

# Self-care behaviours of patients with left ventricular assist devices in Israel: changes during the COVID-19 pandemic

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## Abstract

**Aims** Left ventricular assist devices (LVADs) support the hearts of patients with advanced heart failure. Following LVAD implantation, patients face a complex regimen of self-care behaviours including self-care maintenance, self-care monitoring and self-care management. However, during the COVID-19 pandemic, symptoms of anxiety and depression may have interfered with their self-care. Currently, little is known on how specific self-care behaviours of LVAD-implanted patients changed during the COVID-19 pandemic. We aim to describe the changes in self-care behaviours among patients with an implanted LVAD in Israel during the COVID-19 pandemic and explore the factors related to self-care behaviour change.

**Methods** A prospective observational cross-sectional study design. A convenience sample of 27 Israeli LVAD-implanted patients (mean age  $62.4 \pm 9$ , 86% male, 78.6% living with a partner) completed the LVAD Self-Care Behaviour Scale (1 = *never* to 5 = *always*) and Hospital Anxiety and Depression Scale (0 = *not at all* to 3 = *most of the time*). Data were collected before and after the onset of the COVID-19 pandemic in Israel. Statistical analyses included paired *t*-tests, Pearson's correlations, and one-way repeated measures ANOVAs.

**Results** During the COVID-19 pandemic, a significant decrease was found in patients' adherence to checking and recording their LVAD speed, flow, power and PI (Pulsatility Index) ( $P = 0.05$ ), checking their INR ( $P = 0.01$ ), and daily weighing ( $P < 0.01$ ). The prevalence of some behaviours (e.g. regularly exercising) increased in some patients and decreased in others. Patients living without a partner worsened their adherence to some of the self-care behaviours (e.g. taking medicines as prescribed), compared with those living with a partner ( $M_b = 5.0 \pm 0$  and  $M_d = 5.0 \pm 0$ ,  $\Delta = 0$  vs.  $M_b = 5.0 \pm 0$  and  $M_d = 4.6 \pm 0.9$ ,  $\Delta = -0.4$ , respectively;  $F = 4.9$ ,  $P = 0.04$ ). Women, and not men, tended to improve their adherence to the self-care behaviour such as avoiding kinking, pulling, or moving the LVAD driveline at the exit site ( $M_b = 4.0 \pm 1.0$  and  $M_d = 5.0 \pm 0$ ,  $\Delta = 1.0$  vs.  $M_b = 4.5 \pm 0.9$  and  $M_d = 4.4 \pm 1.2$ ,  $\Delta = -0.1$ ,  $F = 4.7$ ,  $P = 0.04$ , respectively). In total, 41% (11) patients reported neither anxiety nor depression, 11% (3) reported anxiety, 15% (4) reported depression, and 44% (12) reported both anxiety and depression. No associations between anxiety and/or depression and self-care behaviours were found.

**Conclusions** Priorities in self-care behaviours among patients with implanted LVAD changed after the onset of the COVID-19 pandemic. Factors that assisted with adherence to self-care behaviours included living with a partner and being female. The current results may guide further research on identifying behaviours that are at risk of not being maintained during a time of emergency.

**Keywords** LVAD; Self-care; COVID-19

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## Background

Heart failure (HF) is a serious clinical and public health problem affecting 64.3 million people worldwide<sup>1</sup> and about 180 000 people in Israel.<sup>2</sup> Management of end-stage HF incorporates implantation of a left ventricular assist device (LVAD) as a bridge to heart transplantation or as the destination therapy.<sup>3</sup> Successful long-term LVAD support requires a high degree of patient self-care, including self-care maintenance, self-care monitoring, and self-care management.<sup>4</sup> During the COVID-19 pandemic, symptoms of anxiety and depression could have interfered with the self-care of patients with LVAD.<sup>5</sup> Indeed, these patients, their families and health-care providers faced unprecedented and unexpected challenges that may have disrupted appropriate self-care,<sup>5</sup> but little is known about how specific self-care behaviours changed during the pandemic.

## Aims

The current study aimed to describe and compare self-care behaviours before and during the COVID-19 pandemic among a sample of patients with implanted LVADs living in Israel and explore factors related to any changes in self-care behaviours.

## Methods

A cross-sectional study with retrospective comparisons was conducted of a convenience sample of adult (>18 years) patients implanted with LVAD from a single tertiary medical centre in Israel, who were able to read Hebrew. A research nurse provided the patients an explanation of the purpose of the study, the research procedure, and a guarantee of their anonymity and data confidentiality. Patients who signed an informed consent form were provided with a questionnaire to complete at the hospital or at home.

The questionnaire included the LVAD Self-Care Behaviour Scale which consists of 33 statements on three components: self-care maintenance (Items 1–10, 16, and 23–29, 33; 19 items), self-care monitoring (11–14, 17–20, 31, and 32; 10 items), and self-care management (15, 21, 22, and 30; 4 items) on a 5-point Likert scale ranging from 1 (*never*) to 5 (*always*).<sup>4</sup> The higher the mean score of the items, the better the self-care behaviour. The questionnaire also included the Hospital Anxiety and Depression Scale (HADS).<sup>6</sup> The HADS consists of 14 items: seven items indicating anxiety and seven items indicating depression. Participants were asked to rank items on a scale of 0 (*not at all*) to 3 (*most of the time*). The final score was calculated by summing the responses. Scores of 8 or more identify a person as not anxious or depressed.<sup>6</sup> In the current study, the Hebrew HADS version

demonstrated Cronbach's alpha of 0.87 for HADS-A and 0.84 for HADS-D.

Patients completed the LVAD Self-Care Behaviour Scale before the onset of the COVID-19 pandemic in Israel (between March 2017 and February 2020) and, again, following the onset of COVID-19 pandemic in Israel in March 2020 (between April 2020 and September 2020). Whereas the HADS was completed only following the onset of the COVID-19 pandemic in Israel (between April 2020 and September 2020). A research nurse obtained clinical characteristics of the patients from the medical files. Statistical analyses included descriptive statistics, paired sample *t*-tests, Pearson's correlations, and one-way repeated measures ANOVAs. Approval for the study was obtained from the medical centre's Helsinki Committee. All statistical tests were two-tailed, and a *P*-value <0.05 was considered statistically significant. All analyses were performed using IBM SPSS Statistics for Windows, version 27.0 (IBM Corp., Armonk, NY, USA).

Differences in self-care behaviours' scores during and before the COVID-19 pandemic were expressed in deltas by subtracting 'Before COVID-19' scores from 'During COVID-

**Table 1** Sociodemographic and clinical characteristics (*N* = 27)

	<i>n</i>	%
Age, mean ± SD, median	63 ± 9.0, 62	
Gender, male	24	89
Partner		
Yes	21	77.8
No	6	22.2
Education		
Below high school	4	9.3
High school	13	30.2
College/university	5	11.6
Graduate school	5	11.6
Employment		
Employed	2	4.7
Unemployed	25	95.3
LVAD name		
HeartWare HVAD	1	3.7
HeartMate II	4	14.8
HeartMate 3	22	81.5
Indication		
Bridge to transplant	19	70.4
Destination therapy	8	29.6
Cause of heart failure		
NICM	7	25.9
ICM	17	60.3
Other	2	7.4
Do not know	1	3.7
Co-morbidities		
Diabetes	17	63.0
Arrhythmia	14	51.9
Anaemia	9	33.3
Chronic renal failure	13	48.1
Smoking, yes	3	11.1
Time since LVAD implantation (months)		
Median (IQR)	30.1 (19.5–55.3)	
Body mass index		
Mean ± SD, median	27.7 ± 5.7, 26.5	
ICM, ischaemic cardiomyopathy; NICM, non-ischaemic cardiomyopathy.		

19' scores. The variance of the deltas scores was examined. To identify behaviours that increased in some patients and decreased in others, behaviours with deltas scores of 0 among  $\leq 50\%$  of the respondents and a variance  $\geq 1$  were described.

## Results

In total, 27 patients with implanted LVAD (mean age 63 years, 89% male) completed the questionnaire twice. As shown in *Table 1*, for most of the respondents, the indication for trans-

**Table 2** Differences in the mean scores of all items ('During COVID-19' score minus 'Before' score)

Item number	Self-care items	Before COVID-19, mean $\pm$ SD	During COVID-19, mean $\pm$ SD	Delta ('During COVID-19' score minus 'Before' score)	t	P
<b>Self-maintenance</b>						
1.	I clean the controller, batteries, and battery connection	4.5 $\pm$ 0.3	4.4 $\pm$ 0.4	-0.1	1.4	0.2
2.	I make checks that the electric and battery power source are available and work properly	3.7 $\pm$ 1.2	3.9 $\pm$ 1.2	0.2	1.1	0.27
3.	When I go to sleep, I keep the driveline, controller, and power supply secured	4.9 $\pm$ 0.3	4.7 $\pm$ 0.9	-0.2	1.1	0.28
4.	I keep back up battery and controller with me	5.0 $\pm$ 0.2	4.9 $\pm$ 0.4	-0.1	1.8	0.08
5.	I keep back up battery and controller with me	4.1 $\pm$ 1.3	3.9 $\pm$ 1.3	-0.2	0.8	0.45
6.	I avoid kinking, pulling, or moving of the driveline at the exit site	4.5 $\pm$ 0.9	4.4 $\pm$ 1.2	-0.1	0.2	0.84
7.	I wear a stabilization device to keep the driveline in place and to avoid excessive movement at the exit site	4.8 $\pm$ 0.5	4.7 $\pm$ 0.9	-0.1	1.0	0.31
8.	I keep the exit site and the driveline clean and dry	4.9 $\pm$ 0.4	4.9 $\pm$ 0.3	0.0	0.0	1.00
9.	I follow the steps/instructions in changing the sterile dressing on the exit site of the	4.9 $\pm$ 0.3	4.9 $\pm$ 0.4	0.0	0.0	1.00
10.	If applicable, I check and record the LVAD speed, flow, power, and PI every day	3.9 $\pm$ 1.5	3.1 $\pm$ 1.5	-0.8	2.0	<b>0.05</b>
16.	I inspect all cable connectors and the driveline for dirt or damage every day	4.7 $\pm$ 0.8	4.7 $\pm$ 0.6	0.0	0.2	0.86
23.	I can talk to someone about coping with the LVAD or with my health condition	4.9 $\pm$ 0.4	$\leq 4.9 \pm 0.3$	0.0	0.0	1.00
24.	I take my medicines as prescribed every day	5.0 $\pm$ 0.0	4.9 $\pm$ 0.4	-0.1	1.0	0.33
25.	I perform regular exercise	3.6 $\pm$ 1.4	3.5 $\pm$ 1.3	-0.1	0.3	0.74
26.	I eat a heart healthy diet	4.2 $\pm$ 0.9	3.9 $\pm$ 1.0	-0.3	1.5	0.15
27.	I follow the daily recommended fluid intake	4.5 $\pm$ 0.6	4.3 $\pm$ 0.9	-0.2	1.4	0.17
28.	I limit my alcohol intake to 1 unit/day for females and 2 units/day for males	4.2 $\pm$ 1.5	4.5 $\pm$ 1.1	0.3	1.4	0.18
29.	I avoid cigarettes and tobacco smoke	4.5 $\pm$ 1.3	4.4 $\pm$ 1.5	-0.1	0.5	0.65
30.	I get enough sleep	4.4 $\pm$ 0.7	4.5 $\pm$ 0.6	0.1	0.5	0.63
33.	I come to scheduled clinic visits	4.9 $\pm$ 0.4	4.9 $\pm$ 0.3	0	0.0	1.00
<b>Self-monitoring</b>						
11.	I evaluate and monitor my driveline exit site for evidence of infection and drainage as instructed	4.5 $\pm$ 0.4	4.3 $\pm$ 0.5	-0.2	1.9	0.06
12.	I monitor myself for signs of infection including fever, chills, and night sweats	4.7 $\pm$ 0.7	4.3 $\pm$ 1.2	-0.4	1.7	0.10
13.	I monitor myself for any signs of blood in my nose, urine (colour change), or blood in my stools	4.8 $\pm$ 0.8	4.6 $\pm$ 1.1	-0.2	0.8	0.40
14.	I monitor myself for any signs of blood in my nose, urine (colour change), or blood in my stools	4.7 $\pm$ 0.9	4.7 $\pm$ 1.1	0	0.4	0.70
15.	I check my INR regularly at home or clinic as instructed	5.0 $\pm$ 0.0	4.8 $\pm$ 0.4	-0.2	2.7	<b>0.01</b>
16.	I monitor myself for the development or increase in leg swelling	4.9 $\pm$ 0.3	4.9 $\pm$ 0.5	0	0.9	0.38
17.	I monitor myself for worsening shortness of breath	4.8 $\pm$ 0.7	4.8 $\pm$ 0.4	0	0.5	0.65
18.	I monitor myself for worsening fatigue	4.8 $\pm$ 0.8	4.7 $\pm$ 0.7	-0.1	0.8	0.44
19.	I weigh myself every day	4.5 $\pm$ 0.7	3.9 $\pm$ 1.1	-0.6	3.2	<b>&lt;0.01</b>
20.	I measure my blood pressure every day	2.7 $\pm$ 1.2	2.8 $\pm$ 1.1	0.1	0.5	0.65
21.	I monitor myself for symptoms of stroke	4.1 $\pm$ 1.5	4.0 $\pm$ 1.6	-0.1	0.3	0.76
<b>Self-management</b>						
22.	I contact the LVAD/heart failure team in case of alarms or equipment issues	4.3 $\pm$ 0.7	4.4 $\pm$ 0.6	0.1	-0.8	0.4
23.	I talk with LVAD/heart failure team or someone when I am feeling sad or worried	4.7 $\pm$ 0.7	4.6 $\pm$ 0.9	-0.1	0.2	0.88
24.	I adjust my physical activities according to my symptoms	3.1 $\pm$ 1.7	3.7 $\pm$ 1.5	0.6	1.4	0.18
25.	I adjust my physical activities according to my symptoms	4.8 $\pm$ 0.5	4.6 $\pm$ 0.7	-0.2	1.3	0.20
26.	I contact the LVAD/heart failure team in case of symptoms	4.5 $\pm$ 1.0	4.8 $\pm$ 0.5	0.3	1.4	0.18

The significant statistical effects ( $P \leq .05$  or  $P \leq .01$ ) are in bold.

plantation was a bridge to transplant, the majority had HeartMate 3 LVADs, and the most common reason for HF was ischemic cardiomyopathy. The median time patients lived with an LVAD was 30.1 months.

### Differences in the scores of self-care behaviours before and during COVID-19

The scores for various self-care behaviours before and during the COVID-19 pandemic as well as delta scores are presented in Table 2. No differences were found in changes of LVAD Self-Care Behaviour subscales scores including self-maintenance, self-monitoring, and self-management. For the separate items, it was found that keeping the exit site and the driveline clean and dry (Item 7) ( $M = 4.9$ ), monitoring for the development or increase in leg swelling (Item 17) ( $M = 4.9$ ), and attending scheduled clinic visits (Item 33) ( $M = 4.9$ ) were three highly prevalent behaviours that did not change during the COVID-19 pandemic ( $\Delta = 0$ ).

A significant decrease in adherence during the COVID-19 pandemic was found in checking and recording LVAD speed, flow, power and PI (Pulsatility Index) every day (Item 9) ( $M_{\text{before}} = 3.9 \pm 1.5$  vs.  $M_{\text{during}} = 3.1 \pm 1.5$ ,  $\Delta = -0.8$ ,  $t = 2.0$ ,  $P = 0.05$ ), checking INR (Item 14) ( $M_b = 5.0 \pm 0$  vs.  $M_d = 4.8 \pm 0.4$ ,  $\Delta = -0.2$ ,  $t = 2.7$ ,  $P = 0.01$ ), and weighing daily (Item 20) ( $M_b = 4.5 \pm 0.7$  vs.  $M_d = 3.9 \pm 1.1$ ,  $\Delta = -0.6$ ,  $t = 3.2$ ,  $P < 0.01$ ).

During the pandemic some behaviours in some of the patients demonstrated variable prevalence. For example, the prevalence of the behaviour 'keeping back up battery and controller with me' (Item 4) increased among 22% ( $n = 6$ ) and decreased among 38% ( $n = 10$ ) of the respondents (vari-

ance = 2.3,  $\Delta = 0 = 41\%$ ). Also, the prevalence of the behaviour 'performing regular exercise' (Item 21) increased among 32% ( $n = 9$ ) and decreased among 42% ( $n = 11$ ) of the respondents (variance = 3.1,  $\Delta = 0 = 27\%$ ) (Figure 1).

Compared with patients living with a partner, those without a partner tended to worsen their adherence to some of the self-care behaviours including: taking medicines as prescribed (Item 23) ( $M_b = 5.0 \pm 0$  and  $M_d = 5.0 \pm 0$ ,  $\Delta = 0$  vs.  $M_b = 5.0 \pm 0$  and  $M_d = 4.6 \pm 0.9$ ,  $\Delta = -0.4$ , respectively;  $F = 4.9$ ,  $P = 0.04$ ); monitoring for signs of infection including fever, chills, and night sweats (Item 12) ( $M_b = 4.7 \pm 1.0$  and  $M_d = 4.8 \pm 0.9$ ,  $\Delta = 0.1$  vs.  $M_b = 5.0 \pm 0$  and  $M_d = 4.0 \pm 1.5$ ,  $\Delta = -1.0$ , respectively;  $F = 8.9$ ,  $P < 0.1$ ); and monitoring for worsening shortness of breath (Item 18) ( $M_b = 4.7 \pm 0.8$  and  $M_d = 5.0 \pm 0.2$ ,  $\Delta = 0.3$  vs.  $M_b = 5.0 \pm 0$  and  $M_d = 4.4 \pm 0.7$ ,  $\Delta = -0.6$ , respectively;  $F = 4.5$ ,  $P = 0.04$ ).

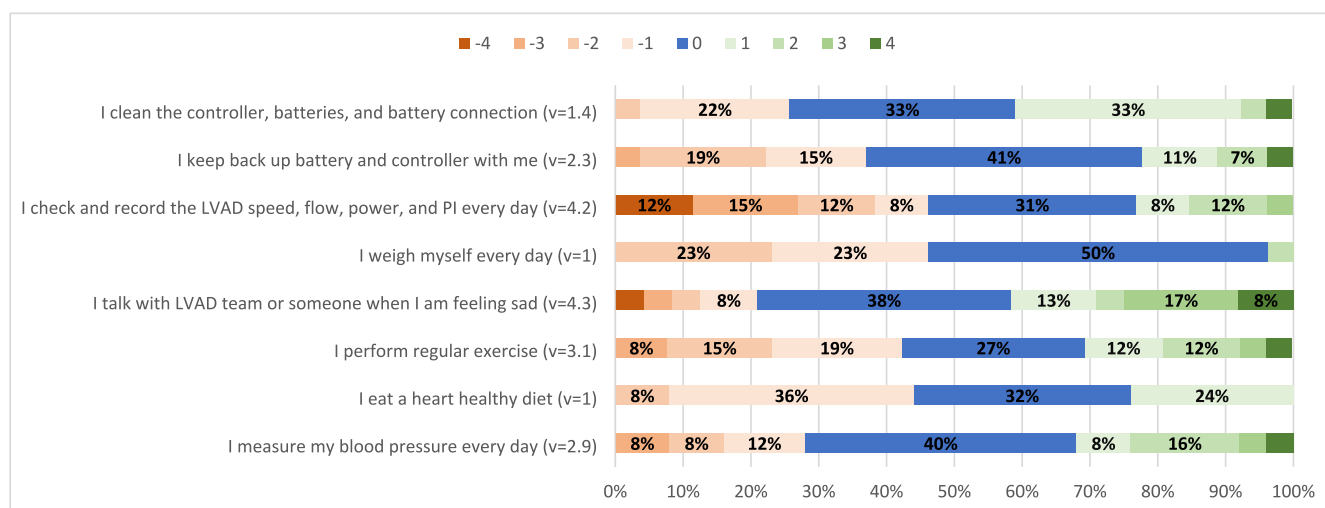
Compared with men, women tended to improve their adherence to self-care behaviour such as avoiding kinking, pulling, or moving of the driveline at the exit site (Item 5) ( $M_b = 4.5 \pm 0.9$  and  $M_d = 4.4 \pm 1.2$ ,  $\Delta = -0.1$ , vs.  $M_b = 4.0 \pm 1.0$  and  $M_d = 5.0 \pm 0$ ,  $\Delta = 1.0$ ,  $F = 4.7$ ,  $P = 0.04$ , respectively).

The changes in self-care behaviours during the COVID-19 pandemic did not lead to the observed clinical outcomes.

### Anxiety, depression, and self-care

In total 41% (11) patients reported no anxiety or depression, 11% (three) reported anxiety, 15% (four) reported depression, and 44% (12) patients reported both anxiety and de-

**Figure 1** Delta of self-care behaviours (percentage of patients) with a variance  $\geq 1$  and/or a  $\Delta = 0 \leq 50\%$ . v, variance. Percentage values below 8 are not indicated.



pression. No associations between anxiety and/or depression and self-care behaviours were found.

## Conclusions

Three behaviours that did not change during the COVID-19 pandemic were keeping the exit site and the driveline clean and dry (Item 7), monitoring for the development or increase in leg swelling (Item 17), and attending scheduled clinic visits (Item 33). The possible explanation for the lack of change may be due to a high acuity of the patients' condition. Two of the three behaviours in which a significant decline was found during the COVID-19 pandemic belong to the self-monitoring factor in the self-care behaviours scale (Item 14, checking INR and Item 20, weighing daily). Normally, patients with LVAD who are regularly treated with an oral anti-coagulant Warfarin are monitored weekly on blood INR levels in a community clinic laboratory. During the COVID-19 pandemic lockdowns, community clinic laboratories continued to provide services to patients. Therefore, this was not the reason for the reported decrease in the performance of INR tests. Moreover, the decreased INR monitoring did not lead to any changes in the patients' INR levels. Previous studies demonstrated that lockdowns during the COVID-19 pandemic led to a decrease in self-monitoring of blood glucose in patients with type 2 diabetes<sup>9</sup> and blood pressure and blood glucose in cardiovascular outpatients.<sup>10</sup> The reasons being inaccurate knowledge, lack of equipment, and inadequate skills in using equipment.<sup>10</sup> It may be assumed that in the current study similar reasons led to the decline in self-monitoring behaviours among patients with implanted LVADs.

The self-maintenance factor in the self-care behaviours scale (Item 9, checking and recording the LVAD speed, flow, power, and PI every day) also was found to decline during the COVID-19 pandemic. A previous study showed that during the pandemic, HF patients' self-care maintenance score was slightly lower than adequate self-care with the lowest average self-maintenance scores being related to physical activity and requesting a low-salt diet outside their homes.<sup>11</sup> This may be due to lockdowns and restrictions leading some patients to prioritize survival and to cope with immediate financial, emotional and social burdens.<sup>11</sup>

Some behaviours demonstrated variable prevalence, such as 'performing regular exercise' (Item 24) and 'eating a heart healthy diet' (Item 25). This may have been related to the presence or absence of lockdowns at the time when the participants responded to the questionnaire. Variability in the prevalence of other behaviours may be explained by external or personal reasons and indicates the need for a person-centred approach.

Patients not living with a partner tended to have worse adherence to some self-care behaviours such as taking

medicines as prescribed, monitoring for signs of infection including fever, chills, and night sweats as well as monitoring for worsening shortness of breath. A previous study demonstrated that during the COVID-19 pandemic, caregivers of patients with an LVAD reduced patients' risk of COVID-19 contagion and ensured appropriate self-care,<sup>12</sup> including driveline wound care and disinfection, LVAD management, and drug therapy administration.<sup>7</sup> In this study, it might be assumed that the majority of partners functioned as the patients' caregivers and therefore an absence of the partner/caregiver might be associated with reduced self-care.

Compared with men, women with an LVAD tended to improve their adherence to the self-care behaviour such as avoiding kinking, pulling, or moving of the driveline at the exit site. Previous research found that before the COVID-19 pandemic, women tended to report self-care problems more often than men.<sup>8</sup> Moreover, during the pandemic, among cardiometabolic patients in Latin America, women reported having healthier eating habits and lower alcohol and tobacco consumption, but exercising less than men.<sup>13</sup> Further studies are required to test the significance of the current self-care gender difference.

The limitations of the study include its small sample which restricts the depth of analysis we could perform. Furthermore, all the patients being treated at one medical centre may limit the generalizability of the results.

In summary, priorities in self-care behaviours among patients with implanted LVAD may differ before and during a pandemic. This may have been the reason why several crucial behaviours in self-care maintenance, management, and monitoring had significantly reduced adherence following the pandemic's onset. Having a partner served as supportive factor in ensuring patients' appropriate self-care, while women adhered more to their self-care compared with men.

During the COVID-19 pandemic, the current study found no associations between symptoms of anxiety and depression and the self-care of patients with LVAD. Future studies with a larger sample are needed to further examine the relationships between various self-care behaviours and psychopathologies such as anxiety and depression in patients implanted with LVAD during a time of emergency. In addition, the current results may guide further research on identifying behaviours at risk of not being maintained during emergency periods. Moreover, the current findings may also help clinicians to point a spotlight on self-care among patients with LVAD by introducing strategies of self-care support into their daily clinical practice. In times of crisis that affect routine care, clinicians need to be aware that patients' self-care requires more or different support, such as adapting the format and frequency of follow-up, encouraging the use of eHealth applications, or finding other flexible solutions to facilitate self-care.<sup>5</sup>



## Conflict of interest

The authors declare they do not have conflict of interest.

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