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Distress and anxiety following postponed cardiac surgery prior to and during the COVID-19 pandemic

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ABSTRACT

INTRODUCTION. Recently, the COVID-19 pandemic has caused postponements of elective cardiac surgery. We hypothesised that postponements due to the pandemic were associated with higher levels of psychological distress than prepandemic postponements.

METHODS. A prospective, observational cohort study was conducted among patients in whom elective cardiac surgery was postponed. Patients who received information regarding a new date of surgery prior to the pandemic were compared with patients postponed during the pandemic without information regarding a new date of surgery. Data were collected from patient records, validated questionnaires and interviews.

RESULTS. Out of 55 postponed patients, 21 experienced prepandemic postponement. No significant differences were observed between groups regarding the psychological measures before their rescheduled operation. However, patients in both groups reported high levels of anxiety and depression with > 60% indicative of potentially positive diagnoses. No differences were found in mortality across groups and no patients developed severe complications. Interviews showed that patients in the COVID-19 group felt immediate relief at postponement and engaged in a meaning-making process with respect to their ability to tolerate postponement in order to reassure themselves and their relatives.

CONCLUSIONS. No significant differences were found in psychological distress between the patients of the two groups. However, both groups experienced high levels of psychological distress. It remains unknown whether these results may be extrapolated to other surgical fields.

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Cancellations of planned cardiac surgery may be triggered for organisational, staff, or patient-related reasons [1, 2], and, most recently, also due to the COVID-19 pandemic. Studies have indicated that waiting time for surgery may increase levels of psychological distress [3-5]. Postponement of elective cardiac surgeries due to the COVID-19 pandemic may aggravate this situation, as psychological distress seems to be increased in the general population during the pandemic [6, 7].

A prospective, mixed methods cohort study among patients waiting for open cardiac surgery at Aalborg

University Hospital (AAUH), Denmark, was initiated during the autumn of 2019 to evaluate psychological distress in patients experiencing postponement of planned cardiac surgery. As a lockdown was imposed in Denmark as from 11 March 2020 due to COVID-19, the hospital started experiencing a shortage of intensive care resources, and consequently a variety of elective surgeries were postponed. In the Department of Cardiothoracic Surgery, all elective, open cardiac surgeries, such as coronary artery bypass grafting and valve surgeries, were postponed, whereas all emergent and urgent cardiac surgeries continued. In contrast to the standard procedure, patients who had their surgeries postponed due to the pandemic received no information regarding a new date of surgery.

The aim of the study was to examine differences in patients' psychological responses to postponement of elective cardiac surgery prior to and during the COVID-19 pandemic. In addition, the aim was to reveal patients' psychological reactions to postponements during the pandemic. We hypothesised that postponement of elective cardiac surgery due to the COVID-19 pandemic was associated with higher levels of psychological distress than in the prepandemic setting.

METHODS

This study formed part of a large prospective, ongoing observational cohort study in the Department of Cardiothoracic Surgery, AAUH, among patients who experienced postponement of elective open cardiac surgery after they had received their date of surgery. The study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline [8] and requirements from the Danish Data Protection Agency were met. The study protocol was approved by the Head of the Department and registered by the hospital (ID: 2019-128). Acceptance from the regional scientific committee was waived due to the observational character of the study.

Participants

Participants consisted of two groups of postponed patients. Patients in group 1 were recruited between 30 September 2019 and 10 March 2020. Patients in group 2 had their surgery postponed due to the COVID-19 lockdown and were recruited between 11 March and 6 July 2020. All patients scheduled for open, elective cardiac surgery were eligible for inclusion if their surgery was postponed after they had received their date of surgery. Pregnant patients, patients on a ventilator waiting for surgery and patients who had their surgery postponed more than once were excluded.

When surgeries were postponed for patients in group 1, the patients received information regarding a new date of surgery within a few days either in the hospital, by phone or by mail. Patients in group 2 were informed by phone or mail notifying them that their surgery needed to be postponed due to the pandemic. Patients in group 2 received no information regarding a new date of surgery. In both groups, the information given stated that the decision to postpone surgery was based on doctors' evaluation to ensure that postponed patients were not in need of urgent surgery. Valve patients were informed that supplementary transthoracic echocardiography was planned during the waiting period to ensure that potential heart failure did not worsen.

Recruitment of patients was conducted by project nurses on the last working day prior to the day of actual surgery if the patients were conscious and able to read and understand Danish.

Data collection

The study was based on both quantitative (survey and clinical) and qualitative (interview) data. The survey consisted of validated questionnaires regarding anxiety and depression (the Hospital Anxiety and Depression Scale (HADS)), quality of life (Short-form Health Survey, 36 items (SF-36)) and heart-focused anxiety (Cardiac

Anxiety Questionnaire (CAQ)), questions on sociodemographic and clinical information, and ad hoc questions regarding the patient's feelings when his or her surgery was postponed (**Table 1**).

TABLE 1 List of survey questionnaires and clinical data.

Type	Obtained from	Clinical data
Validated questionnaires	The patient	*SF-36* The SF-36 is a generic measure of health-related quality of life consisting of 36 items grouped into eight subscales: physical functioning, role physical functioning, role emotional functioning, mental health, vitality, social functioning, bodily pain and general health [9] *HADS* HADS is a 14-item self-reporting measure, consisting of two seven-item subscales measuring anxiety (HADS-A) and depressive (HADS-D) symptoms devoid of somatic symptoms A review of the HADS found a score ≥ 8 on both subscales to be an optimal cut-off point as indication of likely psychopathology with sensitivity and specificity ranging between 0.70 and 0.90 for most reviewed studies [10] *CAQ* Heart-focused anxiety was evaluated using the 18-item self-reported cardiac anxiety questionnaire Each item is rated on a 5-point Likert scale ranging from 0 to 4: never-always Scores on the total and subscales of Worry, Fear, Avoidance Behaviour, Attention, and Safety Seeking are expressed as the mean of the items of the specific scale Studies thus far have shown the CAQ to be a valid and reliable measure of heart-focused anxiety [11, 12]
Personal questions: thoughts, feelings, experiences and habits	The patient	The presence of psychiatric disease In addition, the study included specific questions regarding the circumstances of the postponement situation and immediate feelings and reactions
Information about postponement	The medical record	How: telephone, mail, face to face at the ward Time waiting for rescheduled surgery
Clinical data: present, in-hospital- and post-operative data	The medical record	Age, BMI, gender, logistic EuroSCORE II, date of initially planned surgery, date of postponement of surgery, date and type of surgery performed, in-hospital- and 30-day mortality

BMI = body mass index; CAQ = Cardiac Anxiety Questionnaire; HADS = Hospital Anxiety and Depression Scale; SF-36 = Short-form Health Survey, 36 items.

To explore in-depth how patients experienced postponement of surgery due to the COVID-19 pandemic, personal interviews were conducted with all patients in the COVID-19 group 3-6 months after surgery. These interviews were held at the patients' homes and were transcribed verbatim [13].

Analyses

Quantitative

Prior to analyses, continuous variables were tested for normality using the Shapiro-Wilk test due to the small sample size; non-normal data were analysed accordingly. Subsequently, the two groups were compared on various sample characteristics using a t-test-, Mann-Whitney-, χ^2- or Fisher's exact test, as appropriate, to ascertain whether any pre-existing differences could account for differences in psychological distress. An $\alpha = 0.05$ was considered statistically significant. We also calculated effects sizes as Cohen's D, Cramer's V or r to evaluate whether nonsignificant results may have been due to reduced power.

$$\text{Cohen's D } (= \frac{M1 - M2}{SD\text{pooled sample}}) \qquad \text{Cramer's V } (= \sqrt{\frac{\chi 2}{n(k-1)}}) \qquad \text{r } (= z/\sqrt{N})$$

Qualitative

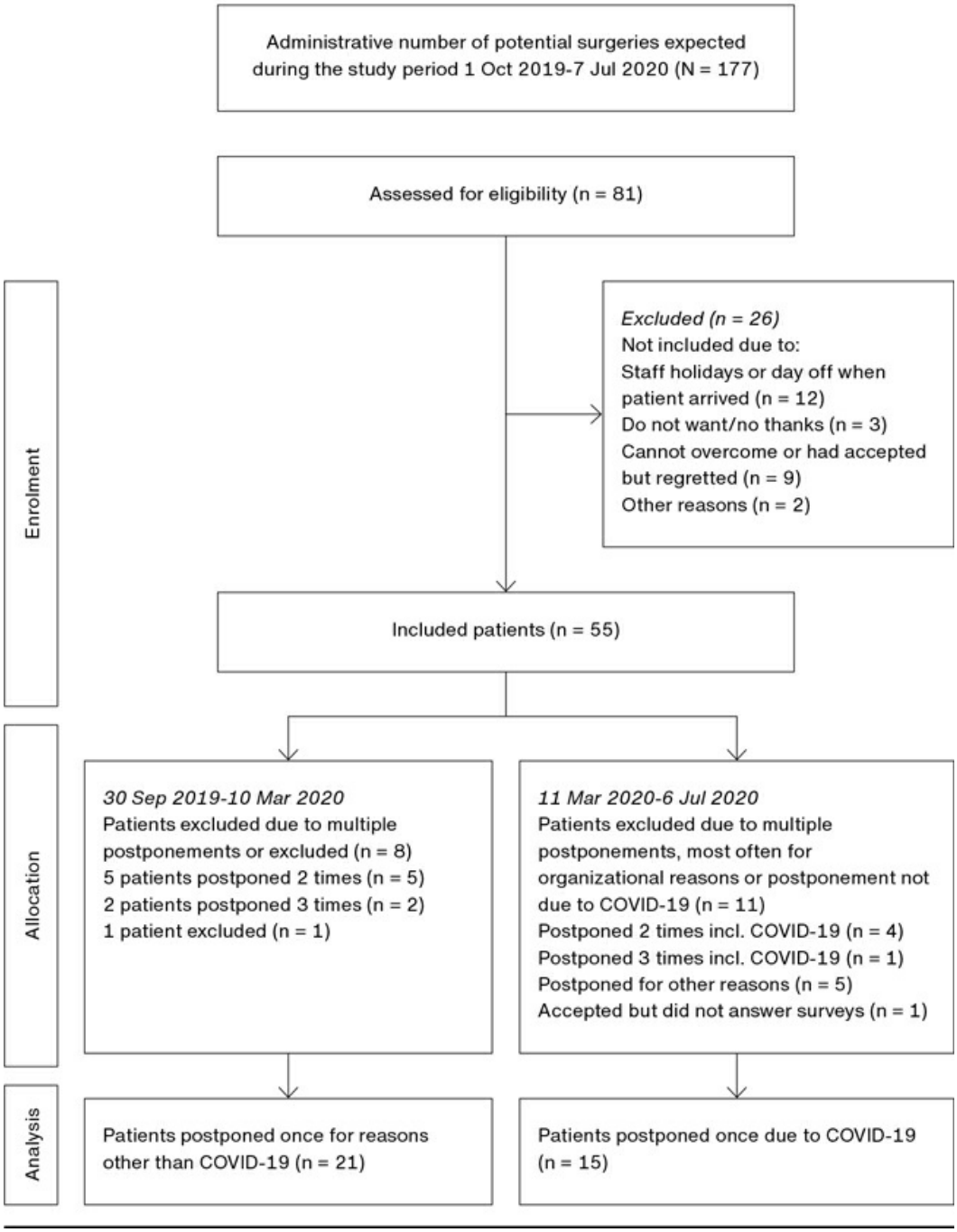
An inductive latent content analysis was performed using NVivo 12 [14] to condense the meaning of the interviews. After familiarising ourselves with the text, the interviews were coded and divided into themes by three researchers (DN, HS and CBT), and the themes were discussed among all authors [13, 15].

Trial registration: not relevant.

RESULTS

A total of 177 cardiac surgeries were expected to be performed in the hospital between 1 October 2019 and 7 July 2020. Among these, 81 (46%) patients experienced postponement of their elective surgery (**Figure 1**), and a total of 55 patients were eligible for inclusion in this study. However, some patients experienced additional postponements, leaving 21 patients for evaluation in group 1 and 15 patients in group 2. All patients in group 2 participated in interviews conducted 118-186 days post-operatively, except one (287 days). The interviews produced 105 standard pages of transcribed interviews. Here, only findings regarding patients' expressions of psychological distress when postponed during the COVID-19 pandemic are presented.

FIGURE 1 Flow chart.



Patients in group 2 were older (p = 0.02), more likely to be informed of the postponement by phone (p = 0.01) and waited 9-10 times longer for their rescheduled surgery. In contrast, post-operative hospitalisation was significantly longer in group 1 (p = 0.01). No other preoperative sociodemographic or clinical differences between groups were identified (Table 2).

TABLE 2 Pre- and post-operative sociodemographic, clinical, postponement-related and psychological characteristics.

	Group 1: prepandemic group (N = 21	Group 2: COVID-19 group (N = 15)	p-value	Effect size[a]
Preoperative characteristics				
Type of surgery, n (%):				
Coronary artery bypass grafting	4 (19)	6 (40)		
Valve surgery	5 (24)	2 (13)		
Combined surgery	12 (57)	7 (47)		
Sociodemographic:				
Age, median (IQR), yrs	67 (61.3-72.8)	76 (68.5-83.5)	0.02	0.28[a-m]
Male gender, n (%)	18 (85.7)	9 (60)	0.12	0.29[a-m]
Clinical characteristics:				
BMI, median (IQR), kg/m²	27.7 (24.1-31.3)	26.3 (21.8-31.0)	1.00	0.16[a-s]
LVEF, median (IQR), %	60 (49.5-72.5)	60 (50-70)	0.62	0.07
Hypertension, n (%)	16 (76)	13 (87)	0.67	0.13[a-s]
Diabetes mellitus, n (%)			0.86	0.09
No diabetes	17 (81)	11 (73.3)		
IDDM	1 (4.8)	1 (6.7)		
NIDDM	3 (14.3)	3 (20)		
EuroSCORE II, median (IQR)	1.60 (0.64-2.57)	1.67 (0.65-2.69)	0.64	0.09
Psychiatric disorder, n (%)	1 (5)	2 (13)	0.57	0.14[a-s]
Medical treatment for psychiatric disorder, n (%)	1 (5)	1 (7)	1.00	0.02
Treatment by psychologist/psychiatrist for psychiatric disorder, n (%)	0	2 (13)	0.20	0.30[a-m]
Postponement related:				
Anxious about disease worsening while waiting, n (%)	3 (14)	6 (40)	0.12	0.30[a-m]
Anxious about dying before rescheduled operation, n (%)	2/19 (14)	2/14 (13)	1.00	0.06
Time waiting for rescheduled operation, mean ± SD, days	6.4 ± 4.3	58.3 ± 17.9	0.00	4.34[a-l]
Psychological characteristics at the time of the rescheduled operation				
HADS-D ≥ 8, n (%)[b]	15 (71)	14 (93)	0.36	0.20[a-s]
HADS-A ≥ 8, n (%)[b]	16 (76)	9 (60)	0.28	0.27[a-s]
HADS-D, median (IQR)	12.83 (9.23-15.63)	11 (8.9-13.1)	0.44	0.10[a-s]
HADS-A, median (IQR)	14.00 (11.84-16.17)	9.33 (5.25-13.42)	0.14	0.24[a-m]
Heart-focused worry and fear, median (IQR)	0.9 (0.1-1.7)	1.0 (0.4-1.6)	1.00	0.04
Cardioprotective behaviour, mean ± SD	1.79 ± 1.0	2.0 ± 1.1	0.59	0.20
Heart-focused attention and checking, mean ± SD	1.0 ± 0.8	1.2 ± 0.6	0.42	0.30[a-s]
Safety and reassurance seeking behaviour, mean ± SD	1. 5 ± 1.1	1.7 ± 1.0	0.66	0.16
Quality of life:				
Physical functioning, mean ± SD	58.88 ± 29.13	67.7 ± 27.7	0.38	0.31[a-s]
Social functioning, median (IQR)	87.5 (68.75-100)	87.5 (56.25-100)	0.94	0.12[a-s]
Role of physical functioning, median (IQR)	12.5 (0-75)	25 (0-62.5)	0.93	0.04
Role of emotional functioning, median (IQR)	100 (0-100)	66.7 (16.7-100)	0.59	0.10[a-s]
Vitality, mean ± SD	49.5 ± 28.7	59.7 ± 26.0	0.29	0.37[a-s]
Bodily pain, median (IQR)	64 (40-88)	74 (49.5-98.5)	0.94	−0.08
Mental health, median (IQR)	76 (63-89)	75 (63-87)	0.94	−0.07
General health, mean ± SD	62.7 ± 21.6	68.2 ± 16.6	0.42	0.28
Post-operative characteristics				
Hospitalised in ICU, mean ± SD, days	1.29 ± 0.90	1.0 ± 0.0	0.16	0.41[a-m]
Hospitalised post-operative, median (IQR), days	6 (3.25-8.75)	5 (4.5-5.5)	0.01	0.52[a-l]
30-days and in-hospital mortality, n	0	0	1.00	0

BMI = Body Mass Index; HADS-A = Hospital Anxiety and Depression Scale – Anxiety Subscale; HADS-D = Hospital Anxiety and Depression Scale – Depression Subscale; ICU = intensive care unit; IDDM = insulin-dependent diabetes mellitus; IQR = interquartile range; LVEF = left ventricular ejection fraction; NIDDM = non-insulin-dependent diabetes mellitus; SD = standard deviation.
a) Effect sizes are expressed as Cohen's D, Cramer's V, or r, and magnitude of effect size is indicated as: a-l) large, a-m) medium or a-s) small effect size.
b) Based on HADS scores using both mean ± SD and caseness based on a cut-off score of 8 for each subscale as suggested by Bjelland et al. [10].

Comparing levels of psychological distress, we found no significant differences between groups with regards to anxiety and depression (HADS), quality of life (SF-36) or heart-focused anxiety (CAQ). However, patients in both groups reported high levels of anxiety and depression, indicating potentially positive diagnoses according to the HADS (Table 2). Responses to ad hoc questions also revealed that more patients in the COVID-19 group were

anxious about their disease aggravating while waiting. However, no differences were found in mortality across groups and no patients developed severe complications while waiting, i.e. myocardial infraction, stroke or complications requiring urgent surgery.

Qualitative analysis revealed two themes focusing on psychological reactions: 1) feelings of relief followed by anxiety and distress, and 2) meaning-making of not being ill and able to tolerate postponement.

As part of theme 1*,* patients expressed immediate feelings of relief and being given "*a breather*". Even so, the time after postponement was *"the hardest to go through that I can remember"* (Quotes 1 and 2, **Table 3**). Additionally, psychological distress caused by postponement was expressed as disappointment, uncertainty, sadness, confusion, loneliness and anxiety (quotes not included). Related to theme 2, psychological distress instigated a meaning-making process around the postponement. In this process, most of the patients created a narrative of not being ill and therefore being able to tolerate postponement (Quotes 3-4, Table 3). In addition, the patients' expressions of how they understood and experienced the severity of cardiac disease seemed to influence the process of meaning-making around postponement.

TABLE 3 Inductive latent content analyses regarding expressions of psychological distress when postponed during the COVID-19 pandemic.

Theme no.[a]	Subthemes	Quote no.	Informant	Quote, meaning units
1: Feelings of relief followed by anxiety and distress	Postponement was a relief Waiting time hard to endure filled with anxiety and fear	1	A	There was also a kind of relief ... I was off the hook this time But on the other hand, of course I was also nervous about the outcome of such a postponement It was a kind of a double feeling, first a bit of relief and then came fear for what would happen ... I would say that the time period between being told that surgery was postponed and until we finally got a new date for surgery was one of the hardest to go through, that I can remember
	Postponement was a relief Waiting time hard to deal with	2	C	I was prepared for that operation, you know, and I thought, alright, it's just as well to get a bit of a breather But that the breather would be as long as it turned out that was also something I couldn't quite deal with
2: Meaning-making of not being ill and able to tolerate postponement	Not feeling ill, still representing with symptoms of cardiac disease	3	D	I wasn't ill ... but also, I haven't been in pain I've only had, what do you call it, trouble breathing, or that's how it feels Yes, a bit of a heavy feeling in the chest...that's what I've felt
	Symptoms as pain, and not feeling well Reduced mobility	4	B	But it was certainly a pain since I wasn't feeling too well at that time Well, I couldn't move around much, then I would get tired
	Knowing the severity of the cardiac disease	5	E	The specialist there had told me I should take it very, very easy, and I couldn't travel and ... the whole family was set to go on a trip in February He said, you won't be able to do that. Then, I knew it was bad
	Knowing the severity of the cardiac disease	6	A	Lying there, I could follow everything on the screen and could see very well when they said one of the pulmonary arteries was completely blocked, and that the two others were getting there
	Questioning the fairness of the postponement	7	E	You know, whether it was the doctor who'd become ill, or it was corona, or it was the equipment that had broken down, it didn't matter, like, in my head A postponement is a postponement, and then you can discuss whether it's fair or not
	Accepting the postponement	8	D	So, we could also understand the postponement, you know Things weren't normal
	Not dangerous to be postponed Being able to tolerate postponement was used to ease the relatives and themselves	9	A	But we comforted each other by saying, hey, they must have assessed that it wasn't that dangerous since they risked postponing it ... so that way we took it quite easy about that postponement No, but we'd have to defend the postponement, also to put those who'd phone us at ease ... and at the same time in order to put ourselves at ease, because that's what happens, the more it's repeated the more we say it loudly to each other, the better it is

a) The interviews produced in 105 standard pages (2,400 characters including spaces) of transcribed interviews. Only findings regarding patients' expressions of psychological distress when postponed during the COVID-19 pandemic are presented here.

Some expressed unawareness of critical symptoms of cardiac disease (Quote 3, Table 3), whereas those feeling more seriously ill had been told so by external cardiac experts or had the longest history of cardiac disease (Quote 5-6, Table 3). These patients expressed doubts relating to their postponement, and one did not find COVID-19 to be a more acceptable reason for postponement than any other reason (Quote 7, Table 3). For the rest of the patients, postponement due to COVID-19 was a circumstance they had to accept (Quote 8, Table 3), and it seemed reasonable as hospitalisation during the pandemic seemed unsafe.

In most patients, being defined as "being able to tolerate postponement" produced a feeling of not being at risk of exacerbation of their condition, morbidity or of dying from their cardiac disease while waiting. They relied on this feeling to reduce their own fear and anxiety and to decrease the worries expressed by their relatives and friends (Quote 9, Table 3).

DISCUSSION

Overall, no significant differences were reported by the two groups regarding anxiety, depression or impaired quality of life, although both groups experienced high levels of psychological distress on the day before their rescheduled operation. Postponement due to the pandemic that left patients with no date of rescheduled surgery did not seem to play a significant role compared with postponement for other reasons without a new date of surgery. This was surprising as COVID-19 seems to add extra psychological distress in the general population [6, 7], and some patients awaiting cardiac surgery would rather die of their known cardiac disease than being exposed to COVID-19 virus [16].

Patients awaiting cardiac surgery have previously been shown to experience psychological distress [3-5] and, compared with anxiety and depression determined at hospital discharge [17], the patients in the present study presented more than twice as high levels of anxiety and depression as determined by the HADS. This difference may represent a transformation in the patients' psychological distress from the day before surgery to discharge.

The high number of postponed surgeries prior to the pandemic was primarily due to organisational and patient-related issues. Further investigation of the potential association between reasons for postponement and patient reactions is needed to fully understand ways of coping with postponements.

Previous research has shown that waiting for cardiac surgery is experienced as being beyond the individual's control, and therefore accepting the waiting time is the only way to avoid frustration and maintain meaning in life [18]. This corresponds to the findings of the present study, as immediate feelings of anxiety and other negative reactions to postponement seemed to subside as the patients accepted and complied with postponement and found meaning through the belief of "not being ill and being able to tolerate postponement".

Theoretically, meaning making is an essential coping strategy when adjusting to stressful events [19]. It refers to processes that align situational meaning (e.g., postponement of surgery) and global meaning (e.g., a full and healthy life) [20]. In the present study, faith in surgeons' assessments seemed to play a major role in meaning-making, as the patients' narrative of "being able to tolerate postponement" seemed essential to their psychological response. However, the interviews indicated that some patients expressed alarming cardiac symptoms during the prolonged waiting period without contacting the hospital. This finding indicates that adequate patient information and follow-up may be essential if surgery is postponed, especially on a long-term basis.

Limitations

The study sample is a subsample of a larger study on postponements. Hence, a priori power calculation was not possible as the pandemic determined the sample size in both groups. Consequently, the sample size is limited, and therefore we also used effect sizes (Table 2) to evaluate whether the lack of significant results may be due to a lack of power.

Although no differences between groups were found on standardized measures, the interviews revealed more information on psychological responses, suggesting that the use of both quantitative and qualitative data may be superior to either method alone. Of note, these data were collected on the day prior to surgery for all patients, which may have affected their reporting of psychological distress even though most questionnaires focused on the past week or month.

Finally, these data may not be generalisable to other populations or situations.

CONCLUSIONS

No significant differences were observed regarding anxiety, depression or quality of life among patients in whom open cardiac surgery was postponed during the pandemic compared with patients who experienced prepandemic postponement. However, patients generally reported high levels of anxiety and depression, indicating that waiting for cardiac surgery was associated with psychological distress. The patients in the COVID-19 group felt immediate relief and engaged in a meaning-making process to be able to tolerate postponement and reassure themselves and their relatives. It remains unknown whether these results may be extrapolated to other surgical fields.

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