

# Impact of Peak Provoked Left Ventricular Outflow Tract Gradients on Health-Related Quality of Life in Patients With Hypertrophic Cardiomyopathy: A Real-World Cross-Sectional Survey

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## INTRODUCTION

- Hypertrophic cardiomyopathy (HCM) is a chronic, progressive disease characterized by left ventricular hypertrophy.<sup>1,2</sup>
- HCM causes substantial symptoms that can significantly impact quality of life (QoL).<sup>3,4</sup>
- Elevated provoked left ventricular outflow tract gradients (LVOT-G) are linked to worse symptoms, more cardiovascular events, and poorer long-term outcomes,<sup>5</sup> but their relationship with QoL remains unclear.

## OBJECTIVE

- This study evaluated the association between LVOT-G, QoL, and work productivity in patients with HCM.

## METHODS

### Study Design

- Between July 2022 and October 2024, data were drawn from the Adelphi Real World HCM Disease Specific Programme™ (DSP), a multinational, cross-sectional survey conducted in Italy, Spain, and the United States.
- The DSP methodology details were previously described, validated, and demonstrated to be representative and consistent over time.<sup>6-8</sup>
- Cardiologists completed questionnaires on the demographic and clinical characteristics of their patients with HCM, and patients completed the EuroQoL 5-Dimension 5-Level Questionnaire (EQ-5D-5L), the Kansas City Cardiomyopathy Questionnaire (KCCQ-23), and the Work Productivity and Activity Impairment (WPAI) questionnaire.
- Patients with HCM were classified into 3 groups based on predefined LVOT-G: Group 1: <30 mmHg, Group 2: ≥30 to <90 mmHg, and Group 3: ≥90 mmHg.<sup>5</sup>
- QoL was measured using EQ-5D-5L, EuroQoL Visual Analog Scale (EQ-VAS) scores, and the KCCQ-23. Work productivity was measured using the WPAI questionnaire.
- Mean QoL and work productivity scores were reported. Spearman's rank correlation, the Kruskal-Wallis test, and the Mann-Whitney test assessed associations between disease progression, as measured using LVOT-G, and outcomes.

## RESULTS

### Patient Population

- Demographics and characteristics of patients with HCM (N=1248) and of the LVOT-G groups are shown in **Table 1**.
- Among the 1248 patients, the mean age was 55.82 years, and 61.30% were male.
- Overall, 79.49% of patients were classified as NYHA class II, and the majority were taking beta-blockers (77.48%).
- 63.62% of patients had LVOT-G ≥30 mmHg.
- Comorbidities:
  - 30.45% of patients had hypertension, 20.11% had atrial fibrillation, and 10.50% had heart failure (**Table 2**).
  - The most common symptom was dyspnea when active (87.65%), followed by fatigue (31.22%), palpitations (29.53%), chest pain (19.04%), and dizziness (9.14%).

### Quality of Life and Work Productivity

- Mean KCCQ Overall Summary Scores decreased significantly with increasing LVOT-G: Group 1 = 82.28, Group 2 = 75.20, Group 3 = 47.98 ( $P<0.05$ ).
- Similarly, mean KCCQ Clinical Summary Scores decreased significantly with increasing LVOT-G: Group 1 = 84.01, Group 2 = 78.05, Group 3 = 55.08 ( $P<0.05$ ) (**Table 3, Figure 1**).
- Higher LVOT-G was significantly associated with lower mean EQ-5D-5L and EQ-VAS scores ( $P<0.05$  for both) (**Table 3, Figure 2**).
- Activity impairment, work-related activity impairment, and overall work impairment due to HCM all significantly increased with rising LVOT-G, as measured by the WPAI (all  $P<0.05$ ) (**Table 3, Figure 3**).

Table 1. Patient demographics and characteristics based on the provoked LVOT-G

| n (%) <sup>a</sup>                       | Total HCM<br>n=1248 <sup>b</sup> | <30 mmHg<br>n=454 | ≥30 to <90 mmHg<br>n=740 | ≥90 mmHg<br>n=54 | P value |
|------------------------------------------|----------------------------------|-------------------|--------------------------|------------------|---------|
| Age, y                                   | n=1248                           | n=454             | n=740                    | n=54             |         |
| Mean (SD)                                | 55.82 (14.72)                    | 56.31 (14.50)     | 55.58 (14.71)            | 54.91 (16.62)    | 0.3842  |
| Time since first onset of symptoms, y    | n=296                            | n=66              | n=228                    | n=2              |         |
| Mean (SD)                                | 2.75 (3.15)                      | 3.12 (3.11)       | 2.64 (3.17)              | 2.13 (0.76)      | 0.5449  |
| Current NYHA classification              | n=1248                           | n=454             | n=740                    | n=54             |         |
| I                                        | 97 (7.77)                        | 29 (6.39)         | 65 (8.78)                | 3 (5.56)         | 0.2218  |
| II                                       | 992 (79.49)                      | 380 (83.70)       | 571 (77.16)              | 41 (75.93)       |         |
| III                                      | 148 (11.86)                      | 43 (9.47)         | 96 (12.97)               | 9 (16.67)        |         |
| IV                                       | 11 (0.88)                        | 2 (0.44)          | 8 (1.08)                 | 1 (1.85)         |         |
| III/IV                                   | 159 (12.74)                      | 45 (9.91)         | 104 (14.05)              | 10 (18.52)       |         |
| Country                                  | n=1248                           | n=454             | n=740                    | n=54             |         |
| Italy                                    | 425 (34.05)                      | 157 (34.58)       | 244 (32.97)              | 24 (44.44)       | <0.0001 |
| Spain                                    | 410 (32.85)                      | 198 (43.61)       | 188 (25.41)              | 24 (44.44)       |         |
| USA                                      | 413 (33.09)                      | 99 (21.81)        | 308 (41.62)              | 6 (11.11)        |         |
| Time since HCM diagnosis, y              | n=1117                           | n=394             | n=676                    | n=47             |         |
| Mean (SD)                                | 2.70 (3.64)                      | 3.08 (4.29)       | 2.45 (3.24)              | 3.10 (2.92)      | 0.1700  |
| Biologic sex                             | n=1248                           | n=454             | n=740                    | n=54             |         |
| Male                                     | 765 (61.30)                      | 276 (60.79)       | 463 (62.57)              | 26 (48.15)       | 0.1062  |
| Female                                   | 483 (38.70)                      | 178 (39.21)       | 277 (37.43)              | 28 (51.85)       |         |
| Currently treated for HCM                | n=1248                           | n=454             | n=740                    | n=54             |         |
| Beta-blockers                            | 967 (77.48)                      | 334 (73.57)       | 591 (79.86)              | 42 (77.78)       | 0.0409  |
| Diuretics                                | 372 (29.81)                      | 127 (27.97)       | 225 (30.41)              | 20 (37.04)       | 0.3323  |
| Calcium channel blockers                 | 351 (28.12)                      | 74 (16.30)        | 270 (36.49)              | 7 (12.96)        | <0.0001 |
| Angiotensin-converting enzyme inhibitors | 264 (21.15)                      | 92 (20.26)        | 162 (21.89)              | 10 (18.52)       | 0.7113  |
| Angiotensin receptor blockers            | 196 (15.71)                      | 75 (16.52)        | 112 (15.14)              | 9 (16.67)        | 0.7999  |
| Antiarrhythmics (including disopyramide) | 174 (13.94)                      | 46 (10.13)        | 117 (15.81)              | 11 (20.37)       | 0.0087  |
| Mineral receptor antagonists             | 136 (10.90)                      | 61 (13.44)        | 69 (9.32)                | 6 (11.11)        | 0.0864  |
| Cardiac myosin ATPase inhibitor          | 85 (6.81)                        | 10 (2.20)         | 75 (10.14)               | 0 (0.00)         | <0.0001 |
| Antianginals                             | 26 (2.08)                        | 13 (2.86)         | 11 (1.49)                | 2 (3.70)         | 0.1883  |
| Other                                    | 27 (2.16)                        | 12 (2.64)         | 13 (1.76)                | 2 (3.70)         | 0.4326  |
| None                                     | 172 (13.78)                      | 86 (18.94)        | 78 (10.54)               | 8 (14.81)        | 0.0002  |
| Duration of current treatment, y         | n=904                            | n=294             | n=567                    | n=43             |         |
| Mean (SD)                                | 1.79 (1.98)                      | 1.94 (2.11)       | 1.68 (1.91)              | 2.18 (2.02)      | 0.4224  |

<sup>a</sup> Unless otherwise stated.  
<sup>b</sup> The cohort included patients with both obstructive and nonobstructive HCM.  
HCM, hypertrophic cardiomyopathy; LVOT-G, left ventricular outflow tract gradient; NYHA, New York Heart Association functional class.

Table 2. HCM symptoms and CV comorbidities based on the provoked LVOT-G

| n (%)                                                      | Total HCM<br>n=1248 | <30 mmHg<br>n=454 | ≥30 to <90 mmHg<br>n=740 | ≥90 mmHg<br>n=54 | P value |
|------------------------------------------------------------|---------------------|-------------------|--------------------------|------------------|---------|
| Proportion of patients currently experiencing symptoms     | n=1225              | n=440             | n=731                    | n=54             |         |
| Currently experiencing symptoms                            | 1182 (96.49)        | 428 (97.27)       | 701 (95.90)              | 53 (98.15)       | 0.3690  |
| Not currently experiencing symptoms                        | 43 (3.51)           | 12 (2.73)         | 30 (4.10)                | 1 (1.85)         |         |
| Current symptoms among patients with symptoms <sup>a</sup> | n=1182              | n=428             | n=701                    | n=53             |         |
| Dyspnea when active                                        | 1036 (87.65)        | 377 (88.08)       | 615 (87.73)              | 44 (83.02)       | 0.5690  |
| Fatigue/weakness                                           | 369 (31.22)         | 136 (31.78)       | 213 (30.39)              | 20 (37.74)       | 0.5128  |
| Palpitations                                               | 349 (29.53)         | 126 (29.44)       | 205 (29.24)              | 18 (33.96)       | 0.7675  |
| Chest pain when active                                     | 225 (19.04)         | 61 (14.25)        | 149 (21.26)              | 15 (28.30)       | 0.0031  |
| Dyspnea when at rest                                       | 121 (10.24)         | 35 (8.18)         | 80 (11.41)               | 6 (11.32)        | 0.2129  |
| Dizziness                                                  | 108 (9.14)          | 33 (7.71)         | 70 (9.99)                | 5 (9.43)         | 0.4357  |
| Edema                                                      | 88 (7.45)           | 44 (10.28)        | 41 (5.85)                | 3 (5.66)         | 0.0200  |
| Paroxysmal nocturnal dyspnea                               | 81 (6.85)           | 25 (5.84)         | 49 (6.99)                | 7 (13.21)        | 0.1316  |
| Orthopnea                                                  | 61 (5.16)           | 20 (4.67)         | 38 (5.42)                | 3 (5.66)         | 0.8472  |
| Total number of top 5 symptoms experienced <sup>b</sup>    | n=1225              | n=440             | n=731                    | n=54             |         |
| 0 (no symptoms experienced)                                | 72 (5.88)           | 26 (5.91)         | 43 (5.88)                | 3 (5.56)         | 0.2165  |
| 1                                                          | 524 (42.78)         | 199 (45.23)       | 302 (41.31)              | 23 (42.59)       |         |
| 2                                                          | 396 (32.33)         | 135 (30.68)       | 248 (33.93)              | 13 (24.07)       |         |
| 3                                                          | 171 (13.96)         | 58 (13.18)        | 104 (14.23)              | 9 (16.67)        |         |
| 4                                                          | 52 (4.24)           | 20 (4.55)         | 28 (3.83)                | 4 (7.41)         |         |
| 5 (all symptoms experienced)                               | 10 (0.82)           | 2 (0.45)          | 6 (0.82)                 | 2 (3.70)         |         |
| CV comorbidities <sup>a</sup>                              | n=1248              | n=454             | n=740                    | n=54             |         |
| Hypertension                                               | 380 (30.45)         | 147 (32.38)       | 220 (29.73)              | 13 (24.07)       | 0.3653  |
| Atrial fibrillation / atrial flutter                       | 251 (20.11)         | 100 (22.03)       | 139 (18.78)              | 12 (22.22)       | 0.3686  |
| Hyperlipidemia                                             | 144 (11.54)         | 51 (11.23)        | 84 (11.35)               | 9 (16.67)        | 0.4827  |
| Heart failure                                              | 131 (10.50)         | 70 (15.42)        | 57 (7.70)                | 4 (7.41)         | 0.0001  |
| Left atrial dilation                                       | 111 (8.89)          | 45 (9.91)         | 60 (8.11)                | 6 (11.11)        | 0.4793  |
| Non-sustained ventricular tachycardia                      | 82 (6.57)           | 36 (7.93)         | 35 (4.73)                | 11 (20.37)       | <0.0001 |
| Bradycardia                                                | 67 (5.37)           | 32 (7.05)         | 30 (4.05)                | 5 (9.26)         | 0.0361  |

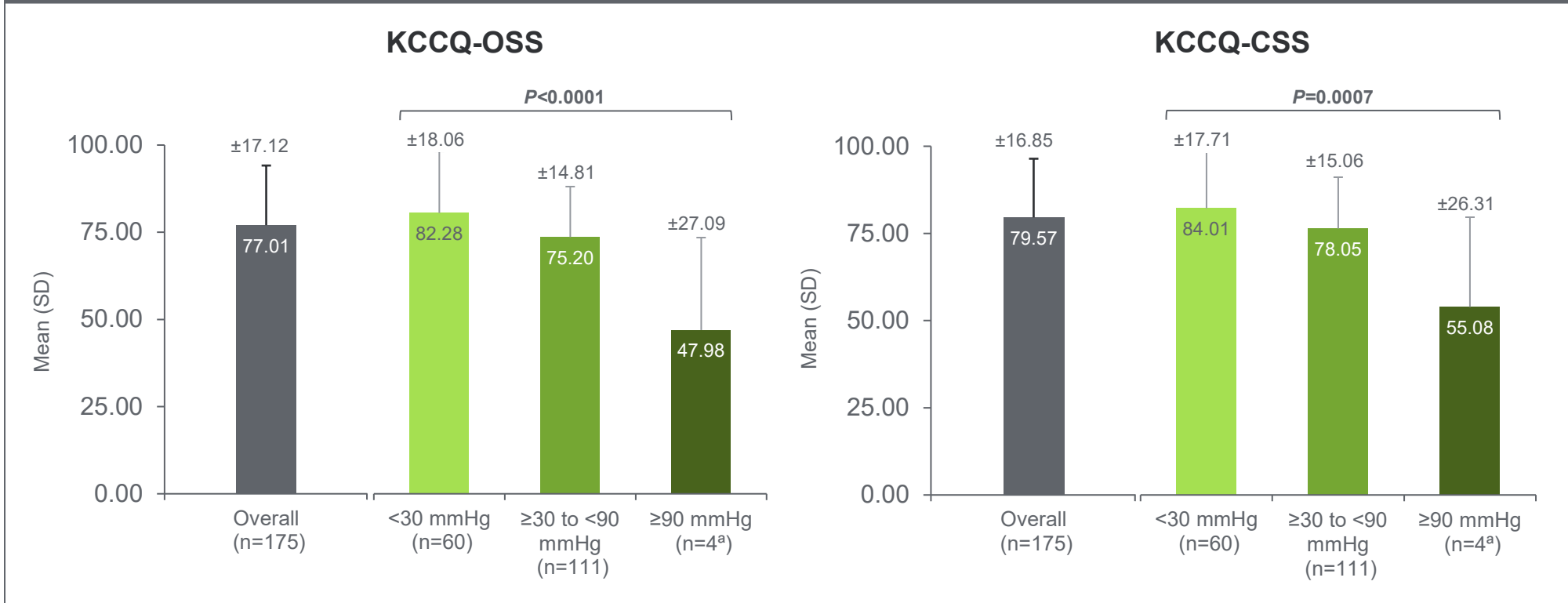
<sup>a</sup> Reported for ≥20% of the population.  
<sup>b</sup> Top 5 symptoms include dyspnea when active, fatigue/weakness, palpitations, chest pain when active, and dizziness.  
CV, cardiovascular; HCM, hypertrophic cardiomyopathy; LVOT-G, left ventricular outflow tract gradient.

Table 3. Quality of life and work productivity based on the provoked LVOT-G

| n (%) <sup>a</sup>                             | Total HCM<br>n=1248 | <30 mmHg<br>n=454 | ≥30 to <90 mmHg<br>n=740 | ≥90 mmHg<br>n=54 | P value |
|------------------------------------------------|---------------------|-------------------|--------------------------|------------------|---------|
| KCCQ-OSS                                       | n=175               | n=60              | n=111                    | n=4              |         |
| Mean (SD)                                      | 77.01 (17.12)       | 82.28 (18.06)     | 75.20 (14.81)            | 47.98 (27.09)    | <0.0001 |
| Quartiles                                      | n=175               | n=60              | n=111                    | n=4              |         |
| 0 to ≤68                                       | 48 (27.43)          | 13 (21.67)        | 32 (28.83)               | 3 (75.00)        | <0.0001 |
| >68 to ≤82                                     | 51 (29.14)          | 8 (13.33)         | 43 (38.74)               | 0 (0.00)         |         |
| >82 to ≤90                                     | 30 (17.14)          | 11 (18.33)        | 18 (16.22)               | 1 (25.00)        |         |
| >90 to ≤100                                    | 46 (26.29)          | 28 (46.67)        | 18 (16.22)               | 0 (0.00)         |         |
| KCCQ-CSS                                       | n=175               | n=60              | n=111                    | n=4              |         |
| Mean (SD)                                      | 79.57 (16.85)       | 84.01 (17.71)     | 78.05 (15.06)            | 55.08 (26.31)    | 0.0007  |
| Quartiles                                      | n=175               | n=60              | n=111                    | n=4              |         |
| 0 to ≤70                                       | 45 (25.71)          | 11 (18.33)        | 31 (27.93)               | 3 (75.00)        | 0.0002  |
| >70 to ≤83                                     | 45 (25.71)          | 12 (20.00)        | 33 (29.73)               | 0 (0.00)         |         |
| >83 to ≤92                                     | 37 (21.14)          | 8 (13.33)         | 28 (25.23)               | 1 (25.00)        |         |
| >92 to ≤100                                    | 48 (27.43)          | 29 (48.33)        | 19 (17.12)               | 0 (0.00)         |         |
| EQ-5D-5L (US value set)                        | n=173               | n=60              | n=109                    | n=4              |         |
| Mean (SD)                                      | 0.86 (0.15)         | 0.90 (0.13)       | 0.85 (0.14)              | 0.64 (0.29)      | 0.0031  |
| EQ-VAS                                         | n=170               | n=58              | n=108                    | n=4              |         |
| Mean (SD)                                      | 75.36 (14.69)       | 79.09 (14.37)     | 74.48 (12.93)            | 45.00 (27.39)    | 0.0050  |
| WPAI                                           |                     |                   |                          |                  |         |
| Percentage activity impairment due to HCM      | n=165               | n=56              | n=105                    | n=4              |         |
| Mean (SD)                                      | 26.73 (24.27)       | 19.29 (23.50)     | 29.81 (23.00)            | 50.00 (40.82)    | 0.0002  |
| Percentage impairment while working due to HCM | n=65                | n=25              | n=38                     | n=2              |         |
| Mean (SD)                                      | 14.15 (19.11)       | 4.00 (7.07)       | 20.00 (21.81)            | 30.00 (14.14)    | <0.0001 |
| Percentage of work time missed due to HCM      | n=65                | n=25              | n=38                     | n=2              |         |
| Mean (SD)                                      | 1.66 (6.85)         | 0.11 (0.53)       | 2.56 (8.79)              | 4.17 (5.89)      | 0.0823  |
| Percentage overall work impairment due to HCM  | n=65                | n=25              | n=38                     | n=2              |         |
| Mean (SD)                                      | 14.92 (20.54)       | 4.08 (7.28)       | 21.09 (23.59)            | 33.33 (9.43)     | <0.0001 |

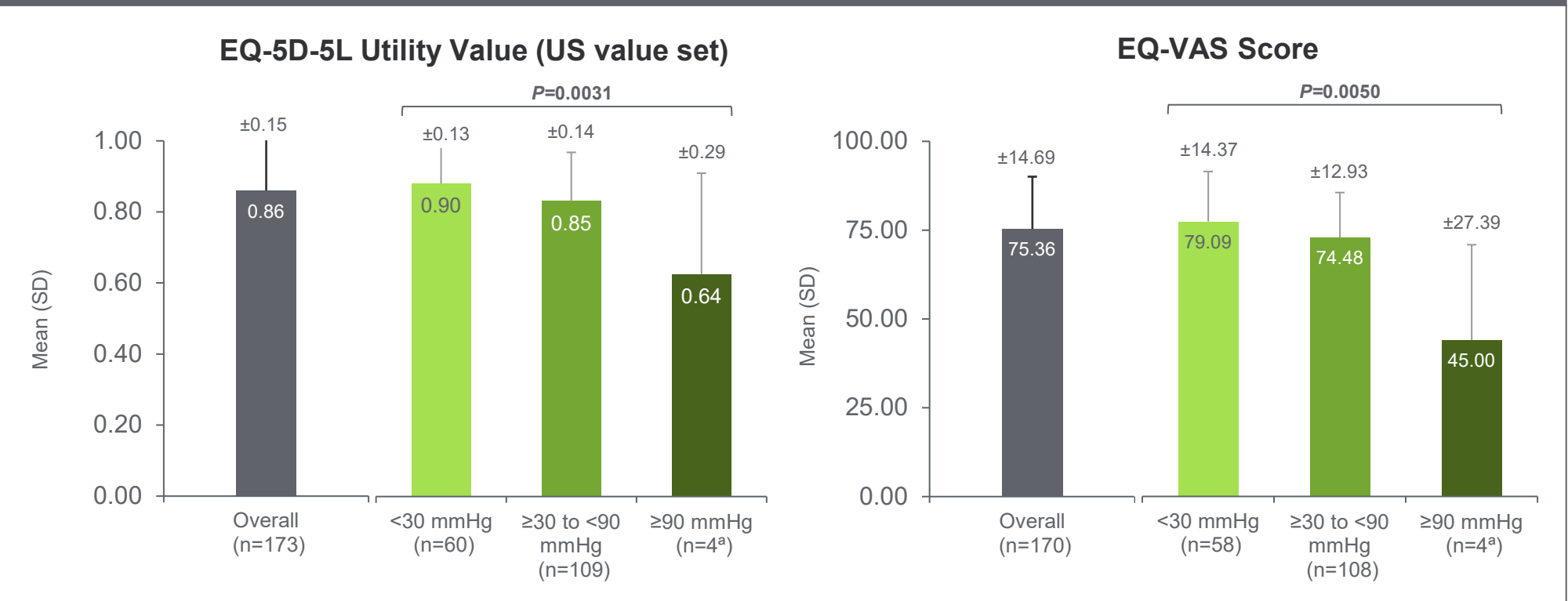
<sup>a</sup> Unless otherwise stated.  
EQ-5D-5L, EuroQoL 5-Dimension 5-Level Questionnaire; EQ-VAS, EuroQoL visual analog scale; KCCQ-CSS, Kansas City Cardiomyopathy Clinical Summary Score; KCCQ-OSS, Kansas City Cardiomyopathy Overall Summary Score; LVOT-G, left ventricular outflow tract gradient; WPAI, Work Productivity and Activity Impairment Questionnaire.

Figure 1. KCCQ-OSS and KCCQ-CSS



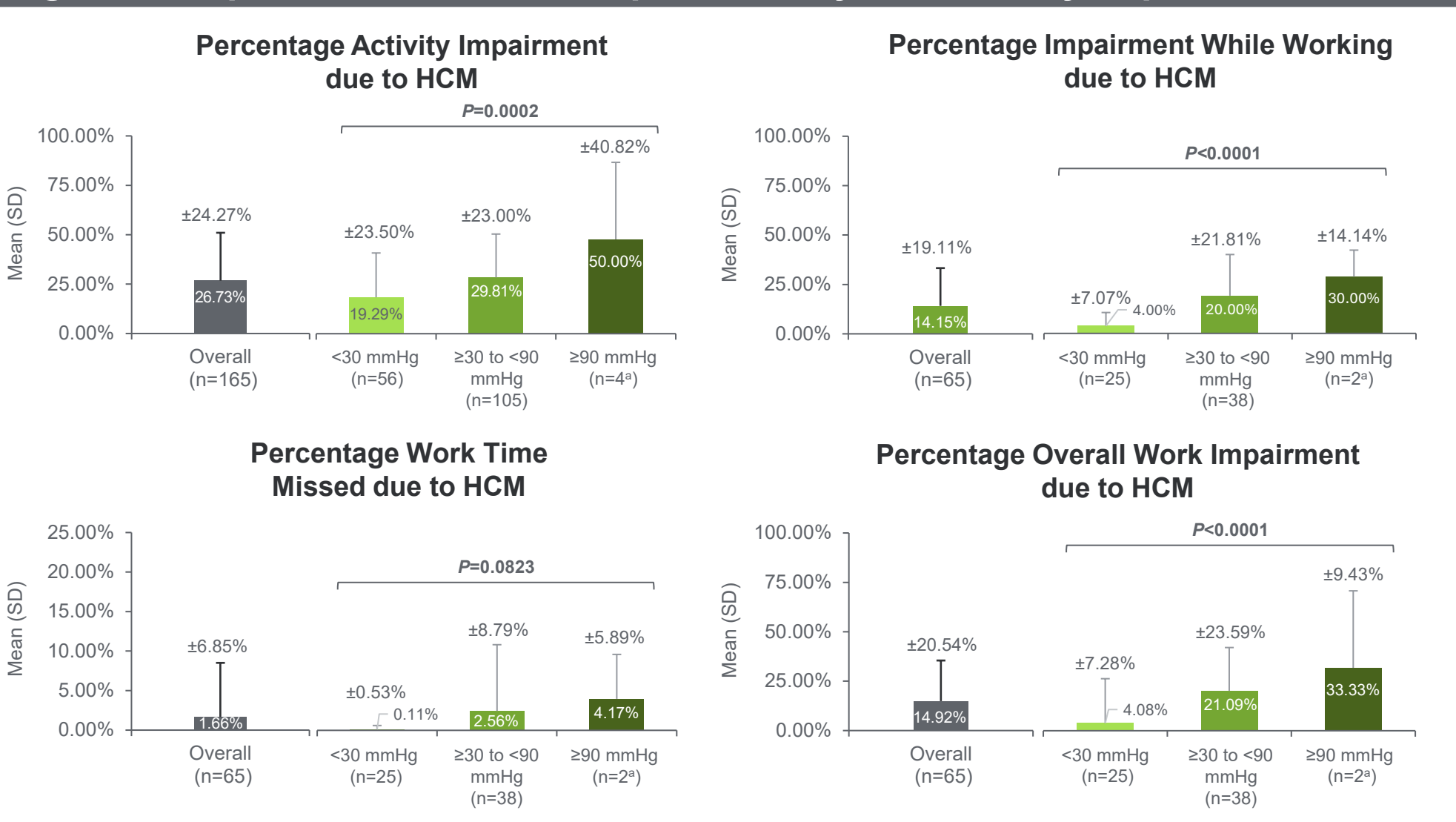
<sup>a</sup> Low base size.  
KCCQ-CSS, Kansas City Cardiomyopathy Questionnaire Clinical Summary Score; KCCQ-OSS, Kansas City Cardiomyopathy Questionnaire Overall Summary Score.

Figure 2. EQ-5D-5L and EQ-VAS



<sup>a</sup> Low base size.  
EQ-5D-5L, EuroQoL 5-Dimension 5-Level Questionnaire; EQ-VAS, EuroQoL visual analog scale.

Figure 3. Impact of HCM on work productivity and activity impairment



<sup>a</sup> Low base size.  
HCM, hypertrophic cardiomyopathy.

## LIMITATIONS

- Data from the survey are cross-sectional, with limited information about individual patient journeys or disease trajectories.
- Participation is affected by the willingness of participants to complete the survey and may not reflect a random sample of cardiologists or patients with HCM.

## CONCLUSIONS

- In patients with HCM, QoL and work productivity deteriorated with disease progression, as measured by LVOT-G.
- Effective treatments that lower LVOT-G and improve patient outcomes are needed to reduce the humanistic burden of HCM.

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### Disclosures

Paulos Gebrehiwet is an employee of and holds stock in Cytokinetics, Incorporated.

