

**Role of Nurses in Comprehensive Care for Cardiac Rehabilitation by a Multidisciplinary
Team: a Questionnaire Study**

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Abstract

Background: Cardiac rehabilitation (CR) consists of comprehensive care by a multidisciplinary team, including a medical doctor, nurse, pharmacologist, physical therapist, registered dietitian, and clinical psychologist. Although nurses generally support the other professionals or stand in for specialists who are not on-site, it is not fully understood how best to take advantage of nurses in CR.

Method and results: We administered a questionnaire about CR to all 733 nurses in the inpatient wards at Fukuoka University Hospital. The nurses answered questions regarding their experience with daily care and treatments in CR based on the guideline for rehabilitation in patients with cardiovascular disease (Japanese Circulation Society 2012). The nurses were aged 31 ± 8 (mean \pm SD) years and each had 108 ± 97 (mean \pm SD) months of experience. One hundred thirty nurses (23.1%) had nursing experience with CR (Exp-CR group) and 433 did not (Non-Exp-CR group). The Exp-CR group was highly motivated to learn more about CR and recognized its importance compared with Non-Exp-CR group. With regard to the effect of care by nurses in CR, nurses in the Exp-CR-group consisted to contribute the beneficial effects of CR revealed with high evidence level in the guideline described above, especially in improved exercise tolerance or quality of life compared with Non-Exp-CR group.

Conclusions: The nurses who had experience with CR were more likely to understand the benefits of CR. Nurses may understand benefits in comprehensive care for CR as part of a multidisciplinary team.

Keywords:

Cardiac rehabilitation, Comprehensive care, Multidisciplinary team, Nurse

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Introduction

Cardiac rehabilitation (CR) has been shown to improve exercise tolerance, quality of life, and prognosis in ischemic heart disease, prevent cardiac remodeling, and reduce systolic blood pressure, recurrence of coronary artery disease and readmission as a result of heart failure due to ischemic heart disease¹⁻⁶. Comprehensive care for CR is provided by a multidisciplinary team including a medical doctor, nurse, pharmacologist, physical therapist, registered dietitian, and clinical psychologist⁷⁻¹¹. The medical doctor controls the pathophysiology. The nurse directly or indirectly prevents the illness, alleviates suffering and advocates in health care for individuals, families, communities, and populations based on nursing science. Especially in the inpatient wards, nurse takes care of medical treatment and supports for self-reliance. The pharmacologist provides medication counseling and improves medication adherence. The physical therapist oversees exercise therapy. The registered dietitian provides nutrition counseling and education. The clinical psychologist provides psychological counseling. Fukuoka University Hospital employs all of these specialists, and it is not fully understood how best to take advantage of the specialty of nursing in CR.

In this study, we used a questionnaire to examine the prevalence of experience with CR, motivation regarding learning about and interest in CR, and treatment selection for CR based on Japanese guidelines¹² among nurses in the inpatient wards at Fukuoka University Hospital.

Subjects and Methods

Study design

In 2018, all 733 nurses in the inpatient wards of Fukuoka University Hospital were given a voluntary questionnaire. The questionnaire included items regarding the nurse's baseline

characteristics, experience in daily care for CR, attitudes about nursing care for CR, and treatment selection in CR following Japanese guidelines¹². Nurses who had experience with CR were also asked to select the degree of attitude of contribution to the beneficial effects of CR revealed in the guideline for rehabilitation in patients with cardiovascular disease (Japanese Circulation Society 2012)¹² that could be used as a specialist in a multidisciplinary team. Overall, 563 nurses (76.8%) answered the questionnaire. As a potential source of bias, the response rates in the inpatient wards were not uniform (Table 1).

The study protocol was approved by the Ethics Committee of Fukuoka University (2018M062).

Questionnaire

The questionnaire included questions in four broad categories: 1) the respondent characteristics, 2) nursing care for daily cardiac rehabilitation, 3) knowledge about daily care in CR, and 4) motivation regarding CR for all nurses. Nurses who had experience with CR were asked 5) attitude of contribution to the beneficial effects of CR by nursing care. **Statistical analyses**

All analyses were performed using the SAS (Statistical Analysis System) Software Package (Ver. 9.4, SAS Institute Inc., Cary, NC, USA) at Fukuoka University (Fukuoka, Japan). Continuous data were reported as the mean \pm standard deviation (SD) and compared between groups by Student's t-test. Categorical variables were compared between groups by a chi-squared analysis. The nurses' contribution to the effects of treatment in CR based on Japanese guidelines were analyzed by a chi-squared test and residual analysis. A value of $p < 0.05$ was considered significant.

Results

Proportions of respondents to the questionnaire and of those with experience in CR by hospital ward

Table 1 shows the proportions of respondents to the questionnaire and of those with experience in CR by hospital ward. The gastrointestinal surgery, neurology and neurosurgery, and emergency medicine wards each accounted for 10% of the responders (60, 57, and 82 nurses in each ward, respectively). In particular, 63.9% of the nurses in the Exp-CR group were in either the emergency medicine or cardiology and cardiovascular surgery wards, which both care for cardiovascular patients.

Baseline characteristics

Table 2 shows the baseline characteristics in all nurses (n=563), and in those with experience with CR (Exp-CR, n=130) and no experience with CR (Non-Exp-CR, n=433). In all nurses, age, months of nursing experience, and the percentage and duration of nursing experience in cardiovascular patient care were 31 ± 8 years, 108 ± 97 months, 18.3 %, and 7 ± 22 months, respectively. The Exp-CR group was older (33 ± 8 years in the Exp-CR group vs. 30 ± 8 years in the Non-Exp-CR group, $p=0.008$), had more nursing experience period (130 ± 101 vs. 101 ± 95 months, $p=0.002$), a greater percentage of nursing experience for cardiovascular patients [50.0 % vs. 8.8 %, $p<0.001$], and more nursing experience period for cardiovascular patients (26 ± 38 vs. 2 ± 9 months, $p<0.001$) than the Non-Exp-CR group.

Nursing care for CR

The results regarding nursing care for CR in all nurses and the Exp-CR and Non-Exp-CR groups are shown in Table 3. With regard to daily care in CR, the Exp-CR group showed higher

awareness of CR (87.7 % in the Exp-CR group vs. 13.9 % in the Non-Exp-CR group, $p<0.001$) and greater consideration of CR during the patient's physical assessment (77.7 % vs. 9.7 %, $p<0.001$). They also scored higher on sharing information about CR with patients (84.6 % vs. 10.4 %, $p<0.001$), and higher on assistance with early intervention in CR (74.6 % vs. 14.1 %, $p<0.001$) compared to the Non-Exp-CR group.

Attitudes about nursing care for CR

Table 4 shows the results regarding the attitudes about nursing care, particularly about interest in and motivation to learn about CR in all nurses and the Exp-CR and Non-Exp-CR groups. The Exp-CR group showed greater interest, understanding, willingness to learn, and knowledge about CR than the Non-Exp-CR group. The Exp-CR group also had significantly higher rates of interest in participating in meetings about CR both in the hospital and outside of the hospital than the Non-Exp-CR group ($p<0.001$ and $p<0.001$).

In the Non-Exp-CR group, 66.1 % of nurses had an interest in CR, 60.7 % understood its necessity, and 64.4 % were willing to learn more about it. In the Non-Exp-CR group, although 76.9 % nurses felt that CR was important and 72.5 % felt that they would be more involved in CR in the future, nurses in this group less intend to participate in meetings about CR both in the hospital and outside of the hospital.

Effects of nursing care in CR

One hundred thirty nurses in the Exp-CR group selected the degree of attitude of contribution to the beneficial effects of CR revealed in the guideline¹² (Table 5). In table 5, we showed the answers about high evidence level treatments that was defined as the evidence from

meta-analysis or multiple multicenter randomized intervention clinical trial with more than 400 individuals¹². The answers about middle and low evidence level treatments were not shown. The nurses answered which of the benefits of CR could be contributed, especially in areas with a high level of evidence, including “Improved exercise tolerance”, “Improved quality of life”, “Prevention of remodeling and reduction of systolic function in the left ventricle”, “Reduction of admission as a result of heart failure due to ischemic heart disease”, “Expectation of body weight management through improvement of lifestyle including long-term dietary counselling”, “Expectation of reduction of cardiovascular events by dietary counselling and exercise therapy against diabetes mellitus using insulin treatment”, and “Expectation of body weight management and smoking cessation by education”. Nurses in the Exp-CR group responded that their care would not support some of the beneficial effects of CR, especially those with low levels of evidence, including “Increased maximum arterio-venous oxygen difference”, “Improved myocardial perfusion”, “Improved endothelial function in coronary and peripheral arteries”, “Increase in the number and function of mitochondria in skeletal muscle and shift in skeletal muscle fiber distribution from type II to type I”, and “Improved depression complicating coronary artery disease and chronic heart failure”.

Discussion

We investigated the current state of nurse experience with CR and nurses’ understanding of the effects of their interventions as part of a multidisciplinary team. Nurses who had prior experience with CR were highly motivated to understand and learn more about CR, and they were more likely to understand the benefits of CR with high evidence levels revealed in the guideline.

In addition, while two-thirds of nurses in the Non-Exp-CR group were also interested in CR

and felt that it was necessary, nurses in this group less intend to participate in meetings about CR.

It has been reported that coordination of CR by a nurse can reduce all-cause and cardiovascular readmission rates, occurrence of coronary artery disease, cardiovascular disease risk and mortality¹³⁻¹⁶. Ögmundsdottir Michelsen H (2018) reported that a tailored, nurse-led cardiac rehabilitation programme could improve risk factor management in post-AMI patients. The specialized cardiac nurses coordinated physiotherapists, a counsellor, and a supervising cardiologist. The patient's follow-up sessions with a nurse were focused on lifestyle, biometric risk factors and medication adherence. In the tailored group 60% of the patients had a cardiologist consultation compared to 98% in the traditional group¹⁶. However, nurses have fewer beneficial cares in CR without coordination or management. Fridlund (2002) reported on the role of the nurse in CR programs and highlighted four concepts: 1) describing the disease and health from the perspective of influencing or triggering risk and health factors, 2) understanding the patient in terms of timing, looking for the 'perfect day' to influence or motivate a lifestyle change and to support and empower the maintenance of a healthy lifestyle by means of life-long follow-ups, 3) interpreting the patient from a lifespan perspective, including their biophysical, intellectual, emotional, existential and socio-cultural dimensions, and 4) knowing and understanding oneself as a nurse from a personal perspective, both as an individual and as a professional¹⁷. These concepts are important for CR, and we thought that they could be useful for improving CR by enabling nurses to make more concrete cares. Thus, this study revealed an area in which nurses can take advantage of their specialty to intervene CR.

Nurses in the Exp-CR group considered to contribute the beneficial effect in CR cares with high evidence levels revealed in the guideline. Since nurses in the Exp-CR group were already

understood the concrete jobs for a nurse in CR, the establishment of roles by nurses seems to have been particularly useful for treating cardiovascular patients. It was reported that a planned strategy of management with early pharmacologic therapy with a nurse was effective for controlling dyslipidemia¹⁸. In this study, we showed that nurses can also understand the benefits of CR with high evidence levels.

Education for nurses who do not have experience with CR is important for improving CR in our hospital. Appropriate study meetings about CR should be effective, because nurses had high interest in and willingness to learn about CR. Even those in the Non-Exp-CR group felt that CR was important and wanted to be more involved in the future. Such meetings should be announced to both the Exp-CR and Non-Exp-CR groups, because it is not enough for only nurses in the Exp-CR group to participate in meetings about CR.

While most of the nurses in the Exp-CR group had nursing experience for cardiovascular disease and belonged to a hospital ward that treated cardiovascular patients, some had to care in CR without nursing experience for cardiovascular diseases. Since patients with cardiovascular diseases can be admitted due to non-cardiovascular-reasons, a patient might have an underlying disease and also need cardiovascular care for rehabilitation. Thus, knowledge about CR is useful for all nurses in our hospital.

This study had some limitations. The response rates in the inpatient wards varied from 34.5% to 100%. CR involves continuous care, from inpatient to outpatient. Although we performed this questionnaire study among nurses in inpatient wards, nurses who work with outpatients should also be analyzed. In this study, although nurses selected attitude of contribution to the beneficial effects of CR revealed in the guideline, we have to consider how to contribute to the beneficial effects of CR as a nurse. We will establish an approach for nursing care based on the results of

this study.

In conclusion, nurses who had experience with CR were more likely to understand the benefits of CR with high evidence levels. Nurse can make the best use of their expertise in comprehensive care in CR as a member of a multidisciplinary team, although we have to consider how to best use participation by a nurse.

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Disclosures

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Table 1. Response rate in each inpatient ward.

Inpatient ward	Total number (n)	Respondents (n)	Respondents/ Total number x 100 (%)	Exp-CR (n)	Exp-CR/ Respondents x100 (%)
Obstetrics	40	39	97.5	1	0.8
Gastroenterology	30	19	63.3	3	2.3
Nephrology and urology	25	17	68.0	1	0.8
Ear, nose, and throat and respiratory medicine	33	26	78.8	3	2.3
Psychiatry	26	12	46.2	0	0.0
Ophthalmology, dental and oral surgery, and general internal medicine	29	14	48.3	3	2.3
Thoracic surgery	25	25	100.0	1	0.8
Gastrointestinal surgery	60	58	96.7	8	6.2
Medical oncology and hematology	29	10	34.5	0	0.0
Gynecology and breast surgery	24	13	54.2	2	1.5
Pediatric surgery	24	17	70.8	3	2.3
Mixed wards	31	28	90.3	2	1.5
Orthopedic surgery	33	25	75.8	4	3.1
Plastic surgery	25	19	76.0	2	1.5
Pediatrics	44	43	97.7	1	0.8
Neurology and neurosurgery	57	57	100.0	7	5.4
Neonatology	65	42	64.6	6	4.6
Emergency medicine	82	55	67.1	50	38.5
Cardiology and cardiovascular surgery	51	44	86.3	33	25.4
Total	733	563	76.8	133	100.0

Table 2. Baseline characteristics

	All nurses (n=563)	Exp-CR group (n=130)	Non-Exp-CR group (n=433)	p value
Female, n (%)	547 (97.2)	123 (94.6)	424 (97.9)	0.07
Age, years	31±8	33±8	30±8	0.008
License				
Nurse, n (%)	563 (100)	130 (100)	433 (100)	1.0
Public health nurse, n (%)	93 (16.5)	24 (18.5)	69 (15.9)	0.5
Midwife, n (%)	34 (6.0)	1 (0.8)	33 (7.6)	0.003
Months of nurse experience	108±97	130±101	101±95	0.002
Nurse experience for cardiovascular patients	103 (18.3)	65 (50.0)	38 (8.8)	<0.001
Months of nurse experience for cardiovascular patients	7±22	26±38	2±9	<0.001

CR, cardiac rehabilitation; Exp-CR, experience with cardiac rehabilitation; Non-Exp-CR, no experience with cardiac rehabilitation.

Table 3. Nursing care for cardiac rehabilitation

	All nurses (n=563)	Exp-CR group (n=130)	Non-Exp-CR group (n=433)	p value
Awareness of CR in daily care	174 (30.9)	114 (87.7)	60 (13.9)	<0.001
Consideration of CR during the patient's physical assessment	143 (25.4)	101 (77.7)	42 (9.7)	<0.001
Sharing information about CR with patients	155 (27.5)	110 (84.6)	45 (10.4)	<0.001
Assisted with early intervention in CR	158 (28.1)	97 (74.6)	61 (14.1)	<0.001

CR, cardiac rehabilitation; Exp-CR, experience with cardiac rehabilitation; Non-Exp-CR, no experience with cardiac rehabilitation.

Table 4. Attitudes about nursing care for cardiac rehabilitation

Variables, n (%)	All nurses (n=563)	Exp-CR group (n=130)	Non-Exp-CR group (n=433)	p value
Interest in CR	403 (71.6)	117 (90.0)	286 (66.1)	<0.001
Understand the need for CR	386 (68.6)	123 (94.6)	263 (60.7)	<0.001
Understand the aim of CR	305 (54.2)	125 (96.2)	180 (41.6)	<0.001
Understand the nurse's role in CR	220 (39.1)	115 (88.5)	105 (24.3)	<0.001
Willingness to learn about CR	399 (70.9)	120 (92.3)	279 (64.4)	<0.001
Knowledge about CR	147 (26.1)	111 (85.4)	36 (8.3)	<0.001
Intend to participate in a meeting about CR in the hospital	102 (18.1)	74 (56.9)	28 (6.5)	<0.001
Intend to participate in a meeting about CR outside of the hospital	70 (12.4)	42 (32.3)	28 (6.5)	<0.001
Greater feeling of the importance of CR in the future	458 (81.4)	125 (96.2)	333 (76.9)	<0.001
Feeling to be involved more in CR in the future	436 (77.4)	122 (93.9)	314 (72.5)	<0.001

CR, cardiac rehabilitation; Exp-CR, experience with cardiac rehabilitation; Non-Exp-CR, no experience with cardiac rehabilitation.

Table 5. Attitudes of contribution to the beneficial effects of CR revealed in the guideline.

Variables	Sufficient			Partial			Insufficient			Ineffective		
	n (%)	ASR	p value	n (%)	ASR	p value	n (%)	ASR	p value	n (%)	ASR	p value
Improved exercise tolerance	48 (36.6)	6.6	<0.001	66 (50.4)	1.6	0.1	15 (11.5)	-4.3	<0.001	2 (1.5)	-3.9	<0.001
Improved quality of life	58 (44.3)	9.0	<0.001	62 (47.3)	0.9	0.4	9 (6.9)	-5.5	<0.001	2 (1.5)	-3.9	<0.001
Prevention of remodeling and reduction of systolic function in the left ventricle	33 (25.2)	2.9	0.003	66 (50.4)	1.6	0.1	19 (14.5)	-3.5	<0.001	13 (9.9)	-0.9	0.4
Reduction of occurrence of coronary artery disease	15 (11.5)	-1.4	0.1	59 (45.0)	0.3	0.7	44 (33.6)	1.5	0.1	13 (9.9)	-0.9	0.4
Reduction of admission as a result of heart failure due to ischemic heart disease	30 (22.9)	2.2	0.03	66 (50.4)	1.6	0.1	28 (21.4)	-1.7	0.1	7 (5.3)	-2.5	0.01
Improvement of prognosis by coronary artery disease or ischemic heart disease	28 (21.4)	1.7	0.08	71 (54.2)	2.5	0.01	26 (19.9)	-2.1	0.03	6 (4.6)	-2.8	0.005
Reduction of systolic blood pressure	22 (16.8)	0.3	0.8	60 (45.8)	0.5	0.6	40 (30.5)	0.7	0.5	9 (6.9)	-2.0	0.047
Increase of high-density lipoprotein and reduction of triglyceride	19 (14.5)	-0.5	0.6	60 (45.8)	0.5	0.6	37 (28.2)	0.1	0.9	15 (11.5)	-0.4	0.7
Expectation of body weight management through improvement of lifestyle including long-term dietary counselling	37 (28.2)	3.9	<0.001	71 (54.2)	2.5	0.01	19 (14.5)	-3.5	<0.001	4 (3.1)	-3.3	<0.001
Expectation of reduction of cardiovascular events by dietary counselling and exercise therapy against diabetes mellitus using insulin treatment	30 (22.9)	2.2	0.03	74 (56.5)	3.0	0.002	21 (16.0)	-3.1	0.002	6 (4.6)	-2.8	0.005
Expectation of body weight management and smoking cessation by education	59 (45.0)	9.3	<0.001	58 (44.3)	0.2	0.9	11 (8.4)	-5.1	<0.001	3 (2.3)	-3.6	<0.001

guideline: Guideline for rehabilitation in patients with cardiovascular disease (Japanese Circulation Society 2012)¹²