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ORIGINAL ARTICLE

A survey of post-operative management for patients following first time lumbar discectomy

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Abstract This study aimed to identify current NHS physiotherapy practice following first time lumbar discectomy in the United Kingdom (UK) in order to inform future research priorities and design. Descriptive survey methodology was utilised employing a postal questionnaire. A total population sample was identified and questionnaires were posted to 87 NHS physiotherapy departments throughout the UK. Participants were senior physiotherapists working with spinal surgery patients. In the inpatient phase, the majority of patients receive physiotherapy. Management focused on mobility and education to facilitate early discharge with most patients being given exercises. However, there was a wide variation in the actual exercises prescribed. There was more variation in the provision of outpatient physiotherapy treatment. Not all patients have access to physiotherapy treatment post discharge in the UK and when treatment was available the content and amount was variable. There is evidence to support rehabilitation classes to assist early improvements in function and return to work but such classes are only available in around half of the centres involved in this study. Regarding the content of exercise classes and individual treatment sessions, a wide range of clinical practice was evident. This study raises many research questions and highlights the need for future research to optimise patient rehabilitation following first time lumbar discectomy.

Keywords Lumbar spine · Discectomy · Rehabilitation · Physiotherapy

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Introduction

There is evidence to support the clinical effectiveness of discectomy for the treatment of lumbar disc prolapse [15]. In 1995, 24,000 spinal surgical procedures were carried out in the National Health Service (NHS) [1] in the United Kingdom (UK) although the proportion of patients undergoing discectomy is not clear. It is estimated that following inter-vertebral disc surgery only 70% of patients are fit to return to work within 12 months [10]. The reason for this is unclear and it raises questions concerning the provision and content of rehabilitation post surgery.

A Cochrane review [25] concluded that there was strong evidence for early intensive exercise programmes i.e. beginning 4–6 weeks post lumbar disc surgery. Improved functional status and faster return to work were found in the short-term, but at long-term follow-up there was no difference with intensive or mild exercise programmes. However, there was a trend towards improvements in long-term outcomes with early rehabilitation [8, 9, 12]. There are no good quality

studies investigating the immediate commencement of rehabilitation [25].

It is not clear whether all patients require rehabilitation. Donceel and Du Bois [11] investigated predictors for work incapacity after disc surgery. Results indicated that use of the Oswestry disability Score, the Zung score, the patient's perception, the Social Readjustment Rating score and the Modified Somatic Perception Questionnaire identified 86% of poor and 90% of good outcomes. The proportion of UK centres currently offering rehabilitation is unknown and no outcomes for ''routine'' rehabilitation versus ''if required''.

Despite Ostelo et al. [25] recommending intensive exercise programmes post discectomy the specific types of exercises most beneficial post discectomy cannot be identified. Existing research has investigated a variety of exercises with no exercise being demonstrated as more beneficial than another.

The use of muscle stabilisation exercises (e.g. multifidus or transversus abdominis retraining) for managing low back pain has been investigated [17–19, 26] but not in the post lumbar discectomy population. There is evidence of multifidus muscle wasting following lumbar surgery [13] although only 20 patients were included in this prospective study with no functional outcomes. Gejo et al. [14] subsequently demonstrated that multifidus muscle function postoperatively was influenced by the length of muscle retraction time during surgery. Longer retraction times were associated with reduced muscle recovery, but this study was conducted in 45 rats and therefore results may not accurately reflect changes in human subjects. Rantanen et al. [28] also investigated lumbar multifidus muscle recovery in a small sample of 18 patients for 5 years post surgery. Muscle atrophy in multifidus at intraoperative biopsy was reported and this atrophy was still evident in the ''negative outcome'' group i.e. in patients with higher occupational handicap scores at 5 years post surgery. Similar results have been found on ultrasound scanning of patients with low back pain [16]. There is also research to suggest that specific retraining of the transversus abdominis and multifidus muscles may be beneficial [17–19, 26].

The concept of specific exercises to restore normal mobility to the nervous system was developed by Breig [2] and Butler [4]. Scrimshaw and Maher [30] investigated the inclusion of neural mobility exercises following spinal surgery by incorporating straight leg raise (SLR) exercises. No benefit was seen by the inclusion of these exercises with the results actually demonstrating reduced clinical outcomes for the SLR group. However, the sample combined patients following fusions, laminectomy and discectomy and results cannot be applied to those undergoing first time discectomy.

Owing to the lack of information in the literature, pathoanatomical knowledge may be used to inform management. Activities such as flexion in standing or sit ups have been demonstrated to increase disc pressures up to four times that measured in supine [23]. The effect of posture and positioning on internal disc pressures may therefore be a factor influencing re-injury in the immediate post-operative period, although it is unclear the role that increases in intradiscal pressures play in discal injury [31]. The other important factor to consider is the healing process. Stress reduction (through immobilisation or lack or weight bearing) during the healing process has been shown (in animal studies) to affect tissue healing leading to impaired tissue function [27]. Physical exercise appears to have a beneficial effect on healing tissue [7] as tension exerted on the wound is thought to stimulate collagen synthesis and ensure that collagen is laid down in an organised manner parallel to the direction of forces [7]. This suggests that the application of controlled stresses is an important part of the recovery process and should be considered when prescribing exercises post discectomy.

Carragee et al. [5, 6] carried out two uncontrolled prospective trials investigating the effect of removing post-operative restrictions following discectomy. No activity restrictions were imposed following surgery. Patients returned to work as soon as they felt able with some patients returning within 1 day following surgery. Despite this rapid return to work there was no increase in complication rates compared to previously published data.

The existing literature identifies the provision of physiotherapy and the content of physiotherapy as requiring further investigation. However, before these issues can be addressed, an understanding of current practice is required. The aim of this study was, therefore, to identify current physiotherapy practice following first time lumbar discectomy in the UK through a national survey.

Materials and methods

Descriptive survey methodology [29] was utilised. A postal questionnaire was employed to enable access to a total population sample, affording good external validity [29]. Appropriate participating centres were identified from the register of British Association of Spinal Surgeons (including Orthopaedic and Neurosurgeons). Questionnaires were posted to 87 NHS

physiotherapy departments throughout the UK between February and March 2003. The participants were senior physiotherapists working with spinal surgery patients.

The Research and Development Department of University Hospitals Birmingham Foundation NHS Trust were consulted regarding ethical approval and advised that, at that time, no formal ethical approval was required. Informed consent was gained by agreement from the participants to return the questionnaire. Participants were assured confidentiality of responses and the completed questionnaires were anonymous.

The questionnaire was developed from the key issues identified from the review of the existing literature to identify the main themes and these are summarised in Table 1. A range of both open and closed questions was included. A pilot study, (n = 10) incorporating physiotherapists in two local hospitals, enabled development of the reliability and validity of the questionnaire. Several questions were re-worded to improve clarity prior to the main study.

A high response rate was important and various strategies identified in the literature to assist the response rate were employed [24, 29]. For example covering letters were included with questionnaires, clear instructions were given, confidentiality was assured and questionnaires were printed on coloured paper. Stamped addressed envelopes were also included and reminders sent out after 3 weeks if questionnaires had not been returned.

Data were analysed using descriptive statistics. A quantitative approach to content analysis was used for analysis of the open questions in which themes were identified and the number of responses to each theme was collated.

Results

Seventy-seven out of 87 questionnaires were returned with a response rate of 89%. Two respondents were not applicable for inclusion as no lumbar surgery was carried out at their work place at the time of the study. Therefore 75 questionnaires (86% applicable response rate) were included for analysis.

Table 1 Summary of main themes from literature review

Strong evidence exists for intensive exercise programmes beginning 4–6 weeks post surgery [25]
There is a lack of studies to demonstrate any benefit of immediate post-operative physiotherapy [25]
Supportive evidence exists for no post-operative restrictions following discectomy with no detrimental effects [5, 6]
There is no consensus or evidence to guide the content of rehabilitation [25]
Straight leg raise exercises post discectomy were not recommended [30]
Multifidus wasting was noted post discectomy [13, 14, 28]

Provision of physiotherapy

Provision of post-operative inpatient physiotherapy

Seventy-four out of 75 (98.6%) respondents indicated that patients received inpatient physiotherapy with the majority being assessed the day after surgery i.e. day 1 (96%). The number of inpatient contacts ranged from one to six sessions (mean 3.15). In cases where a range of contacts was reported the maximum number of contacts was used for analysis.

Provision of outpatient physiotherapy

Outpatient physiotherapy was provided routinely in 33 centres (44% of respondents) and only ''if required'' in 35 centres (46%). Five centres (7%) never provided physiotherapy for the following reasons: lack of staff, lack of funding for this service and if the surgeons did not think physiotherapy follow-up was necessary.

Where physiotherapy was provided routinely, 91% of patients began outpatient physiotherapy by the 4th post-op week (Table 2). Fifty-three percentage of centres commenced physiotherapy in the 2–3 weeks post-op period. A different referral pattern was found in the ''non-routine'' outpatient treatment group (Table 2). The majority of centres could not specify when outpatient treatment would commence (51.5%). Reasons for this included variable timing, dependent on service provider and waiting list, dependent on the patient needs and dependent on the surgeon. However, most commonly, patients commenced treatment after 4 weeks (26.5%).

Where physiotherapy was provided ''if required'' respondents were asked to give reasons for referring for physiotherapy treatment and some respondents provided multiple answers. Five main themes emerged

Table 2 Timing of first outpatient session

Timing of 1st out patient physiotherapy session	% Routine follow-up (n = 34)	% Non-routine follow-up (n = 35)
0–4 weeks	91 (31)	8.5 (3)
4–6 weeks	0	28.5 (10)
No answer	6 (2)	11.5 (4)
Unable to specify timing	3 (1)	51.5 (18)

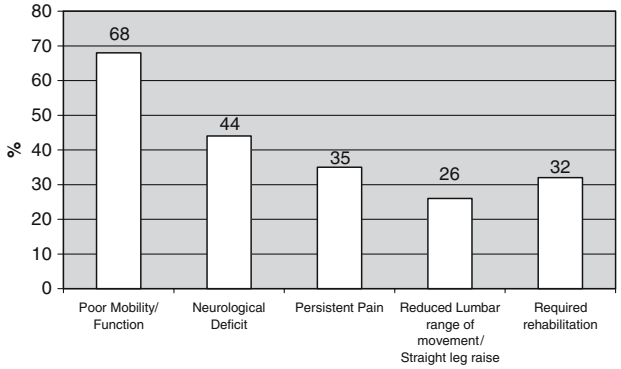

Fig. 1 Reasons for providing outpatient physiotherapy (non-routine $n = 34$)

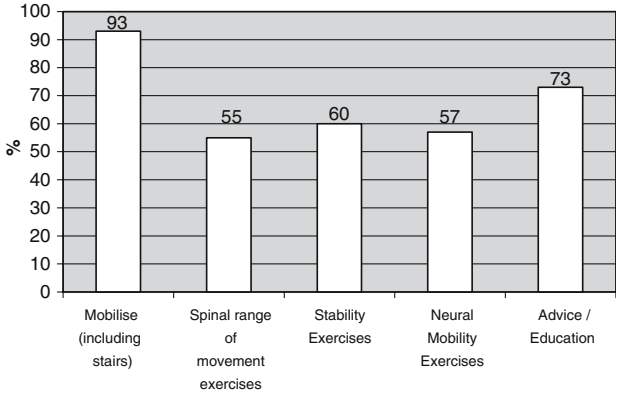

Fig. 2 Content of inpatient physiotherapy ($n = 74$)

(Fig. 1). Poor mobility and function were the main reasons. A third of respondents stated that patients were referred if they required rehabilitation. Reasons that a patient may require rehabilitation included: needing specific exercises, having difficulty with exercises, or poor compliance.

Only 46% ($n = 35$) provided information regarding number of outpatient sessions. Thirteen respondents did not answer and a further 22 were unable to estimate the number of sessions. In the responses that were given a wide range of outpatient sessions was reported (range 1–20 sessions) (Table 3). The largest proportion of patients received between five and eight sessions (mean 6.9).

Content of physiotherapy

Content of post-operative inpatient physiotherapy

Respondents were able to provide multiple answers relating to treatment priorities for inpatient physiotherapy. Five main themes emerged from the responses (Fig. 2). The most common aspect of treatment was to mobilise the patient in preparation for discharge.

Table 3 Number of outpatient physiotherapy sessions (n = 35)

Number of out-patient physiotherapy sessions	Frequency	Percentage
1–2	5	14
3–4	4	11.5
5–6	14	40
7–8	6	17
9–10	2	6
10+	4	11.5

A large variety of exercises were prescribed. The most common spinal range of movement (ROM) exercises were knee rolling ($n = 33$), pelvic tilting ($n = 32$), alternate knee/hip flexion ($n = 22$) and extension exercises ($n = 29$). The most common muscle stabilisation exercises were transversus abdominis in neutral ($n = 34$), Gluteal exercises ($n = 16$), progression of transversus abdominis ($n = 10$), non-specific core stability exercises ($n = 8$), multifidus retraining ($n = 6$) and sit ups ($n = 7$). Fifty-seven percentage of respondents included neural mobility exercises that ranged from gentle ankle movements to more aggressive SLR performed actively or passively.

Exercises were provided at varying stages during the inpatient episode. The most extreme example of variation noted was that some patients were given flexion exercises on ‘‘Day 1’’ whereas others were advised during the inpatient stay that they could begin such exercises after 6–8 weeks.

The provision of advice or education was an important part of physiotherapy management with 73% of patients given advice (written and/or verbal). Although not specifically asked, information regarding post-operative sitting restrictions was provided by some centres ($n = 37$). The majority of respondents who provided this information reported that patients were allowed to sit on day 1 or 2 ($n = 26$) which was in contrast to another respondent who reported no sitting for 2 weeks and another stated only ‘‘perch’’ sitting for 6 weeks. Four respondents indicated that sitting was dependent on advice from the consultant. The time allowed to sit also varied from ‘‘a few minutes maximum’’ to ‘‘30 minutes’’ initially. These times were increased at variable rates including 30 minutes maximum in first 6 weeks, 60 minutes maximum in first 4–6 weeks with others adopting a much more relaxed approach i.e. gradually increasing over the first 6 weeks.

Content of outpatient physiotherapy

Only 23% of respondents indicated that they had guidelines or protocols for physiotherapy outpatient follow up. The content of outpatient physiotherapy was more general than inpatient treatment and five main themes emerged (Fig. 3).

Mobility exercises were the most common intervention with the most prevalent exercises being non-specific lumbar ROM exercises ($n = 17$) and neural mobilisation exercises ($n = 16$). Almost a third of respondents stated that treatment given was dependent on the individual patient presentation (Fig. 3). Thirty-seven percent ($n = 25$) of respondents indicated that general rehabilitation was included in outpatient treatment. This incorporated progressing exercises given as an inpatient, graded functional exercises, paced increase in activity and programmes that included general fitness and strength training. Nine respondents included hydrotherapy in their answer.

Although not asked specifically, some respondents also included information and advice regarding return to work and driving. Nine out of the 21 respondents who commented on ''return to work'' indicated that this was dependent on the surgeon and ranged from 2 to 12 weeks. Most commonly, return to work was not advised before the 4th post-operative week, with heavier manual work not advocated before the 12th post-operative week. Seventeen centres provided information regarding time to recommence driving. This ranged from 2 to 12 weeks post-operatively. Some centres did not specify a time but said it was dependent on patient progress.

Only 49% (33 out of 67 respondents) indicated that patients had access to classes or group sessions. Two different types of group treatment were identified encompassing hydrotherapy ($n = 8$) or a variety of exercise/rehabilitation groups e.g. back class, back school, back fitness class, functional rehabilitation programme. The content of these classes is summarised in Table 4. General fitness training included circuit training, functional exercises and general strengthening exercises.

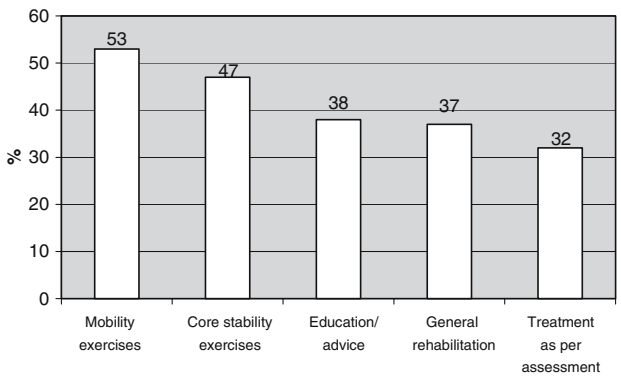

Fig. 3 Content of outpatient physiotherapy ($n = 69$)

Table 4 Content of exercise classes

Content of classes	% of respondents ($n = 33$)
Stability exercises	56 (14)
General fitness	56 (14)
Education	36 (9)
Mobility exercises	28 (7)

Discussion

The high response rate seen in this study along with the sampling strategy of a total population sample affords the study good external validity [24], suggesting generalisation of the findings to physiotherapy practice within the NHS. The high response rate also suggests an interesting subject area for physiotherapists.

Provision of physiotherapy

This survey demonstrates good agreement regarding the provision of inpatient post-operative physiotherapy but variation regarding provision of outpatient physiotherapy and suggests that outpatient physiotherapy may not be necessary for all patients. Five main reasons were identified for providing physiotherapy in the non-routine group i.e. poor mobility/function, neurological deficit, persistent pain, reduced ROM and patients requiring rehabilitation. In terms of identifying patients that require rehabilitation, Donceel and Du Bois [11] investigated indicators of poor outcome (i.e. work incapacity) which included the patient's estimation of pain, the patient's prediction of his possibilities for returning to work and high Oswestry Disability Index scores. Reasons given in this questionnaire for referral to physiotherapy did not include psychosocial factors despite consensus in the literature that psychosocial factors such as anxiety and depression can help identify those more ''at risk'' of chronicity [21]. Donceel and Du Bois [11] suggest that such measures as the Oswestry Disability Index and the Zung Depression Scale could be a useful way of identifying patients at risk of poor outcome to inform a clinician's decision making.

Agreement existed that inpatient physiotherapy was provided in the majority of cases. However, there was

variation in the number of inpatient sessions (1–6). External factors may have influenced this variation including the length of stay or surgeon's preference. In the outpatient group there was an even greater range (1–20) suggesting variation in patient management in the UK. There was also more variation in time to commence treatment in the outpatient group. In the inpatient group the majority of centres provided physiotherapy day one post operation. Generally it was found that those receiving outpatient physiotherapy ''routinely'' commenced treatment earlier than those receiving ''non-routine follow-up''. It is unclear whether a delay in beginning treatment affects outcome.

The content of physiotherapy

Some agreement was found regarding the content of inpatient treatment with more variation in the outpatient phase. Although there is a lack of research to support the content of inpatient early rehabilitation, consistent themes were identified. These themes suggest that the overall objective was to facilitate discharge with 93% of centres ensuring that patients were able to mobilise. Similar types of exercises were continued from the inpatient to outpatient phase although a different emphasis emerged. For example, spinal range of motion exercises were less common in the outpatient phase (25% centres) compared to the inpatient phase (55%). Variation in the type and timing of commencing an exercise was also evident, reflecting the findings of previous studies. For example, Kjellby-Wendt and Styf [20] started intervention day 1 post-operatively, compared to other programmes starting at 4–6 weeks post-operatively [3, 8, 9, 12, 22].

Some centres adopted a more conservative approach regarding exercise selection. Flexion has been shown to increase pressure on the posterior portion of the disc [23] and flexion exercises were introduced very early in the rehabilitation programme by one third of respondents (i.e. pelvic tilting) but introduced much later by others. Similarly, sitting is associated with increased pressure within the disc [23] and some respondents indicated sitting was allowed immediately post surgery while others advised a delay. Theoretically these movements or positions may increase the risk of complications post-operatively, however, Carragee et al. [5, 6] removed all post-operative restrictions and found no increase in complication rates. Therefore, from a healing perspective, the inclusion of mobility exercises or postures that stress the disc in both the in and outpatient stages of rehabilitation would seem appropriate to ensure that, as the collagen fibrils are laid down to repair the wound, movement occurs in the area maintaining flexibility as these fibrils begin to contract [27].

Stabilisation exercises were frequently included in both phases of rehabilitation (60% inpatient phase and 47% outpatient phase). There is a theoretical basis to support the inclusion of specific trunk stabilisation exercises such as transversus abdominis and multifidus retraining for patients with certain types of back pain [16–19, 26] but this has not been validated in the post-surgical patient group. Transversus abdominis exercises were the most frequently described exercise but a small proportion of participants ($n = 6$) specifically stated that multifidus retraining was included in the inpatient phase. Considering the surgical procedure, it may be postulated that targeting this muscle would be beneficial to recovery especially as there is evidence of multifidus muscle wasting following lumbar surgery [13, 14]. Rantanen et al. [28] also found that 5 years after surgery all patients showed increases in Type 1 muscle fibre diameter compared to intraoperative biopsy but increases in Type 2 fibre diameter were found only in those who had made good recovery. Much of the multifidus retraining commonly used by physiotherapists targets Type 1 muscle retraining i.e. tonic muscle recruitment. However, considering Rantanen's conclusions, it could be postulated that specific multifidus training including phasic Type 2 muscle strengthening exercises may be beneficial although this has yet to be demonstrated.

Neural mobilisation exercises were more likely to be included in the inpatient than outpatient phase of rehabilitation (57% of respondents versus 23%, respectively). There is little support for their use in the literature [30] and this is an area requiring further research.

Advice and education is a vital role for physiotherapists in the inpatient and outpatient phase. It is interesting that results showed only 73% included advice and education as part of inpatient treatment and 38% as part of outpatient care. It may be that physiotherapists fail to see advice and education as an intervention in itself. This may indicate that physiotherapists underestimate their role as advisor and educator. There were wide variations in the advice given to these patients (regarding time/advice to sit, return to driving and return to work) and this calls into question the need for restricting activities in the post-operative period. Centres that impose greater restrictions may actually be encouraging unhelpful illness behaviour in patients that could contribute to ongoing disability.

One of the main differences to emerge between the content of treatment when comparing the inpatient and outpatient phases was the issue of clinical

reasoning. Thirty-two percentage of respondents did not provide details of outpatient treatment indicating that treatment depended on the clinical assessment of each patient. This was not mentioned in the inpatient section and perhaps this is because there is a more common goal of facilitating discharge. In the outpatient phase the goals of treatment may differ much more widely amongst patients with perhaps more variation in their clinical presentation during this phase. It is of interest that clinical reasoning was specifically mentioned as it highlights the strong emphasis placed on decision making by the professional that ensures treatment is decided on an individual basis.

A question was included specifically to explore the use of exercise classes as there is supportive evidence that intensive exercise programmes beginning 4–6 weeks post surgery improves clinical outcomes [25]. Approximately half of centres offered some form of exercise classes suggesting considerable variation in provision of rehabilitation. Although most classes began 4–6 weeks post surgery there was also variation in the content of the classes. Hydrotherapy classes were provided at a small number of centres and this highlights another area where there is no research to guide practice.

The aim of this study was to identify current clinical practice to facilitate research design and it has raised pertinent research questions. There are suggestions in the literature that not all patients require outpatient physiotherapy and this needs to be explored further. Issues around timing, the number of sessions and content of physiotherapy treatment also needs to be considered. These factors would ideally be addressed through a randomised controlled trial. The screening of patients to identify those at risk of poor outcome and who would potentially benefit from Physiotherapy treatment could also be incorporated into such a trial. This would aid decision making by both surgeons and physiotherapists regarding the need to refer for outpatient physiotherapy treatment.

Conclusion

The study provides an overview of current practice regarding post-operative Physiotherapy management of patients following discectomy in the UK. The findings identified discrepancies in the services provided for patients and highlighted that current research is not always reflected in the treatment provided.

In the inpatient phase, the majority of patients receive physiotherapy but the amount of physiotherapy treatment was variable. There was some consensus as patient management focused on mobility and education to facilitate early discharge. However, patients were given a wide range of exercises to continue on discharge.

There was variation in outpatient follow up physiotherapy. Not all patients had access to treatment despite there being evidence to support rehabilitation classes to assist early improvements in function and return to work. Such classes were only available in around half of the centres involved in this study. When individual treatment was available, the content and amount (i.e. number of sessions) was variable indicating further discrepancies in treatment provision. The content of individual treatment was variable and was largely based on the individual patient's presentation. However, the review of the literature shows limited research upon which to base treatment decisions. Further studies are required to identify optimal content of treatment.

This study has identified key issues that will inform the design of a future clinical trial exploring the efficacy of post-operative physiotherapy.

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