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The Effect of a Pulmonary Care Bundle Implemented With Cardiac Surgery Patients on Recovery

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ABSTRACT

Background: Various care bundles have been used with cardiac surgery patients in order to improve recovery by reducing complication rates. Pulmonary complications are frequent in cardiac surgery patients. The number of studies examining care bundles aimed at preventing pulmonary complications is limited. Further studies in this field may support the recovery of patients.

Aim: The primary aim of this study was to examine the effect of a pulmonary care bundle (PCB) on the recovery of patients undergoing cardiac surgery.

Study Design: In this quasi-experimental study, 103 patients were divided into control and study groups. The control group received standard care. A PCB was administered to the study group by nurses in a Cardiovascular Surgery Clinic in Turkey. The Descriptive Characteristics Data Form, Pulmonary Care Bundle Implementation and Evaluation Form, Respiratory Patterns Follow-up Form and Quality of Recovery Questionnaire-40 were applied to the patients. After data collection, the Quality of Recovery Questionnaire-40 scores and respiratory patterns of the patients in the study and control groups were compared. In addition, the nurses' rate of using the care bundle was examined, and their rate of compliance with the bundle was evaluated.

Results: The Quality of Recovery Questionnaire-40 scores of the study group (177.70 ± 10.77) were higher than those of the control group (165.28 ± 15.63) ($p < 0.05$). The study group's scores for cough and pathologic pulmonary sound were lower than those of the control group. The oxygen saturation level was higher in the study group than in the control group ($p < 0.05$).

Conclusion: The PCB had positive effects on recovery. The respiratory pattern findings were better, and the incidence of respiratory complications was lower in patients who received the care bundle.

Relevance to Clinical Practice: The PCB supported the patients' recovery. This care bundle can be used to prevent pulmonary complications.

1 | Introduction

Cardiac surgery is frequently performed in the treatment of cardiovascular diseases, which rank first among the causes of death [1]. Although cardiac surgery significantly reduces morbidity and mortality rates, it also causes various complications during the recovery period. These lead to a complicated recovery process. Each parameter of the patient is thus always closely monitored during the perioperative period, and efforts are made to prevent possible postoperative complications [2].

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Summary

- What is known about the topic
  - Care bundles are effective in reducing complications.
  - Care bundles are the foundation of improved recovery.
- What this paper adds
  - The pulmonary care bundle applied to patients before and after surgery improved their breathing patterns.
  - The pulmonary care bundle positively affected the quality of patient recovery.

However, to more effectively prevent complications, it has been recommended that evidence-based practices be used when providing patient care in the perioperative period [3].

Evidence-based practices form the basis of improved recovery in cardiac surgery [3]. In 2019, the Enhanced Recovery After Surgery (ERAS) society published an enhanced recovery guideline consisting of evidence-based practices for cardiac surgery. It has been suggested that transferring these practices to the clinic improves the quality of care and accelerates patients' recovery [3, 4]. It has also been noted that applying improvement programmes developed outside the current health care system in the clinic may initially be difficult because these programmes are wide-ranging. For this reason, it has been suggested that evidence-based practices be systematically transferred to the clinic by developing and applying various care bundles [5]. Cardiac surgery is a complex procedure and the risks of complications during the recovery process are great. In this regard, progress in the use of enhanced recovery practices in the clinic tends to occur slowly. Creating and testing new care bundles will thus make a significant contribution to this field [6].

2 | Background

A number of different care bundles have been developed for cardiac patients worldwide. Most studies have focused on preventing surgical site infections after cardiac surgery [6–8]. Care bundle studies have also been conducted for delirium, atrial fibrillation and ventilator-associated pneumonia after cardiac surgery [9–11]. In addition, a perioperative mental health care bundle, a thermal care bundle for normothermia and a prehabilitation care bundle to prevent respiratory complications have been developed [12–15]. All these studies have shown that care bundles reduce the incidence of complications and contribute to the recovery of cardiac surgery patients.

Care bundles for many complications have been developed for cardiac surgery patients. However, studies have mostly focused on preventing infections [6–8]. According to the literature, respiratory complications are also frequently seen after cardiac surgery, and the number of care bundle studies on this topic is limited. In addition, to the best of our knowledge, there is no pulmonary care bundle (PCB) that supports patients with audiovisual-based education and face-to-face counselling during the perioperative period. The care bundle that we designed and implemented in the present study guides patients until discharge and offers an evidence-based practice bundle for nurses. In this respect, we believe that our PCB will contribute to the literature.

3 | Aims

The goal of the present study was to develop a PCB that would have therapeutic effects on the respiratory patterns of patients and reduce the prevalence of pulmonary complications. In line with this goal, the study examined the effect of the PCB on the recovery of the cardiac surgery patients who participated.

3.1 | Hypotheses

H0. *The PCB administered to the cardiac surgery patients has no positive effect on their recovery.*

H1. *The PCB administered to the cardiac surgery patients has a positive effect on their recovery.*

4 | Design and Methods

4.1 | Setting and Sample

This study had a quasi-experimental (non-randomized) design with control and study group patients who underwent open heart surgery. The study was conducted in the cardiovascular surgery clinic and cardiovascular surgery intensive care unit of a training and research hospital in southeastern Turkey. Data were collected from the patients between October 2021 and May 2022. The one-way hypothesis of the study was that 'The care bundle administered to the cardiac surgery patient has positive effects on their recovery'.

The one-way hypothesis was used as the basis for the power analysis conducted to determine the study sample. The effect size was assumed to be a difference of 0.50. The sample size was calculated as 103 participants in total, with 69 in the control group and 34 in the study group, with an alpha significance level of 0.05 and a confidence interval of 95%.

The study population consisted of all patients ($N = 163$) who were attending the hospital where the study was conducted in order to undergo cardiac surgery and who underwent surgery during the data collection period. Following the power analysis, the sample consisted of 103 patients (study group: 34; control group: 69) who met the sampling criteria. The CONSORT diagram shows which patients were excluded (Figure 1).

4.1.1 | Inclusion Criteria

- Being aged 18 years or above
- Being scheduled for elective cardiac surgery
- Undergoing cardiac surgery for the first time

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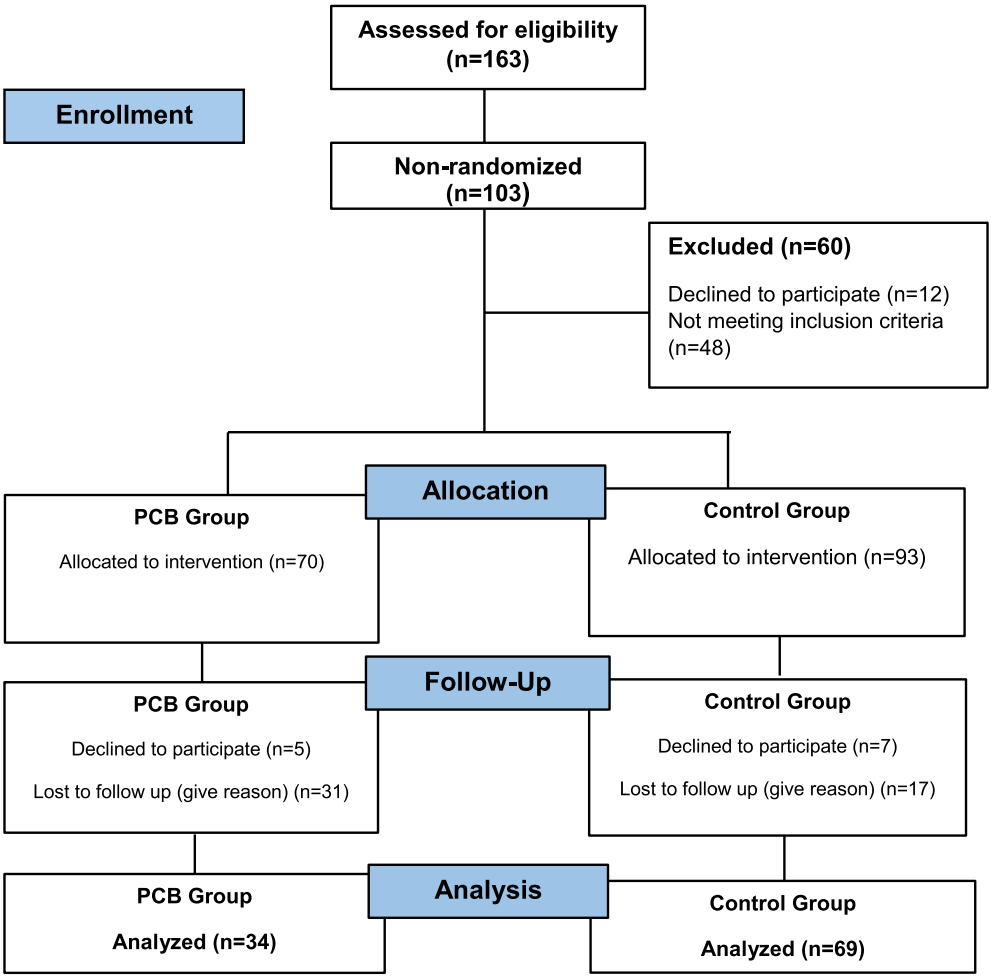

FIGURE 1 | CONSORT diagram.

- Being able to be extubated and not being sedated after cardiac surgery
- Having no communication barriers (hearing and vision problems)
- Having no musculoskeletal system disease or neurological problem that would prevent walking after surgery
- Having no respiratory diseases
- Having no diagnosed psychiatric or mental disorder
- Volunteering to participate in the study

4.1.2 | Exclusion Criteria

- Developing a complication that would prevent the mobilization after surgery
- Having a respiratory problem that would delay disconnection from the mechanical ventilator
- Wanting to withdraw from the study before or after surgery

Of the total of 60 patients excluded from the study, 12 did not agree to take part, while the remaining 48 patients were excluded for reasons such as death ($n=8$), complications ($n=5$), presence of a neurological illness ($n=2$), withdrawal from surgery ($n=11$), urgent surgery ($n=10$), presence of a previous pulmonary illness ($n=10$), undergoing cardiac surgery for the second time ($n=1$) and having COVID-19 during the postoperative period ($n=1$) (Figure 1).

4.2 | Data Collection Tools and Methods

4.2.1 | Descriptive Characteristics Data Form

This form contained questions about the patients' age, gender, marital status, education level, body mass index and chronic diseases. The form was administered to the study and control group patients preoperatively.

4.2.2 | PCB Implementation and Evaluation Form

This form included a checklist for the components of the PCB. The form was filled out by the nurses and was used both to facilitate the implementation of the PCB and monitor whether it had been fully administered to the patients. The steps that had been performed were marked by the nurses. If necessary, the reason that any steps had not been performed was also written in the relevant section. The form was administered to the patients in the study group from the preoperative period onwards.

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4.2.3 | Respiratory Patterns Follow-Up Form

This form was created to monitor the respiratory patterns of the patients. Data on dyspnoea, cough, respiratory rate, saturation, pathologic pulmonary sounds and body temperature were collected by the researcher. Categorical variables such as dyspnoea and coughing were evaluated one day before the patients were discharged, whereas continuous variables such as respiratory rate and saturation were measured daily between 16:00–18:00 until the day before discharge and recorded on the form. The mean values of each patient's continuous variables were used in statistical analysis.

4.2.4 | Quality of Recovery Questionnaire-40 (QoR-40)

This scale is used to assess the quality of postoperative recovery and the health status of patients in the early postoperative period. The scale was developed by Myles et al. in 2000 [16]. The validity and reliability of its Turkish version were established by Karaman et al. in 2014. This scale consists of five subscales (physical comfort, emotional state, patient support, physical independence, pain) and 40 items. The lowest score obtainable from the scale is 40, while the highest score is 200. The higher the score, the better the recovery status. In the validity and reliability study of the scale, the Cronbach alpha value was found to be 0.93 [17]. In the present study, the Cronbach alpha value was determined as 0.84. In the present study, the QoR-40 was applied to the study and control group patients one day before discharge in the postoperative period.

4.2.5 | Pulmonary Care Bundle (PCB)

The PCB was constructed using practices with a high level of evidence (levels of evidence 1 and 2). It consisted of instruction for patients with video training, respiratory exercises and gradual mobilization [4, 18–22]. Table 1 shows the content of the care bundle in detail. The video training provided to the patients included postoperative pain management, exercises (deep breathing exercises, incentive spirometer use, in-bed leg exercises) and gradual mobilization (Table 1). After the PCB was developed, its content validity was evaluated using the Davis technique [23]. For this evaluation, five experts were consulted. Based on the

TABLE 1 | Pulmonary care bundle.

Components of the pulmonary care bundle
Education of the patient and patients' relatives
During the preoperative period, inform the patient and patient relatives about: • Respiratory management, • Gradual mobilisation, • Pain management and encouragement to exercise in the postoperative period.
Respiratory management
Evaluate pain prior to exercise.
Have the patient do the deep respiratory exercise 5–10 times every hour.
Have the patient use an incentive spirometer 5–10 times every hour.
Support the incision area with a pillow during the cough exercise.
Have the patient produce a controlled cough 3–5 times after using the spirometer.
Ensure the patient's mobilisation until discharge.
Gradual mobilisation
Conduct a pain evaluation after mobilisation.
Evaluate vital signs (pulse: 60–110/min; mean artery pressure: 60–95 mm/Hg; body temperature: ≥ 36°C; respiration 12–25/min; PaO_2: 90 and above, absence of significant dysrhytmia in hemodynamics).
Check blood glucose level prior to mobilisation (should be 80–180 mg/dL).
Two hours after extubation, have the patient sit down and slide their feet up and down for 15 min.
On the first day after extubation, have the patient do lower extremity exercise for 5 min in the morning. Have them sit at the edge of the bed for 5 min and then walk them 10 m.
On the first day after extubation, have the patient do lower extremity exercise for 5 min in the evening. Have them sit at the edge of the bed for 5 min and then walk them 30 m.
On the second day after extubation, have the patient do lower extremity exercise for 5 min in the morning. Have them sit at the edge of the bed for 5 min and then walk them 30 m.
On the second day after extubation, have the patient do lower extremity exercise for five minutes in the evening. Have them sit at the edge of the bed for five minutes and then walk them 30 m.

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experts' suggestions, some of the items were revised and the care bundle was finalized.

4.2.6 | Study Procedure

The study was initiated by collecting data from the control group. The control group received standard care in the preoperative and postoperative periods without receiving any intervention. This care did not include any video-assisted patient training during the preoperative period. In addition, the use of spirometry and deep breathing exercises in the postoperative period was explained to the patients by nurses without using video content. In addition, the patients' mobilization was not managed in a gradual and standardized process, as in the PCB. Before the care bundle was implemented for the study group, the nurses working in the cardiovascular surgery clinic and cardiovascular surgery intensive care unit were informed about its administration. After data had been collected from the control group and the nurses had been informed about the care bundle, the interventions for the study group were initiated.

The video training included in the bundle was applied to the study group patients by the nurses. To ensure that this process was standardized for all patients, the nurses used videos prepared by the researcher. The video training included the following topics: pain management in the postoperative period, exercises to be performed (deep breathing exercises, incentive spirometer use, in-bed leg exercises) and gradual mobilization. In addition, the nurses provided information to the study group patients about the practices in the PCB during the perioperative period. In the postoperative period, the patients performed the exercises and gradual mobilization components with the support of the nurses. After the data collection process was completed, the PCB Implementation and Evaluation Forms filled out by the nurses were examined, and the nurses' rate of compliance with the bundle was determined.

4.3 | Data Analysis

Statistical analyses were performed in the IBM SPSS for Windows 25.0 programme. Skewness and kurtosis coefficients were calculated to determine whether the variables fit the normal distribution. Variables that fit the normal distribution were given as mean ± standard deviation values, and variables that did not fit the normal distribution were given as median values. In the analysis of intergroup differences, the t-test was used when the normality assumption was met. The Mann–Whitney U test was used when the assumption of normality was not met in the analysis of differences between groups. Chi-square or Fisher's exact tests were used to analyse categorical variables. Post hoc power analysis was performed based on the QoR-40 to evaluate the effect size and power of the intervention. The level of statistical significance was set at $p < 0.05$.

4.4 | Ethics Statement

Ethical approval for the research was obtained from the Clinical Research Ethics Committee of Harran University (dated 06 September 2021, numbered HRU/21.15.29). In addition, permission was obtained from the hospital where the study was conducted (dated 05 October 2021). Written consent, in which they stated that they would voluntarily implement the PCB with the patients, was obtained from the nurses working in the cardiovascular surgery clinic and cardiovascular surgery intensive care unit where the data would be collected. In addition, written informed consent was obtained from the patients included in the study, indicating their voluntary participation in the study. The study was conducted following the principles of the Declaration of Helsinki to ensure good clinical practice.

5 | Results

Table 2 shows the distribution and statistical comparisons of the descriptive characteristics of the control and study group patients ($p > 0.05$) (Table 2).

Table 3 shows the findings regarding the comparison of the postoperative respiratory patterns of the control and study groups. According to Table 3, 11.6% of the patients in the control group and 5.9% of the patients in the study group developed respiratory complications such as pneumonia, atelectasis and pleural effusion (χ^2,0.491; $p = 0.295$). There was no significant difference between the groups in patients with shortness of breath ($\chi^2 = 2.229$; $p = 0.05$). Cough (79.7%) and pathologic pulmonary sound (82.6%) were more common in the control group than in the study group (55.9% and 32.4%, respectively) ($\chi^2 = 6.393$; $p = 0.011$, $\chi^2 = 25.642$; $p < 0.001$). The mean saturation level was 91.64% ± 2.60% in the study group and 90.34% ± 3.18% in the control group ($t = -2.056$; $p = 0.042$) (Table 3).

Table 4 shows the postoperative mean scores of the patients in both groups for the QoR-40 and its subscales and their statistical comparisons. According to Table 4, the mean total score of the study group (177.70 ± 10.77) was higher than that of the control group (165.28 ± 15.63) ($t = -4.706$; $p = 0.000$). When the subscales of the scale were examined, the emotional state score (39.92 ± 6.53) was better in the control group ($t = -4.089$; $p = 0.000$). In the study group, the scores were better for comfort (53.17 ± 4.31), physical independence (19.64 ± 2.39) and for pain (34.00) ($t = -3.227$; $p = 0.002$, $t = -6.742$; $p = 0.000$, $U = -3.233$; $p = 0.001$). When the patient support subscale was examined, the median value in the two groups was the same (35.00) and the difference between the groups was not statistically significant ($U = -0.621$; $p = 0.535$). In addition, the effect size of PCB was calculated based on the QoR-40 scores that were significant between the two groups ($t = -4.706$; $p = 0.000$) (Table 4). In the post hoc power analysis, the effect size was 0.79 and the power of the study was 96%.

5.1 | Nurses' Rates of Compliance With the Care Bundle

After the data of the patients who received the PCB intervention were collected, the researcher examined each patient's care bundle form. It was found that some items in the care bundle had not been implemented in 10 of the 34 patients. When these items were examined, it was determined that there were problems with the 'Mobilization' component of the PCB. The nurses

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TABLE 2 | Descriptive characteristics of the control and study groups and their comparisons ($N = 103$).

Characteristics	Control group (n: 69) n (%) Mean ± SD	Study group (n: 34) n (%) Mean ± SD	Test	p
Gender				
Female	21 (30.4)	8 (23.5)	$\chi^2 = 0.537$	0.464
Male	48 (69.6)	26 (76.5)		
Marital status				
Married	57 (82.6)	33 (97.1)	$\chi^2 = 31.020$	0.078
Single	12 (17.4)	1 (2.9)		
Education status				
Illiterate	30 (24.8)	7 (12.2)	$\chi^2 = 9.245$	0.083
Literate	9 (13.0)	3 (8.8)		
Primary school	17 (24.6)	14 (44.2)		
Middle school	7 (10.1)	5 (14.7)		
High school	1 (1.4)	3 (8.8)		
Undergraduate and above	5 (7.2)	2 (5.9)		
Body mass index[a]				
Underweight	2 (2.9)	0 (0.0)	$\chi^2 = 2.070$	0.563
Normal	16 (23.2)	6 (17.6)		
Overweight	38 (55.1)	18 (52.9)		
Obese	13 (18.8)	10 (29.4)		
Chronic disease	41 (59.4)	19 (55.9)	$\chi^2 = 0.117$	0.732
Chronic disease diagnosis				
Hypertension	29 (42.0)	13 (38.2)	$\chi^2 = 0.136$	0.713
Diabetes mellitus	31 (44.9)	13 (38.2)	$\chi^2 = 0.417$	0.519
Hyperlipidemia	4 (5.8)	2 (5.9)	$\chi^2 = 1.000$	0.649
Smoking	32 (46.4)	9 (26.5)	$\chi^2 = 3.767$	0.052
Age	61.04 ± 10.63	58.41 ± 9.31	$t = 2.162$	0.303

Abbreviation: SD, standard deviation.
[a]Body mass index classification [24].

stated their reasons in the 'Reasons for Non-implementation' section on the second page of the care bundle form. Based on these answers, two reasons were determined. These reasons were excessive workload and busy shifts. As a result, the rate of full compliance with the care bundle was 70.6%. This rate was calculated based on the number of patients in the study group who were fully administered the care bundle.

6 | Discussion

This study attempted to contribute to a better quality of recovery among patients by developing a care bundle to prevent respiratory complications. With regard to postoperative respiratory patterns, there was less presence of cough and fewer pathologic pulmonary sounds (mostly rhonchus) in the study group. Moreover, the saturation level of the study group was found to be better. Although no significant difference was observed, the study group had a lower rate of patients with dyspnoea and fewer respiratory complications. On the basis of these data, it can be suggested that the exercises included in the PCB aided bronchial cleansing by expanding the lung capacity of the patients. In addition, although there was no significant difference between the groups in terms of complication rates, the findings can be considered clinically important.

Strobel et al. implemented a care bundle with recommendations for the prevention of post-cardiac surgery pneumonia in 18 centres with low (< 5.9%), moderate (5.9%–6.1%) and high (> 6.1%) pneumonia rates in United States [25]. After the intervention,

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TABLE 3 | Postoperative respiratory patterns of the control and study groups ($N = 103$).

	Control group (*n*: 69)	Study group (*n*: 34)		
	n (%)	*n* (%)		
Respiratory characteristics	**Mean ± SD/Median**	**Mean ± SD/Median**	**Test**	***p***
Respiratory complication	8 (11.6)	2 (5.9)	$\chi^2 = 0.491$	0.295
Shortness of breath	33 (47.8)	11 (32.4)	$\chi^2 = 2.229$	0.135
Cough	55 (79.7)	19 (55.9)	$\chi^2 = 6.393$	**0.011***
Pathologic pulmonary sound[a]	57 (82.6)	11 (32.4)	$\chi^2 = 25.642$	**0.000****
Respiration rate	27.89 ± 4.54	27.91 ± 4.19	$t = -0.019$	0.985
Saturation (%)	90.34 ± 3.18	91.64 ± 2.60	$t = -2.056$	**0.042***
Body temperature (°C)	36.50	36.50	$U = 0.500$	0.371

Abbreviation: SD, standard deviation.
[a]Rales, rhonchus, wheezing, absence of breathing sounds, etc.
* $p < 0.05$, ** $p < 0.01$.

TABLE 4 | Comparison of QoR-40 scores of the control and study groups ($N = 103$).

	Control group (*n*: 69)	Study group (*n*: 34)		
Scores	**Mean ± SD/Median**	**Mean ± SD/Median**	**Test**	***p***
Postoperative total score	165.28 ± 15.63	177.70 ± 10.77	$t = -4.706$	**0.000****
Postoperative subscale scores				
Emotional state	39.92 ± 6.53	37.97 ± 3.49	$t = -4.089$	**0.000****
Comfort	49.81 ± 6.09	53.17 ± 4.31	$t = -3.227$	**0.002****
Physical independence	15.5 ± 3.78	19.64 ± 2.39	$t = -6.742$	**0.000****
Patient support	35.00	35.00	$U = -0.621$	0.535
Pain	33.00	34.00	$U = -3.233$	**0.001****

Abbreviation: SD, standard deviation.
* $p < 0.05$, ** $p < 0.01$.

the rate of pneumonia was reduced to 2.4% and the result was statistically significant. Furthermore, Fleming et al. created a 'perioperative care bundle' for improved recovery after cardiac surgery in England [26]. According to the results of their study, although no significant difference was observed regarding the rate of postoperative respiratory failure complications, the rate was lower in the study group patients (1.9%) with the care bundle intervention compared to the control group (9.4%). In these two previous studies, an early and gradual mobilization was practiced, as in the PCB developed in the present study. In all these studies, early mobilization may have contributed to a decrease in the rate of pulmonary complications. In addition, Luo et al. prepared a short-term prehabilitation care bundle to prevent respiratory complications for cardiac surgery patients in Chine [14]. In their study, patients in the study group who underwent three days of prehabilitation developed fewer pulmonary complications and it was thus determined that short-term rehabilitation preoperatively may be beneficial for patients.

In the present study, the PCB was found to have positive effects on the patients' respiratory function, as in previous studies. However, no respiratory physiotherapist support was provided during the implementation of the PCB. Examining the literature, respiratory physiotherapy has been found to have positive and strong effects on respiratory function, reducing the prevalence of postoperative pulmonary complications [27, 28]. If there had been a respiratory physiotherapist in the team implementing PCB in the present study, it is likely that patient outcomes would have been much better.

The postoperative recovery status of the control and study group patients in the present study was analysed using the QoR-40. To the best of our knowledge, there is no previous study in which a quality of recovery scale has been used after the administration of a cardiac surgery care bundle. According to the literature, evaluating patient-reported outcomes using such scales provides important data [29]. The recovery status of the study group was found to be better than that of the control group. When the subscales were examined, it was determined that the comfort and physical independence levels of the study group patients were also better. In addition, patients in the study group had a lower level of pain. Evaluating these findings, it seems that the activities included in the care bundle may have a positive effect in helping the patients regain their independence. With an increase

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in their physical independence, the patients' comfort levels may also have increased, and their pain may have decreased as a result of the physiological and psychological effects of the activities they engaged in. These results support our hypothesis. However, when the emotional state subscale was examined, it was seen that the study group had a worse emotional state. The nurses provided emotional support to the patients alongside the video training and continuous contact. However, the information and guidance given regarding such complicated surgeries may not have been sufficient to effectively combat the patients' stress. More professional emotional support should be provided to cardiac surgery patients.

According to the literature, in order for the care bundle to be completed successfully, it must be fully implemented in 95% of the current patient population [11]. When the rate of nurses' compliance with the PCB was examined, it was seen that it was below 95% and that the bundle was thus unsuccessful according to the rules for care bundle implementation. Although the nurses were informed about PCB and continuous support was provided, it was not possible to reach a rate of 95%. Training and counselling increased the nurses' knowledge about and understanding of the PB and prevented uncertainties in implementing its different steps. Factors other than knowledge and understanding should be addressed and evaluated in order to increase compliance. Establishing a culture of care bundle practices may increase the acceptability of such practices. However, the period set aside for preparation may need to be much longer for better-grounded practices to be implemented. Pilot studies could be conducted to identify potential problems at an early stage and to ensure that the necessary measures are taken. However, it has also been reported in the literature that it is incorrect to evaluate the success of a care bundle according to this percentage, because even if a compliance rate of 95% is not achieved, care bundles still positively contribute to the recovery of patients [11].

7 | Limitations

Patients were not given a standardized position during the respiratory exercises in the care bundle. Patients performed breathing exercises in a semi-fowler or fowler position. In the study, no respiratory physiotherapist support was available for patients. Postoperative mediastinal tubes or chest tubes may have negatively affected the respiratory management of the patients. In this study, no training or intervention was provided for chest tubes.

8 | Recommendations and Implications for Practice

Patients who received a care bundle had better respiratory pattern findings and a lower incidence of respiratory complications. It was found that the care bundle had positive effects on recovery. Future studies can be carried out to evaluate the efficacy of care bundles designed to prevent respiratory complications in cardiac surgery patients. Various policies can be established to increase the adoption and use of evidence-based practice methods, such as care bundles, by nurses in health institutions. In the literature, it is recommended that a long-term, multidisciplinary and joint training programme be adopted to increase compliance with the care bundles. It is also stated that support should be provided to increase the use of care bundles by developing multidisciplinary strategies [30].

9 | Conclusion

In conclusion, the practices included in the PCB did positively affect the recovery of patients. In addition, the resources used in PCB are not costly. Apart from that, because of the nature of PCB, patients' willingness to participate in exercises and mobilization is important for better recovery outcomes in the postoperative period. Therefore, it may enable PCB patients to participate more actively in their recovery process.

Author Contributions

Yasemin Yılmaz: conceptualization, data curation, formal analysis, investigation, methodology, resources, writing – original draft. **Ayla Yava:** conceptualization, data curation, formal analysis, investigation, methodology, resources, supervision, validation, writing – review and editing. **Mehmet Salih Aydın:** conceptualization, methodology, supervision, writing – review and editing.

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Ethics Statement

Ethical approval for the research was obtained from the Clinical Research Ethics Committee of Harran University (dated 06 September 2021, numbered HRU/21.15.29). In addition, permission was obtained from the hospital where the study was conducted (dated 05 October 2021).

Consent

Written informed consent was obtained from the patients included in the study, indicating their voluntary participation in the study.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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