

## THE ROLE OF THE PSYCHOLOGIST IN MULTIDISCIPLINARY TREATMENTS FOR CHRONIC NECK AND SHOULDER PAIN: A CONTROLLED COST-EFFECTIVENESS STUDY

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**ABSTRACT.** This study was designed to determine a cost-effective use of psychologist resources in multimodal cognitive-behavioural treatments (MMCBT) for chronic neck/shoulder pain. A randomised controlled trial was conducted with 66 patients divided in two groups. The first group (A) was treated following the approach of MMCBT with the clinical psychologist only functioning as a "coach" to the other health professionals. In this group, the psychologist had on average 5 hours of input per patients. The second group (B) was treated with the same inpatient MMCBT but with the behavioural component administered by the clinical psychologist directly to the patients. In this second group the psychologist had on average 17 hours of input per patient in the entire intervention. The outcome variables included physical, emotional and social factors, and sick-leave. Both groups showed significant improvements over time. The improvements were evident only in sub-groups, specifically in women. The only significant difference between the groups was in "perceived helplessness" favouring the "psychologist contact" setting. It is concluded that in terms of input of clinical psychology, the treatment setting with the "coaching" technique proved to be the most cost-effective use of the psychologist in the two treatment settings investigated.

*Key words:* cognitive-behavioural intervention, musculoskeletal pain, learned helplessness, cost-effectiveness analysis, multidisciplinary treatment.

Long-term absenteeism due to musculoskeletal pain is an increasing problem in the Western world. The cause is most often stated as a non-specific pain syndrome with pain in back, neck and shoulder regions (3, 16, 21, 23, 27). The ability to document a

precise diagnosis is possible in about 10-15% of such patients (21). Low back pain has been the most common problem experienced. The proportion of cases with neck and shoulder pain, however, has been steadily increasing in Sweden (22, 27, 34). During the 1980's numerous studies about this problem have been done in many countries. A general conclusion of these studies is the need for standardised and structural medical examinations and the need for new effective and well evaluated treatments (16, 21-24, 31, 34). Some of the studies have shown that a multimodal cognitive-behavioural based treatment is effective in reducing musculoskeletal pain problems (10, 11, 13, 19, 20, 21, 26). The evaluations have been performed as a comprehensive treatment package but without analysing the unimodal treatment components individually. Studies of treatments in a unimodal sense have been conducted and have provided little evidence to support traditional physical therapy regimes alone as an effective remedy for long-term pain (21, 31). However, some studies have shown positive findings when physical therapy regimes are administered in an operant conditioning setting (11, 17). There is some evidence suggesting that cognitive-behavioural intervention alone can be effective in combating long-term pain (5, 18, 19).

Multimodal treatment programmes require substantial staff resources, as several disciplines are involved in the treatment. This commits substantial financial resources for the clinic and the insurance company.

We present a study designed to find a cost-effective use of psychologist resources in a multimodal and a multidisciplinary treatment setting. To our knowledge no study has yet investigated the psychologist's role in a multimodal treatment setting.

Table I. Descriptives on the study subjects

	Treatment 1 (n = 37)	Treatment 2 (n = 29)
Female (%)	70	59
Age (Years; Mean and S.D.)	40 (10)	39 (9)
Employment (%):		
Blue Collar work	33	48
Clerical work	15	7
Academic work	3	—
Service/Care	49	45
Spinal mob.* (Mean and S.D.)	90 (21)	93 (17)
Neck mobility# (Mean and S.D.)	288 (90)	300 (88)
Sick-listing one year pre treatment (Days; Mean and S.D)	237 (126)	256 (117)

\* Spinal mobility was measured using the Kyphometer technique (8).

# Neck mobility (1) was measured using the Myrin technique.

The aim of the present study was: *i*) to determine whether an added psychological component administered by a clinical psychologist to patients enhances multimodal treatment results; and *ii*) to compare the costs of the psychologist administering the behavioural intervention directly to patients versus contribution to the treatment "package" merely by "coaching" the other health professionals in the multidisciplinary team.

## MATERIAL AND METHODS

### Study design

The study was designed as a controlled trial with study subjects randomly assigned to two different treatment alternatives, described in a later section. The outcome was evaluated by a multidimensional battery of questionnaires selected in advance on the basis of the scientific findings of the multidisciplinary dimension of long-term spinal pain. A 2 by 3 repeated measure design, two experimental groups and three assessments were applied. The assessments were done at baseline (the week before treatment start), post treatment (the last day of treatment) and at a follow-up (six months after treatment).

### Subjects

The criteria stipulated for participation were: *i*) neck and shoulder pain without objective neurological signs, *ii*) age 20 to 55 years, *iii*) fluent in the Swedish language, and *iv*) no comorbidity that could impair participation in the programme (e.g. heart condition, alcoholism).

The subjects who participated in the study, had been referred to an in-patient orthopaedic department in the north of Sweden. The clinic's catchment area is nationwide. Seventy eligible subjects were randomly assigned to two different treatment groups. Information about the project was supplied to each participant and written consent to participate in the study was obtained by a research

assistant not engaged in the treatment. Sixty-six subjects were included in the study. Full time participation and compliance with the treatment activities were required during the four weeks and verified once a week during staff meetings. If these requirements were not fulfilled the subject was excluded from the study. The four subjects who were excluded from the study had either not completed the questionnaires or they had entered another treatment programme offered at the clinic.

Descriptive data about the study groups are displayed in Table I.

### Description of the treatment packages

The staff involved in the treatment consisted of physical therapists, physicians, physical training instructors, nurses and psychologists. During the year prior to the start of the study, the medical staff had been instructed in a cognitive-behavioural approach to treating long-term pain and been exposed to it in their daily work. Reinforcement techniques, relaxation training, problem-solving with goal setting and operant behavioural modification regimes were used by the psychologists and taught to the rest of the staff. The purpose was to ensure that all personnel were working with the same approach and applying the techniques.

Two treatment designs were administered in the project. Treatment A ( $n = 37$ ) was a programme designed mainly to improve physical fitness (strength and endurance), health behaviour and develop plans for return to work. In addition to treatment A, treatment B ( $n = 29$ ) included a cognitive-behavioural intervention administered by the psychologist. Both treatment settings were in-patient programmes and lasted for five weeks.

### Treatment design one (group A)

Patient education consisted of a series of lectures about anatomy, stress, diet, pain behaviour and secondary gains, medication and other pain relieving techniques, health behaviour and coping strategies. The lectures were held by all categories of staff. All subjects were trained in groups by a physical therapist (PT) to do progressive relaxation. The PT's treatment also included various types of physical

exercise, transcutan electrical nerve stimulation, hot/cold packs, mobilisation, stabilisation and traction. The system concentrated on instructing the patient in self treatment methods.

Health behaviour such as smoking, alcohol and medication cessation and diet was assessed and the desired change was practised under a nurse's supervision. The nurse also functioned as a co-ordinator for all the staff and collected information about the patients from the various staff members. Once a week all staff met for approximately two and a half hours to report and discuss the patients' progress. Using that information the nurse and the patient generated a structured goal setting plan following the treatment. The goal setting concerned the work situation, physical exercise and private life (e.g. domestic, marital or social situations).

In this treatment setting (treatment A) the *psychologist only assumed the role of a coach* to the rest of the staff in the applying behavioural techniques in their normal work routine. The "coaching" was performed in groups at special meetings held on a weekly basis. The meetings lasted for about two hours. Additional individual assistance was provided where required. These additional sessions were held weekly or when deemed necessary and lasted for about 30 minutes. The psychologist did not intervene directly with the patients. Calculated psychologist time used per patient in the coach setting was approximately 1 hour per patient and week which for the complete treatment package 1 gave a total of 5 hours per patient. There was no follow-up contact in this treatment design.

#### *Treatment design two (group B)*

In addition to the core treatment previously discussed, a cognitive-behaviour intervention (C-B sessions) was administered by the psychologist in a group setting. The main purpose of the C-B sessions was to increase the patient's sense of self-efficacy by teaching and practising effective pain and stress coping skills applied to the patients own life context. Examples of coping techniques taught are applied relaxation, increased behaviour activities, and cognitive distraction. Furthermore, pain behaviour and the role of secondary gains were also taught and invoked in an appraisal of each patient's pain behaviour. Behavioural changes in everyday life were prepared by means of discussions with spouses and work supervisors, initiated by the patient. Problem-solving and goal setting skills were taught and a stepwise behavioural modification plan was then written as a contract between the therapist and the patient. The contract was the parallel to the nurses' explicit plan in treatment A. The contractual behavioural changes concerned work situation, physical exercise and private life.

In this programme follow-up contacts were provided for a six-month period after treatment. Every sixth week the psychologist had telephone discussions with the patients about goal fulfillment. The C-B module followed a predetermined standardised plan (available upon request from the first author).

In Treatment B the psychologist used approximately 3 hours a week per patient plus approximately 20 minutes, five times during the follow-up. The total amount of time spent in this programme was approximately 16 hours and 40 minutes per patient.

The same clinical psychologist (a woman) was involved in both treatment models.

#### *Data-gathering procedures*

All subjects underwent a thorough standard medical examination by an orthopaedist at the start of the treatment period. Furthermore, pre- post- and 6 months after treatment all subjects were required to complete a battery of questionnaires concerning psycho-social, functional and medical issues. The measures of psycho-social and functional variables were done by a research assistant uninvolved in the treatment. The orthopaedist doing the clinical measurements was unaware of the group status of the patients and did not even know if they were subjects in the study, since all patients referred to the clinic had the same structured examination.

The analysis of the cost-effectiveness ratio of the two options studied was performed on the following basis: total cost and incremental cost were calculated using average salary of psychologist time, plus administrative overheads, social insurance and cost of space. The calculation was done on a one year basis, why no discount rate was used. All costs were calculated using the 1992 price level. Effectiveness was measured in relation to the parameters used in the clinical assessments.

#### *Assessment measures*

*Daily ratings of pain intensity and anxiety.* These parameters were recorded by the subjects for seven consecutive days. Recordings were to be done 3 times a day (morning, lunch and evening) using a 100 mm visual analogue scale (VAS) (12) with the anchors "no pain/anxiety" and "very intense pain/anxiety". The ratings were aggregated into a measure of mean intensity of pain and anxiety.

*Depression.* This factor was assessed by Beck's depression inventory (BDI) (2). Higher scores reflect greater severity of depression.

*Perceived helplessness.* The 15-item Swedish version of the Arthritis Helplessness Index (25) was slightly modified to pertain to neck- shoulder- and back pain. It required subjects to rate the extent to which they believe they can control the consequences of pain. A high score indicate a high level of perceived helplessness.

*Disability.* The Swedish version of the Stanford Health Assessment Questionnaire (28) was used where subjects were asked to rate the satisfaction in performing 12 activities of daily living. A high score indicate a low disability.

*Marital satisfaction.* A shortened and adapted version of the Index of Marital Satisfaction Scale (29) was used. A high score indicate higher degrees of satisfaction.

*Absenteeism.* Information concerning each subject's sick leave was obtained from the National Health Insurance Authority (NHIA) for a one-year period prior to the start of treatment and for a 1.5 year period after the end of treatment. As the NHIA does not record diagnosis in their database it was not possible to separate absences due to neck and shoulder pain from that due to other illnesses. The recorded absences are thus due to all types of illnesses. In Sweden all employees are covered by The National Insurance Scheme. The employer and the Insurance Authority must be notified no later than end of business on the same day the absence occurs in order for the employee to receive benefits. Consequently virtually all absenteeism is on record. Employees also have the option to be absent full or part time of the day due to a sickness. For this reason absenteeism was calculated as a normative value in which all part time and full time sick-leave was computed in to number of full days of absence.

Table II. Repeated measurement variance analysis with pre-, post-, and follow-up assessment of endpoints by group

	Treatment 1		Treatment 2		Between Group F statistics	Over Time F statistics	Group by Time F statistics
	M	S.D.	M.	S.D.			
Pain intensity							
Pre	51.6	20.6	52.2	16.8			
Post	42.4	22.7	45.0	17.2			
F.U.	48.5	23.2	45.2	13.5	0.03	3.91*	0.98
Disability#							
Pre	24.1	9.1	27.1	7.7			
Post	27.0	10.6	30.1	11.3			
F.U.	25.6	11.2	26.2	9.1	0.50	6.14**	0.41
Anxiety							
Pre	26.1	26.1	28.1	18.7			
Post	14.3	17.7	20.0	18.5			
F.U.	25.2	18.3	15.7	17.0	3.38	4.89**	0.36
Pre	9.7	5.2	9.7	6.2			
Post	6.8	5.3	7.6	5.6			
F.U.	8.9	5.5	8.4	5.3	0.04	9.59***	0.58
Helplessness							
Pre	42.0	5.8	42.2	4.9			
Post	39.5	6.5	37.6	5.2			
F.U.	42.0	6.9	39.2	5.8	2.05	15.98***	3.19*
Marital Satisf. ##							
Pre	35.6	5.1	32.8	5.4			
Post	36.6	4.4	33.1	4.8			
F.U.	35.1	6.7	33.1	4.7	3.24	0.75	1.37

\*  $p = 0.05$ , \*\*  $p = 0.01$ , \*\*\*  $p = 0.001$ .

# High values indicate low disability.

## High values indicate greater marital satisfaction.

### Statistical analysis

Analysis of variance with repeated measures was conducted to determine the treatment effect between groups over time. The results were also analysed with chi-square tests according to proportion of subjects who had improved or deteriorated between assessments.

## RESULTS

The analysis of variance with repeated measures showed significant changes over time in all parameters assessed within the two treatment groups, except in marital satisfaction (Table II). The between group analysis only revealed a significant difference in "perceived helplessness". It should be noted, though, that the standard deviations are of a considerable size, and with the limited sample size of the two groups, the differences would have had to be very large to attain significance.

<sup>1</sup> A change (i.e. improvement or deterioration), between assessments within a subject was operationally defined as a difference of plus minus 5 mm VAS for pain intensity and anxiety, or plus minus 2 scores for all other variables.

### Short-term results

Fig. 1 shows the percentage of improved and deteriorated subjects on the last day of the treatment<sup>1</sup>. On all variables measured the proportion of improved subjects were higher than those deteriorated in both groups. On average 20% of all subjects actually became worse during the treatment period. A chi-square test revealed no significant differences between the treatments, in respect to proportion of improved/deteriorated subjects.

### Long-term results

The percentage of improved and deteriorated subjects at the six-month follow up compared with pre-treatment values is shown in Fig. 2. The figure shows that the effect was still positive for the subjects' physical and psychological well-being. Although a substantial proportion of deteriorated subjects were observed, the figure also shows a tendency for treatment B to be the more beneficial treatment in proportion of improved

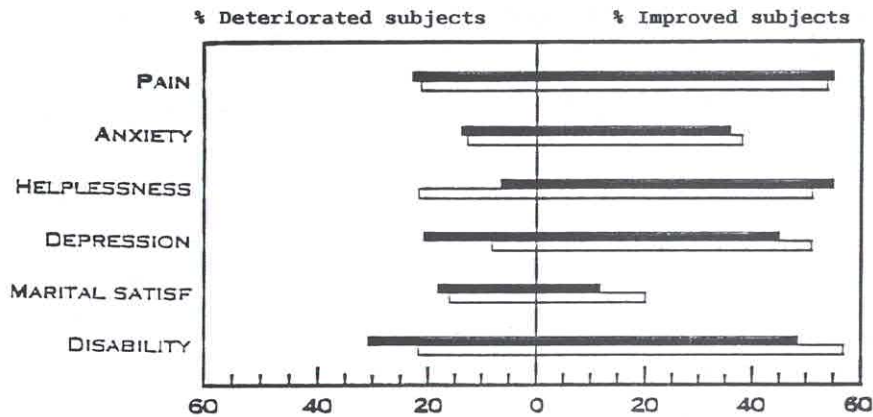


Figure 1. Proportion of improved and deteriorated subjects at last treatment day compared with pre-treatment. □ Treatment A, ■ Treatment B.

subjects on the variables "perceived helplessness", "depression" and "marital satisfaction". Chi-square analysis revealed that the only significant difference between the treatments in proportion of improved/deteriorated subjects was found in depression ( $p = 0.02$ ) with treatment A having a significantly higher proportion of deteriorated subjects than treatment B.

#### Maintenance-sustained changes

To investigate maintenance, an analysis was done of differences between post- and follow-up assessments. The differences were calculated within subjects of post- and six-month follow-up assessments. Overall, in both treatment groups the proportion of improved and stable subjects was greater than the proportion of deteriorated subjects (Table III). Chi-square analysis

did not reveal any significant differences between the treatments.

#### Absenteeism

Analysis of variance with repeated measures did not reveal any significant differences between the groups in sick-leave at either the six-month assessment ( $F = 0.05$ ,  $p = 0.822$ ) or twelve months assessment ( $F = 0.28$ ,  $p = 0.596$ ). Fig. 3 shows the mean number of days of absenteeism for each recorded six-month period. The figure illustrates that the decrease in days of sick-leave was magnified when the observation period was extended to 18 months post-treatment.

An interesting observation in the result analysis was that the statistical significance within group improvements found in all variables except "perceived

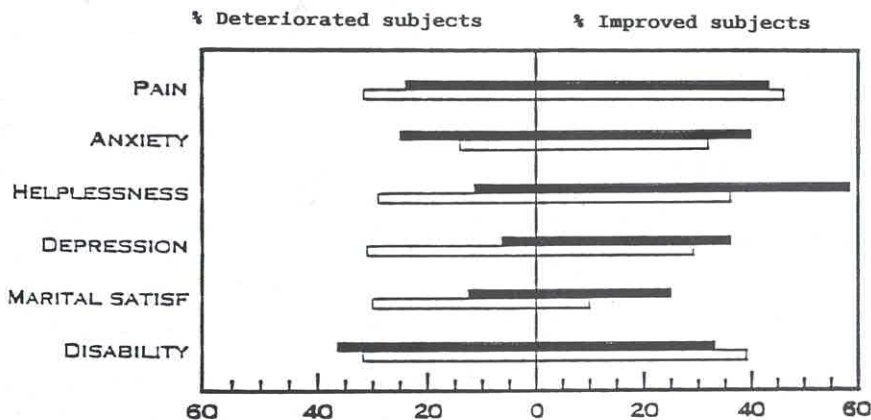


Figure 2. Proportion of improved and deteriorated subjects at six-month follow-up compared with pre-treatment. □ Treatment A, ■ Treatment B.

Table III. Proportion of subjects maintaining post treatment level at the 6-month assessment

No significant differences were found.

Treatment	% Deteriorated		% Maintained		% Improved	
	A	B	A	B	A	B
Pain	37	44	37	24	26	32
Anxiety	32	46	60	33	8	21
Disability	13	11	58	37	29	52
Depression	7	4	71	89	23	8
Helplessness	23	31	68	58	10	12
Marital Satisfaction	15	12	85	75	0	13

helplessness" seemed to be limited to the women in the study. In "perceived helplessness" there were significant improvements in the male sample but only in treatment B (psychologist contact). However, these results must be interpreted with caution as the male sample is very small.

#### Cost-effectiveness

The total cost per psychologist hour, including salary, overheads, social insurance and space, was SEK 200. The total cost per patient in treatment design A was thus SEK 1,100 and for treatment design B SEK 3,710.

Although differences were observed in the absolute number of patients who had improved and deteriorated—as measured by the variables assessed for the two treatment alternatives—no statistically significant difference could be established, except for the variable "perceived helplessness". The cost-effectiveness ratio will thus be negative for pain, anxiety, disability, depression, and marital satisfaction. It is therefore possible to conclude that treatment

alternative B is not cost-effective in this respect. The cost-effectiveness ratio of perceived helplessness is SEK 4,587 per patient with demonstrated statistical significant improvement, including all of the costs generated to achieve this.

#### DISCUSSION

This study has presented the findings of a randomised controlled trial undertaken to assess the optimal role of the clinical psychologist in multimodal cognitive behavioural interventions for the rehabilitation of patients with long-term, intractable pain of the neck and shoulder. On grounds of ethics we were not allowed to have a "no treatment" group, nor a placebo, nor a sham treatment group. Moreover, the key comparison postulated in advance was to contrast participation of a clinical psychologist as a "coach" to other health professionals in the multidisciplinary team versus the clinical psychologist administering the behavioural components of the multimodal approach directly to the patients. By most outcome criteria, both groups of patients improved and they both did so to the same extent. Even though only about 33–40% of each group showed some improvement at the six-month follow-up, it deserves to be emphasized that those patients who had been referred to the clinic may well be the more severe cases of the general pain population. Crook et al. (6, 7) showed that when compared with a general pain population, subjects referred to rehabilitation facilities experience more psycho-social distress and functional impairment. Several authors have suggested the risk of underestimating the treatment effect due to selection bias in the referral pattern (4, 33). The results further revealed that the improvements were mainly limited to the women in the study. Because of the limited

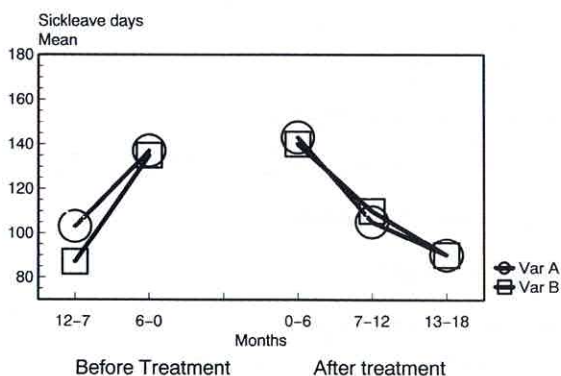


Figure 3. Mean days of sick-leave in six-month periods pre and post treatment. Sick-leave during the treatment period is not included.

sample size (men comprised about 30–40% in the two samples) caution must be taken in interpreting these findings. However, these findings are consistent with findings in a previous study performed in Sweden (15). Further analysis are necessary, however, to identify the traits of the subgroups.

The result revealed some differences between the treatments. Undergoing a more strict cognitive-behavioural therapy with a clinical psychologist (treatment B) proved to be more effective in increasing the subject's perception of control, by reducing the level of helplessness.

Studies investigating the learned helplessness concept in pain patients have shown that perceived helplessness (measured with AHI) is positively associated with non-compliance, passive coping-style, physical impairment and pain intensity and negatively associated with internal locus of control (9, 14, 25, 30, 32). Furthermore, a decreased level of perceived helplessness over time is associated with decreased passive coping and pain intensity (32). These findings demonstrate that perceived helplessness is an important factor in the rehabilitation of pain patients.

Results of this study show that perceived helplessness can be changed successfully by a thorough psychologist intervention. Pain patients suffering from a high degree of perceived helplessness might thus be a group where the more time consuming treatment alternative (Treatment B) would prove to be cost-effective. Since the study did not include any weighting of relative importance between the different variables assessed, it is not possible, from this study, to conclude whether treatment alternative B would be more cost-effective if all variables were combined in the analysis of cost-effectiveness. This remains to be demonstrated in another study, although it seems unlikely that the relative weights of the different variables would balance the relative minor, yet, statistically significant, improvements in perceived helplessness. The cost-effectiveness of treatment programme B may be quite different if it was focused on improving perceived helplessness only, and further could discriminate among patients and select those who would gain from more intensive cognitive-behavioural therapy with a clinical psychologist.

Analysis done on maintenance shows a tendency for subjects in treatment B to maintain improvements and continue to improve after treatment to a greater extent than subjects in treatment A. The subjects in the "coaching setting" (treatment A) did not have any

booster contact with the rehabilitation staff after treatment. The tendency towards higher maintenance in treatment B might thus be evidence of the importance of booster contact and not of the complete treatment setting.

The power of this study to avoid Type II errors in declaring "no difference" is limited. We do not pretend to have calculated sample sizes. They were determined entirely by the budget and other resources available. Given the expense of Multi Modal Cognitive Behavioural Treatments (MMCBT) we felt well-controlled small evaluations were preferable to widespread national implementation of programmes without any evidence of effectiveness or cost-effectiveness. Interest in multimodal and behavioural strategies is growing rapidly and implementation of various centres is imminent. This study and its predecessors strongly suggest that a pause to rethink such strategies is in order and that perhaps introduction of MMCBT type programmes elsewhere should be done in the context of large multi-centred controlled studies. That is particularly true since the benefits derived and verified in controlled studies is modest so far.

In conclusion, the results in this study suggest that both versions of the MMCBT model are effective in improving the health of neck/shoulder pain patients (as assessed by the outcome variables), with the psychologist administered group therapy setting having the significantly best effect in decreasing a helpless coping style. Furthermore, the MMCBT is effective only in subgroups. Finally, the results suggest that a treatment setting where the psychologist "coaches" the treatment staff is the most cost-effective of the two treatment options investigated.

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