseline score; (D) depression and baseline score; (E) education, depression, anxiety, and baseline score; (F) education, presence of vascular risk factors, previous cardiovascular event, depression, anxiety, and baseline score; and (G) education, previous cardiovascular event, depression, anxiety, and baseline score.

DOI: 10.1161/JAHA.114.000901
have consistently shown that women generally have poorer HRQL after an ACS event, the reasons for this are not well understood. Studies that have attempted to investigate sex differences in the predictors of HRQL have mostly focused on clinical characteristics and treatment procedures. Yet, these only partially explain the observed sex discrepancies in HRQL, and gender has been suggested as accounting for the residual discrepancies. Furthermore, angina frequency is an important characteristic of HRQL in ACS. The prevalence of angina tends to be higher in women, compared to men. Hence, it is possible that societal views on the acceptability of residual angina in women versus men may, in part, account for less aggressive treatments among women.

In addition, studies investigating HRQL post-ACS have typically included older adults and few have focused on younger patients with ACS. Some studies have investigated social support as a determinant of HRQL and have found it to be particularly important for women. These studies have been mostly conducted among older populations, but younger populations are a particularly vulnerable population who may have persisting disease burden leading to a loss of many years of productivity. In the MONIKA/KORA population-based registry, it was demonstrated that HRQL is greatly impaired post-ACS, especially among young adults (aged 45 to 54 years), compared to their same age-group counterparts in the general population. Our results, based on a younger population, are concordant with previous findings and sustain the importance of social support in long-term HRQL among young women after an ACS event. Low social support appears to be more detrimental to women than men. This may be because of the fact that women, especially younger ones, may have higher combined occupational and household responsibilities than men and thus may require more social support. It is plausible that these young women who have low social support will face greater difficulties re-immersing into their normal routine and re-establishing an adequate HRQL post-ACS. Therefore, the value of social support post-ACS also needs to be underlined among such young adult populations.

The importance of studying gender-related factors as separate entities from sex has been increasingly emphasized in health research. In fact, different gender-related factors, including family and societal roles, have been suggested as being key to the psychosocial response that one may have after having a CVE. It has been suggested that women may have more difficulty coping after a cardiac event than men. In our young population of patients with ACS, we interestingly observed that a higher femininity score may be linked to poorer HRQL. The BRSI considers traits such as “sensitive to the needs of others,” “compassionate,” and “loves children,” among others, as being feminine characteristics. These can be thought of as being linked to higher femininity among women may be even more impactful. Additional investigations in other study groups may also better show the influence of gender-related factors on HRQL in ACS.

Our study is unique in that it is a large-scale prospective cohort study of patients with premature ACS. Nonetheless, there are certain limitations to our study. The sample size for women was smaller than that for men. As data were incomplete on some variables, we used multiple imputation. Although the results may not be as accurate as with a complete data set, we obtained very similar results to those yielded from the non-imputed models. Therefore, it is unlikely that the multiple imputation procedures have biased our results. Also, there are many possible determinants of HRQL, and the use of many variables in the multivariable models may have reduced the power to detect statistical significance. However, our results were similar after adjustment for multiple testing, with nearly all of the variables retaining statistical significance. As well, it would have been interesting to address medication use, but we had insufficient data to conduct these analyses. It is also possible that among eligible participants, those enrolled were in a more favorable clinical situation. Moreover, because various questions on the SF-12 and SAQ refer to questions on health status over the past 4 weeks, there is the possibility of poor recall.

**Conclusions**

Female patients with premature ACS report significantly poorer HRQL than male patients, both in terms of physical.
and mental functioning. Gender appears to be more important than sex in predicting long-term HRQL post-ACS. Future research should aim to address gender-related factors as a means to improve HRQL among young patients recovering from ACS. Specific gender-related factors, such as social support, may be amenable to interventions and could improve the HRQL of patients with premature ACS.

Appendix

Co-Investigators for GENESIS-PRAXY

Co-Principal Investigators

Louise Pilote (MD, MPH, PhD), Divisions of General Internal Medicine and Clinical Epidemiology, McGill University Health Center, Montréal, Québec, Canada

Igor Karp (MD, MPH, PhD), University of Montréal Hospital Research Center (CRCHUM) and Department of Social and Preventive Medicine, University of Montréal, Montréal, Québec, Canada

Co-Investigators

Simon L. Bacon (PhD), Concordia University and Research Center, Hôpital du Sacré-Coeur de Montréal, Montréal, Québec, Canada

Jafna L. Cox (BA, MD, FRCP, FACC), Department of Medicine and of Community Health and Epidemiology, Dalhousie University, Halifax, Nova Scotia, Canada

Kaberi Dasgupta (MD, MSc, FRCP), Research Institute of the McGill University Health Center, Montréal, Québec, Canada

Stella S. Daskalopoulou (MD, MSc, PhD), Research Institute of the McGill University Health Center, Montréal, Québec, Canada

Mark J. Eisenberg (MD, MPH) Jewish General Hospital, McGill University, Montréal, Québec, Canada

James C. Engert (PhD), Research Institute of the McGill University Health Center, Montréal, Québec, Canada

William A. Ghali (MD, MPH, FRCP), University of Calgary, Calgary, Alberta, Canada

Karim H. Humphries (MBA DSc), University of British Columbia, Vancouver, British Columbia, Canada

Nadia A. Khan (MD, MSc), University of British Columbia, Vancouver, British Columbia, Canada

Kim L. Lavoie (PhD), University of Quebec at Montréal (UQAM) and Research Center, Hôpital du Sacré-Coeur de Montréal, Montréal, Québec, Canada

Colleen M. Norris (RN, PhD), University of Alberta, Edmonton, Alberta, Canada

Doreen Rabi (MD, FRCP, MS), University of Calgary, Calgary, Alberta, Canada

Derek So (MD, FRCP, FACC), University of Ottawa Heart Institute, Ottawa, Ontario, Canada

Ken D. Stark (PhD), Department of Kinesiology, University of Waterloo, Waterloo, Ontario, Canada

Vicky Tagalakis (MD, FRCP, MSc), McGill University, Divisions of Internal Medicine and Center for Clinical Epidemiology and Community Studies, Jewish General Hospital, Montréal, Québec, Canada

Meytal Avgil Tsadok (PhD), Research Institute of the McGill University Health Center, Montréal, Québec, Canada

Roxanne Pelletier (PhD), Research Institute of the McGill University Health Center, Montréal, Québec, Canada

George Thanassoulis (MD, FRCP) Research Institute of the McGill University Health Center, Montréal, Québec, Canada

Avi Shimony (MD), Jewish General Hospital, McGill University, Montréal, Québec, Canada

GENESIS-PRAXY Participating Centers

| Site | Site Principal Investigator |
|------|-----------------------------|
| St Paul’s Hospital, Vancouver, British Columbia, Canada | Krishan Ramanthan |
| Surrey Memorial Hospital, Surrey, British Columbia, Canada | Jan Kornder |
| Libin Cardiovascular Institute of Alberta, University of Calgary, Calgary, Alberta, Canada | Todd Anderson/Doreen Rabi |
| University of Alberta and the Mazankowski Alberta Heart Institute, Edmonton, Alberta, Canada | Colleen Norris/Michelle Graham |
| University of Ottawa Heart Institute, Ottawa, Ontario, Canada | Derek So |
| McMaster University/Hamilton Health Sciences (General Site), Hamilton, Ontario, Canada | Madhu Natarajan |

DOI: 10.1161/JAHA.114.000901
Appendix. Continued

| Site                                                                                     | Site Principal Investigator               |
|-----------------------------------------------------------------------------------------|------------------------------------------|
| McMaster University/Hamilton Health Sciences (Juravinski Site), Hamilton, Ontario, Canada | Mike Rokoss                               |
| Ottawa Hospital, Ottawa, Ontario, Canada                                                 | Michele Turek                             |
| St Michael’s Hospital, Toronto, Ontario, Canada                                          | Asim Cheema                               |
| London Health Sciences Center, London, Ontario, Canada                                   | Shahar Lavi                               |
| The Scarborough Hospital, General Division, Scarborough, Ontario, Canada                 | Sherryn Roth                               |
| Hôpital Général de Montréal, Montréal, Québec, Canada                                     | Thao Huyinh                               |
| Hôpital Royal Victoria, Montréal, Québec, Canada                                         | Viviane Nguyen                            |
| Hôpital Général Juif-Sir Mortimer B. Davis, Montréal, Québec, Canada                    | Mark Eisenberg                            |
| Institut universitaire de cardiologie et de pneumologie de Québec (Hôpital Laval), Québec, Québec, Canada | Julie Métro                                |
| Hôpital du Sacré-Coeur de Montréal, Montréal, Québec, Canada                           | Michel Doucet                              |
| Cité de la Santé de Laval, Laval, Québec, Canada                                        | Martine Montigny                          |
| Hôtel Dieu du Centre Hospitalier de l’Université de Montréal, Montréal, Québec, Canada   | Samer Mansour                             |
| Centre de santé et de services sociaux de la région de Thetford, Thetford Mines, Québec, Canada | Claude Lauzon                             |
| CSSS Chicoutimi, Chicoutimi, Québec, Canada                                             | Tomas Cieza                                |
| Centre Hospitalier Universitaire de Sherbrooke, Sherbrooke, Québec, Canada               | Michel Nguyen                             |
| CSSS Alphonse Desjardins (CHAU-Hôtel-Dieu-de Lévis), Lévis, Québec, Canada              | François Grondin                          |
| Queen Elizabeth II Health Science Center, Halifax, Nova Scotia, Canada                   | Jafna Cox                                 |
| The New Brunswick Heart Center Research Initiative and The New Brunswick Heart Center, New Brunswick, Canada | Peter Fong                               |
| Basset Healthcare, Cooperstown, New York, USA                                           | Dhananjai Menzies                         |
| Inselspital, University of Bern, Switzerland and Lausanne University Hospital, Lausanne, Switzerland | Nicolas Rodondi |

Acknowledgment

The authors acknowledge Jasmine Poole for her dedication to the study.

Sources of Funding

This study was funded by the CIHR and the Heart and Stroke Foundations of Québec, Nova Scotia, Alberta, Ontario, Yukon, and British Columbia, Canada. Pilote is funded by a James McGill Chair at McGill University.

Disclosures

None.

References

1. Swenson JR, Clinch JJ. Assessment of quality of life in patients with cardiac disease: the role of psychosomatic medicine. J Psychosom Res. 2000;48:405–415.
2. Brink E, Grankvist G, Karlson BW, Hallberg LR. Health-related quality of life in women and men one year after acute myocardial infarction. Qual Life Res. 2005;14:749–757.
3. Brown N, Melville M, Gray D, Young T, Munro J, Skene AM, Hampton JR. Quality of life four years after acute myocardial infarction: short form 36 scores compared with a normal population. Heart. 1999;81:352–358.
4. Schweikert B, Hunger M, Meisinger C, König HH, Gapp O, Holle R. Quality of life several years after myocardial infarction: comparing the MONICA/KORA registry to the general population. Eur Heart J. 2009;30:436–443.
5. Agewall S, Berglund M, Henareh L. Reduced quality of life after myocardial infarction in women compared with men. Clin Cardiol. 2004;27:271–274.
6. Beck CA, Joseph L, Belisle P, Pilote L. Predictors of quality of life 6 months and 1 year after acute myocardial infarction. Am J Med. 2001;142:271–279.
7. Duenas M, Ramirez C, Arana R, Falide I. Gender differences and determinants of health related quality of life in coronary patients: a follow-up study. BMC Cardiovasc Disord. 2011;11:24.
8. Emery CF, Frid DJ, Engebretson TO, Alonzo AA, Fish A, Ferkeitch AK, Reynolds NR, Dujardin JP, Homan JE, Stern SL. Gender differences in quality of life among cardiac patients. Psychosom Med. 2004;66:190–197.
9. Norris CM, Ghali WA, Galbraith PD, Graham MM, Jensen LA, Knudtson ML. Women with coronary artery disease report worse health-related quality of life compared to men. Health Qual Life Outcomes. 2004;2:21.
10. Pettersen KL, Reikvam A, Rollag A, Stavem K. Understanding sex differences in health-related quality of life following myocardial infarction. Int J Cardiol. 2008;130:449–456.
11. Shumaker SA, Brooks MM, Schron EB, Hale C, Kellen JC, Inkster M, Wimbush FB, Wiklund I, Norris M. Gender differences in health-related quality of life among postmyocardial infarction patients: brief report. CAST Investigators. Cardiac Arrhythmia Suppression Trials. Womens Health. 1997;5:3–60.
12. van Jaarsveld CH, Sanderman R, Ranchor AV, Ormel J, van Veldhuisen DJ, Kempen GJ. Gender-specific changes in quality of life following cardiovascular disease: a prospective study. J Clin Epidemiol. 2002;55:1105–1112.
13. Westin L, Carlsson R, Erhardt L, Cantor-Graae E, McNeill T. Differences in quality of life in men and women with ischemic heart disease. A prospective controlled study. Scand Cardiovasc J. 1999;33:160–165.
14. Wiklund I, Herlitz J, Johansson S, Bengtson A, Karlson BW, Persson NG. Subjective symptoms and well-being differ in women and men after myocardial infarction. Eur Heart J. 1993;14:1315–1319.
15. Norris CM, Murray JW, Triplett LS, Hegadoren KM. Gender roles in persistent sex differences in health-related quality-of-life outcomes of patients with coronary artery disease. Gend Med. 2010;7:330–339.
16. World Economic Forum. The Global Gender Gap Report. 2013.
Quality of Life in Acute Coronary Syndrome  Leung Yin ko et al

17. Blumenthal JA, Wang W, Babyak MA, Krantz DS, Frid DJ, Coleman RE, Waugh R, Hanson M, Appelbaum M, O’Connor C, Morris JJ. Stress management and exercise training in cardiac patients with myocardial ischemia. Effects on prognosis and evaluation of mechanisms. Arch Intern Med. 1997;157:2213–2223.

18. Pilote L, Karp I. GENESIS-PRAXY (GENdEr and Sex determInantS of cardio-vascular disease: From bench to beyond-Premature Acute Coronary Syndrome). Am Heart J. 2012;163:e2.

19. Ware J Jr, Kosinski M, Keller SD. A 12-Item Short-Form Health Survey: SF-36 Physical and Mental Health Summary Scales: A User’s Manual. 2nd ed. Boston, MA: The Health Institute, New England Medical Center; 1994.

20. Ware J, Kosinski M, Keller SD. SF-36 Physical and Mental Health Summary Scales: A User’s Manual. 2nd ed. Boston, MA: The Health Institute, New England Medical Center; 1994.

21. Failde I, Ramos I. Validity and reliability of the SF-36 Health Survey Questionnaire in patients with coronary artery disease. J Clin Epidemiol. 2000;53:359–365.

22. Smith HJ, Taylor R, Mitchell A. A comparison of four quality of life instruments in cardiac patients: SF-36, QLI, QLMI, and SEIQoL. Heart. 2000;84:390–394.

23. Spertus JA, Winder JA, Dewhurst TA, Deyo RA, Fihn SD. Monitoring the quality-of-life in patients with coronary-artery disease. Am J Cardiol. 1994;74:1240–1244.

24. Spertus JA, Winder JA, Dewhurst TA, Deyo RA, Prodzinski J, Mcdonell M, Fihn SD. Development and evaluation of the Seattle Angina Questionnaire: a new functional status measure for coronary-artery disease. J Am Coll Cardiol. 1996;25:333–341.

25. Spertus JA, McDonell M, Woodward CL, Fihn SD. Association between depression and worse disease-specific functional status in outpatients with coronary artery disease. Am Heart J. 2000;140:105–110.

26. Johnson JL, Greaves L, Repta R. Better Science With Sex and Gender: A Primer for Health Research. Vancouver: Women’s Health Research Network; 2007.

27. Bem SL. The measurement of psychological androgyny. J Consult Clin Psychol. 1974;42:155–162.

28. Vaglio J Jr, Conard M, Poston WS, O’Keefe J, Haddock CK, House J, Spertus JA. Testing the performance of the ENRICHD Social Support Instrument in cardiac patients. Health Qual Life Outcomes. 2004;2:24.

29. Zigmond AS, Snith RP. The hospital anxiety and depression scale. Acta Psychiatr Scand. 1983;67:361–370.

30. Weintraub WS, Spertus JA, Kolm P, Moron DJ, Zhang Z, Jarkovitz C, Zhang W, Hartigan PM, Lewis C, Veledar E, Bowen J, Dunbar SB, Deaton C, Kaufman S, O’Rourke RA, Goeree R, Barnett PG, Teo KK, Boden WE, Mancini GB. Effect of PCI on quality of life in patients with stable coronary disease. N Engl J Med. 2008;359:677–687.

31. Yuan YC. Multiple Imputation for Missing Data. Concepts and New Development (Version 9.0). Rockville, MD: SAS Institute Inc; 2010.

32. Norris CM, Spertus JA, Jensen L, Johnson J, Hegadoren KM, Ghalı WA. Sex and gender discrepancies in health-related quality of life outcomes among patients with established coronary artery disease. Circ Cardiovasc Qual Outcomes. 2008;1:123–139.

33. Hemingway H, Langenberg C, Damant J, Frost C, Pyorala K, Barrett-Connor E. Prevalence of angina in women versus men: a systematic review and meta-analysis of international variations across 31 countries. Circulation. 2008;117:1526–1536.

34. De Smedt D, Clays E, Annemans L, Doyle F, Kotseva K, Pajak A, Prugger C, Jennings C, Wood D, De Bacquer D. Health related quality of life in coronary patients and its association with their cardiovascular risk profile: results from the EUROASPIRE III survey. Int J Cardiol. 2013;168:898–903.

35. Dodson JA, Arnold SV, Reid KJ, Gill TM, Rich MW, Masoudi FA, Spertus JA, Krumholz HM, Alexander KP. Physical function and independence 1 year after myocardial infarction: observations from the Translational Research Investigating Underlying disparities in recovery from acute Myocardial infarction: Patients’ Health status registry. Am Heart J. 2012;163:790–796.

36. Kristofferzon ML, Lofmark R, Carlsson M. Coping, social support and quality of life over time after myocardial infarction. J Adv Nurs. 2005;52:113–123.

37. Bird CE, Rieker PP. Gender matters: an integrated model for understanding men’s and women’s health. Soc Sci Med. 1999;48:745–755.

38. Krieger N. Genders, sexes, and health: what are the connections—and why does it matter? Int J Epidemiol. 2003;32:652–657.

39. King KB. Psychologic and social aspects of cardiovascular disease. Ann Behav Med. 1997;19:264–270.

40. Kristofferzon ML, Lofmark R, Carlsson M. Perceived coping, social support, and quality of life 1 month after myocardial infarction: a comparison between Swedish women and men. Heart Lung. 2005;34:39–50.