

## Biopsychosocial Needs among Patients with Lower Limbs Amputation

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### Abstract

**Background:** amputation of the lower limb is a physically and psychologically traumatic event that leads to a mismatch between the physical representation of the body and the body itself. **Aim:** The study aimed to assess biopsychosocial needs among patients with lower limbs amputation. **Methods:** a descriptive exploratory design was followed to achieve the aim of this study. The study conducting at the surgical unit and at the outpatients clinics at El-Demerdash Hospital affiliated to Ain Shams University hospital. A purposive sample of 50 patient post lower limb amputation surgery according to inclusion and exclusion criteria. **Data collection Tools:** I-Patient's interviewing questionnaire, II-Assessment of patient's Biopsychosocial needs. **Results:** The present study revealed that about half of the studied subjects had need assistance regarding dressing as a physical need, more two third of them had onset of the pain suddenly, more than half of them had sometimes shyness in front of people, more than two third of them sometimes had handicapped to go out for shopping, about half of them sometimes had difficulty to cope with their condition. **Conclusion:** The studied subjects had poor knowledge about dangerous of diabetes mellitus. The physical, psychological, social and spiritual factors impact strongly on patient' status after lower limb amputation. **Recommendations:** Further studies are needed to study the impact of the biopsychosocial needs on the quality of the life of the patients.

**Keywords:** Biopsychosocial needs, Amputation, lower limbs.

### Introduction

Lower limb amputation surgery is an invasive procedure performed to remove ischemic, infect necrotic tissue or locally unrespectable tumor and at the same time, it is a life-saving procedure. Amputation is performed to remove tissue that no longer has an adequate blood supply because of impaired circulation as a complication of diabetes mellitus, repeated severe infection that leads to gangrene. Although attempts have been made in the world to better

manage diabetes and the foot ulcers that can be complications of the disease, the number of resulting amputations has not decreased (*Brown, Iorio & Klement, 2014*).

The only absolute indication for amputation is irreversible ischemia in a diseased or traumatized limb. Amputation also may be necessary to preserve life in patients with uncontrollable infections and may be the best option in some patients with tumors. Injury not affecting circulation may result in a limb that it is not as functional as a prosthesis. Similarly,

certain congenital anomalies of the lower extremity are best treated with amputation and prosthetic fitting (*O'Brien, Cox & Shortell, 2016*).

The Success of rehabilitation after amputation is related to the level of limb loss, with a more distal amputation corresponding to a better success rate. The primary underlying reason for increased success with more distal amputations is the marked increase in energy requirements with more proximal amputations. The slower rates reflect a compensatory mechanism to conserve energy expenditure per unit time (power). Malnourished or immunocompromised patients have increased rates of perioperative complications, although this is less evident with more proximal amputations (*Hasanadka, McLafferty & Moore, 2011*).

#### **Significance of the study:**

Patients with lower limb amputation constitutes a growing segment of contemporary health care practice. There are about more than 300,000 patients with amputations live in the United States. (*Barla, Gavanier & Mangin, 2017*).

Globally, In 2015, the numbers of patients with lower limb amputation were 4.1 million amputees (*Van Netten, Fortington & Hinchliffe, 2016*). The medical records of the surgical outpatient clinic at Ain Shams University hospital documented 160 patients who underwent lower limb amputation in years (2017/2018) (*Ain Shams Medical Statistic and information department, 2018*).

Educating patients with lower limb amputation is a must if the nurse wants them to follow through medication, exercise, and other life-style changes. However the best results come when the nurse combines education with behavior

modification strategies and emotional support. This study will add to the body of knowledge that supports professional practice and improve the quality of care provided by nurses.

#### **Aim of the study:**

This study aimed to assess Biopsychosocial needs among patients with lower limbs amputation.

#### **Research Questions:**

- 1-What are Biopsychosocial needs among patients with lower limbs amputation?
- 2-What are the factors affecting the Biopsychosocial needs among patients with lower limbs amputation?

#### **Subjects and methods:**

##### **Research Design:**

A descriptive exploratory research design was used to achieve the aim of the study. It is a design used when the researcher want to describe a specific behavior that occurs in the environment without influencing manipulating the variables in any way (*Smith, 2017*).

##### **Research Setting:**

The study conducted at the surgical unit at El. Demerdash Hospital affiliated to Ain Shams University which composed of ten beds and also at the outpatients clinics which contain big halls for waiting patients.

##### **Subjects:**

A purposive sample of 50 patient post lower limb amputation surgery admitted to the above-mentioned clinical setting. The sample size was calculated by adjusting the power of the test to 80% and

the confidence interval to 95% with margin of error accepted adjusted to 5% and a known total population of 355 patients using the following equation:

$$X = Z(c/100)^2 r(100-r)$$

$$N = N_x / ((N-1)E^2 + X)$$

$$E = \text{Sqrt} [(N-n)/n(N-1)]$$

Where N is the population size, r is the fraction of responses that you are interested in, and Z(c/100) is the critical value for the confidence level (Chau *et al.*, 2017). The study sample was selected according to the following inclusion criteria: Adult patients from both gender, Accepting to participate in the study, age from 18 to 60 years, The patients' with unilateral or bilateral lower-limb amputation, post-operative patients, Have no cognitive or mental impairment. **Exclusion criteria:** patients with cognitive or mental impairment, subjects refuse participation in the study.

#### Tools of data collection:

Two tools used to collect the data as follows:

#### I-Patients' interviewing questionnaire:

It was designed by the investigator in simple Arabic language after reviewing the relevant recent related literatures. The questionnaire included three parts as follows:

##### Part 1: socio-demographic data:

it was designed to assess patients' demographic data of the patients under study. It composed of 10 questions such as age, gender, level of education, occupation, marital status, smoking habit, exercise and monthly income.

**Part 2: Patient's medical data:** the researcher designed it after reviewing the related literature (Brown, *et al.*, 2014). It was

consist of 5 questions to assess the present health history such as main cause of amputation surgery and 6 questions to assess the past health history such as previous Surgeries.

##### Part 3: patient's knowledge level:

it was designed by the investigator aimed at assessment of patients' level of knowledge regarding lower limb amputation surgery after reviewing the related literature (O'Brien, Cox & Shortell, 2016). It was consisted of 15 assessment describing four sections as follows:

**Section 1:** Questions about general information about lower limb amputation (three MCQs).

**Section 2:** Questions about Section 2: Questions about patients knowledge about medical intervention (four MCQs).

**Section 3:** Questions about exercises & physical activity postoperative (two MCQs).

**Section 4:** Questions about rehabilitation postoperative (four MCQs).

**Section 5:** Questions about post-operative follow up (two MCQs).

The scoring system was rating and ranging from 1 (poor) to 3 (good) points for each item. Each question response was either poor (1 grade), average (2 grade) and good (3 grade).

The total item 15 and score was from 15-45 grades:

- Poor knowledge <50%
- Average knowledge 50-75%
- Good knowledge >75%

## II: Assessment of patient's Biopsychosocial needs:

It was adapted (Abeysekera & Dawson, 2015) and filled by the researcher in a simple Arabic. It was used to assess biopsychosocial needs (physical, psychological, social, and spiritual) among patients with lower limb amputation. It was included four sections as follows:

### Section 1: Physical needs in patients with the lower limb amputation:

This section included 10 MCQ concerned with activities of daily living and pain. The activities of daily living were included six items (bathing, dressing, transferring, toileting, continence and feeding)

#### ❖ Scoring System of activities of daily living:

The scoring system was rating and ranging from 1 (low needs) to 3 (high needs) points for each item. Each question response was either low (1 grade), average (2 grade) and high (3 grade).

The total item 10 and score was from 10-30 grades:

- Low needs <50%
- Average needs 50-75%
- High needs >75%

#### ❖ Scoring of the Stump Pain

It included 4 items {onset, Duration, severity, and pattern of stump pain with total score of 18 mark.

#### -for the onset of pain

- 1 = Gradual pain,
- 2 = sudden pain

#### -for the duration of pain

- 1 = less than a quarter of one hour,
- 2 = a quarter of one hour to half one hour,
- 3 = more than one hour

#### -for pain severity

- (1-3) = mild pain,
- (4-6) = moderate pain,
- (7-10) = severe pain

#### -for pain pattern

- 1 = Burning pain,
- 2 = cramping pain,
- 3 = stabbing pain

Patients' recognition for pain was ranged as follows:

- < 50% was indicate that patient had less recognition of stump pain.
- 60% to 75%) was indicate that patient had average recognition of stump pain.
- >75% was indicate that patient had more recognition of stump pain.

### Section 2: Psychological needs in patients with lower limb amputation

It was included 15 MCQ such as sleeping disturbances and fear from complication of the surgery.

#### The Scoring System of psychological needs:

The scoring system was rating and ranging from 1 (never) to 3 (Always) points for each item. Each question response was either never (1 grade), Sometimes (2 grade) and Always (3 grade).

The total item 15 and score was from 15-45 grades:

Low needs <50%  
Average needs 50-75%  
High needs >75%

### **Section 3: Social needs in patients with lower limb amputation**

This section was included 15 MCQ such as the effect of the surgery when go out for shopping or travelling.

#### **❖ Scoring System of social needs:**

The scoring system was rating and ranging from 1 (never) to 3 (Always) points for each item. Each question response was either never (1 grade), Sometimes (2 grade) and Always (3 grade).

The total item 15 and score was from 15-45 grades:

-Low needs <50%  
-Average needs 50-75%  
-High needs >75%

### **Section 4: Spiritual needs in patients with lower limb amputation**

This section was included 10 MCQ such as the internal conflicts toward the future.

The scoring system was rating and ranging from 1 (never) to 3 (Always) points for each item. Each question response was either never (1 grade), Sometimes (2 grade) and Always (3 grade).

The total item 10 and score was from 10-30 grades:

- Low needs <50%  
- Average needs 50-75%  
- High needs >75%

### **Operational Definitions:**

**Lower limb amputation:** is surgical removal of all or part of lower limb due to trauma or medical illness.

**Biopsychosocial needs:** refer to physical, psychological, social and spiritual needs of patients subjected to lower limb amputation after surgery.

### **Procedures:**

The study goes through three phases

#### **1-preparatory phase:**

It included reviewing of related literature and theoretical back ground of various aspects of the study using books, articles, internet periodicals and magazines to develop tools for data collection.

### **Tools Validity & Reliability:**

Testing validity of the proposed tools by inspecting the items to determine whether the tools measure what supposed to measure. The tools were revised by a jury of five experts from different academic categories (two professors, two assistant professors and one lecture) from medical surgical nursing department, faculty of nursing, Ain Shams University. The experts reviewed the tools and its content for clarity, relevance, comprehensiveness, accurateness, logical consequence, applicability and simplicity. Modifications were done according to their recommendations.

Testing reliability of the proposed tools was done statistically by Cronbach Alpha test. It was used to measure the internal consistency (Reliability of the used tool or instrument) the reliability score of tool as above is (0.832, 0.863 and 0.854) for

knowledge, biopsychosocial and total questionnaire, where the minimum Reliability coefficient we need is 60%, so is the reliability coefficient for all questions. While validity score of tools is (0.931, 0.74 and 0.922) for patient's knowledge, biopsychosocial and total questionnaire respectively, this indicated high total internal consistency of the used tool.

### **Ethical Considerations:**

The ethical research consideration in the study included the following:

The investigator approval was obtained from the scientific ethical committee in faculty of nursing, Ain Shams University before starting the study.

The investigator clarified the aim of the study to the subjects included in the study before starting the study.

The investigator assured maintaining anonymity and confidentiality of the subjects' data that were included in the study.

Patients were informed that they were allowed to choose to participate or not in the study and they had right to withdrawal from the study at any time without any reason.

Written consent was obtained from patients to participate in the study.

### **Pilot study:**

A pilot study was carried out in surgical units and out patient's clinic at El. Demerdash Hospital affiliated to Ain Shams University on 10% patients of sample size to test the applicability, clarity and efficiency of the tools used in the study and to determine the time needed to answer the study tools. Patients which were included in the pilot study were included in the study sample

because no modification were done after conducting pilot study.

### **Field work:**

The aim of this stage was to assess the knowledge and biopsychosocial needs for patients with lower limb amputation through collecting the data using the tools after confirming its validity and reliability and explaining the aim of the study simply by the investigator to the studied subjects and obtaining their permission for data collection prior to data collection. All the available subjects (50) were included in the study.

Data collection took about six months started from the beginning of December 2018 to the end of May 2019. The data were collected by the researcher through three days per week (Sunday, Monday and Wednesday) in the morning at the evening shifts. It took about (20-45) minutes to fill the patients interview questionnaire at surgical units and out patients clinic at El. Demerdash Hospital affiliated to Ain Shams University.

### **Limitations of the study:**

-More than half of studied patients were depressed due to missing part of their body and they were need for more support during speaking with them.

-Some patients in the hospital were not want to share in the study, so the investigator was need more support from the hospital staff to be guide.

-Some questions were asked twice or three time every session from hospital staff about what he was doing and this was lose the time of the researcher.

-Some patients not compliance with follow up time due to the difficulty of transportation, so the investigator hold back until contact with subjects regarding the suitable follow up time.

-Some patients in the start of the interview had resistance until felt comfortable, and they was took more time to build the relationship.

#### IV-Statistical design:

The data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

#### The following tests were done:

- Chi-square ( $\chi^2$ ) test of significance was used in order to compare proportions between qualitative parameters.
- Independent-samples t-test of significance was used when comparing between two means.
- Pearson's correlation coefficient (r) test was used to assess the degree of association between two sets of variables
- The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following:
  - Probability (P-value)
  - P-value  $\leq 0.05$  was considered significant.

- P-value  $\leq 0.001$  was considered as highly significant.
- P-value  $> 0.05$  was considered insignificant.

#### Result

**Table (1):** showed that the mean age of the studied patients was 45.60, and 58% of them were from not working, while marital status 70% of them were married and 52% of them were live with their family and 52% of them were from urban, with about 46% of them their income not enough for the cost of treatment and 54% of them were smokers, while 84 of them had not practice sport regularly.

**Table (2):** This table revealed that the most common present medical history of main cause for amputation was diabetic foot (68%), followed by symptoms appeared before amputation and 44% from subjects had foot ulcer never improves, while 82% from subjects had stump pain pot operative with about 48% from subjects had moderate stump pain and 40% from subjects had pain relieved . On the other hand medical treatment in pain relives (40%).

**Table (3):** This table showed that there was statistically significant relation between the studied subjects' level of knowledge and their biopsychosocial needs and Level of spiritual needs, at p-value  $< 0.001$ .

**Table (4):** This table revealed that there were a highly significant and Positive correlation between subjects' total biopsychosocial& spiritual needs score and their total knowledge score at p-value 0.01& r =(-0.845, -0.912, -0.847, -0.804).

There is Positive correlation and significant patients with lower limb amputation between total score knowledge, total score physical needs, total score psychological needs, total score social needs and total score spiritual needs

**Table (1):** Number and percentage distribution of patients with lower limb amputation regarding to their socio-demographic characteristics (N=50).

<b>socio-demographic characteristics</b>	<b>No.</b>	<b>%</b>
<b>Age (years)</b>		
20-30 years	5	10.0
30-40 years	7	14.0
40-50 years	18	36.0
>50 years	20	40.0
Mean $\pm$ SD		45.60 $\pm$ 8.66
<b>Occupation</b>		
Not working	29	58.0
Working	21	42.0
<b>Marital status</b>		
Unmarried	15	30.0
Married	35	70.0
<b>With whom you live</b>		
With family	26	52.0
Alone	16	32.0
With relatives	8	16.0
<b>Residence</b>		
Rural	24	48.0
Urban	26	52.0
<b>Own income enough for the costs of treatment</b>		
No	27	54.0
Yes	23	46.0
<b>Cigarettes smoking</b>		
No	23	46.0
Yes	27	54.0
<b>Practice any sport regularly</b>		
No	42	84.0
Yes	8	16.0

**Table (2):** Number and percentage distribution of patients with lower limb amputation according to their present medical history (N=50).

<b>Present medical history</b>	<b>No.</b>	<b>%</b>
<b>Main cause of amputation*</b>		
Diabetic foot	34	68.0
Accident to the lower limb	9	18.0
Vascular damage limb	13	26.0
Malignant tumor in lower limb	3	6.0
Others	0	0.0
<b>Symptoms appeared before amputation*</b>		
Sever pain and numbness	21	42.0
Foot ulcer never improves	22	44.0
Infection	16	32.0
Others	3	6.0
<b>Presence of pain postoperative</b>		
Stump pain	41	82.0
Phantom pain	41	82.0
<b>Severity of stump pain if present</b>		
Mild	3	6.0
Moderate	24	48.0
Sever	23	46.0
<b>Medical treatment*</b>		
Anti-inflammatory	17	34.0
Pain relive	20	40.0
Antibiotics	10	20.0
Anti-coagulant	4	8.0
Others	3	6.0

\*Numbers are not mutually exclusive



**Table (3):** Relation between studied subjects level of knowledge and their biopsychosocial (n=50).

Biopsychosocial	Level of knowledge						Total		Chi-square test	
	Poor (n=15)		Average (n=22)		Good (n=13)		No.	%	x2	p-value
	No.	%	No.	%	No.	%	No.	%		
<b>Level of physical needs</b>										
High Need	12	80.0%	2	9.1%	1	7.7%	15	30.0%	88.782	<0.001**
Average Need	2	13.3%	18	81.8%	4	30.8%	24	48.0%		
Low Need	1	6.7%	2	9.1%	8	61.5%	11	22.0%		
<b>Level of psychological needs</b>										
High Need	11	73.3%	1	4.5%	3	23.1%	15	30.0%	100	<0.001**
Average Need	2	13.3%	19	86.4%	1	7.7%	22	44.0%		
Low Need	2	13.3%	3	13.6%	8	61.5%	13	26.0%		
<b>Level of social needs</b>										
High Need	13	86.7%	2	9.1%	0	0.0%	15	30.0%	79.682	<0.001**
Average Need	1	6.7%	19	86.4%	4	30.8%	24	48.0%		
Low Need	1	6.7%	1	4.5%	9	69.2%	11	22.0%		
<b>Level of spiritual needs</b>										
High Need	10	66.7%	2	9.1%	5	38.5%	17	34.0%	69.711	<0.001**
Average Need	3	20.0%	18	81.8%	3	23.1%	24	48.0%		
Low Need	2	13.3%	2	9.1%	5	38.5%	9	18.0%		

P-value >0.05 NS; \*p-value <0.05 S; \*\*p-value <0.001 HS

**Table (4):** correlation between studied subjects' total biopsychological& spiritual needs score and their total knowledge score (n=50).

Biopsychosocial	total knowledge score	
	R	p-value
Total score physical needs	-0.845	0.01**
Total score psychological needs	-0.912	0.01**
Total score social needs	-0.847	0.01**
Total score spiritual needs	-0.804	0.01**

R-Pearson Correlation Coefficient

\*\*p-value <0.01 highly significant

## Discussion

The present study showed that the highest percentage of the studied subjects were age of group greater than 50 years. This finding was agreement with **Narres, Kvitkina & Claessen, (2017)** who conducted a study titled "Incidence of lower extremity amputations in the diabetic compared with the non-diabetic population" and found that, the highest percentage of the studied subjects were age of group greater than 50 years.

Regarding to the studied subjects 'gender, the present study revealed that more than half of the studied subjects were males. This finding is consistent with **Davie-Smith, Paul&Nicholls,(2017)**

who conducted a study titled "The impact of gender, level of amputation and diabetes on prosthetic fit rates following major lower extremity amputation" and found that, more the half of the studied subjects were males .

Regarding to the studied subjects 'educational level, the highest percentage of the studied subjects were Primary educated. These findings are on the same line with **Williams, Sanfey& Smink, (2015)**who conducted a study about "Patient education level affects functionality and long term mortality after major lower extremity amputation" and found that the highest percentage of the studied subjects were Primary educated.

Concerning occupation of the studied subjects, the result of the present study revealed that more than half of the studied subjects were not working. This finding is in agreement with **Hassett et al, (2016)** who conducted a study about "Estimating the prevalence of limb loss in the United States". And found more than half of studied subjects were not working.

As regard marital status, the result of the study showed that Two-thirds of the studied subjects were married. This finding is in agreement with **Resnik& Borgia, (2015)** who conducted a study about "Predicting prosthetic prescription after major lower-limb amputation" and found that, about Two-thirds of the studied subjects were married.

As regards, living condition, the result of the present study revealed that more than half of studied subjects included in this study were living with their families. This is in agreement with **Richa Sinha, Wim JA van den Heuvel&Perianayagam Arokiasamy ,(2017)** Who conducted a study about "Factors affecting quality of life in lower limb amputees". And found that more than half of studied patients included in this study were living with their families.

As regards, Residence the present study showed that more than half of studied patients were from urban areas. This result is correspond with **Noula, Tochie &Tchuenkam, (2019)** who conducted a study about "Treatment of the diabetic foot to amputate or not?" And found that more than half of studied patients from urban areas.

As regards income the result of the present study revealed that most of studied patients had insufficient income .this result in agreement with **Sinha van den & Arokiasamy, (2014)** who conducted a study about" Amputations and

socioeconomic position among persons with diabetes mellitus" And found that most of studied patients had insufficient income.

Concerning cigarette smoking the result of the present study showed that more than half of the studied patients were smokers. This findings were in agreement with **Rodrigues, Vangaveti& Malabu, (2016)**. Who conducted a study about" Prevalence and Risk Factors for Diabetic Lower Limb Amputation" And found that most of the studied patients were smokers.

Concerning the cause of lower limb amputation, the current study revealed that half of the studied patients suffered from chronic diseases such as diabetes mellitus that considered the most main cause of lower limb amputation, this result was in agreement with **Narres, et al,(2017)** who conducted the study about "Incidence of lower extremity amputations in the diabetic compared with the non-diabetic population" and describe the presence of lower limb amputation due to complication of diabetes mellitus. This result due to vascular atrophy and necrosis beginning in the foot.

The current study revealed that the highest percentage of the studied patient had the foot ulcer as the first symptoms that appeared on their foot. This results agreed with **Santosa, Moysidis& Kanya, (2015)** who conducted the study about "Decrease in major amputations in Germany". It may be due to presence of diabetes mellitus.

Concerning to type of postoperative pain and severity, the current study showed that most of patients had moderate pain. This is in agreement with **Pollmanns& Weyermann, (2018)** who conducted the study about "Hospital cases and amputations for diabetes mellitus Time series and differences on a small scale", who found that most of studied patients also had moderate pain.

Regarding to medical treatment, the current study showed that most of patients were using pain killer when need. This finding was in agreement with **May, Hahn& Tonn, (2016)** who conducted the study about "Decrease in (Major) Amputations in Diabetics", and found that most of the patient were using pain killer when need.

Regarding to the Relation between patients with lower limb amputation level of knowledge and the biopsychosocial needs. The present study showed that there were statistical significant relations between the studied patient's level of knowledge and their Level of physical needs, Level of psychological needs, Level of social needs and Level of spiritual needs. This is in agreement with **Sinha,et al , (2014)**who conducted the study about" Factors affecting quality of life in lower limb amputees", and found that there were statistical significant relations between the studied patients level of knowledge and their biopsychosocial needs.

Regarding to the relation between studied subjects' total biopsychosocial& spiritual needs score and their total knowledge. The present study showed that there were Positive correlation and significant patients with lower limb amputation between total score knowledge, total score physical needs, total score psychological needs, total score social needs and total score spiritual needs This is in agreement with **O'Brien, et al ,(2016)** who conducted the study about " Risk factors for early failure of surgical amputations " who found that there was a Positive correlation and significant patients with lower limb amputation between total score knowledge, total score physical needs, total score psychological needs, total score social needs and total score spiritual needs.

### **Conclusion:**

More than half of the studied had unsatisfactory knowledge regarding lower limb amputation ,more than three quarters of them had satisfactory self-care of amputated part, while regarding physical problems, near half of studied patients had moderate pain and more half of them need assistance with daily living activities regarding toileting, moving and bathing. A regard to psychological needs, the all of the present patients suffered from GIT symptoms, psychosomatic symptoms and behavioral symptoms on speech. Concerning social needs near less than half of the studied patients stated that they had mild social needs parameters as feeling missing share activities with society.

### **Recommendation:**

- 1-Supportive care services should be provided to meet biopsychological needs.
- 2- Health education programs about lower limb amputation and importance caring about these patients by television and social media
- 3-rehabilitation programs that considered the most important point for these patients, and it may be implemented through collaboration between various rehabilitation team
- 4-further searches about the effect of the biopsychological needs on the quality of the life for patients.

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