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Effect of the implementation of clinical guidelines for knee replacement surgery on hospitalization time

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KEYWORDS
Clinical guidelines;
Total knee prosthesis;
Length of hospital stay

Abstract
Purpose: To analyze the efficacy of implementing clinical guidelines for knee prosthetic surgery as a tool to reduce length of hospitalization.
Materials and methods: A retrospective study was carried out of 464 patients subjected to total knee replacement. Four patient groups were established. An active group (AG), where patients were operated used the clinical guidelines, and 3 control groups: one made up of patients operated by the same surgeon as the AG before he started using the guidelines (PCG) and two groups of patients operated by other surgeons that did not use the clinical guidelines before or after its introduction (PNCG and NCG, respectively). The following factors were analyzed in each group: demographic data, Charlston's comorbidity index, preoperative, post-operative and total length of stay, number of blood bags transfused, destination upon discharge, readmission within 30 days and complications.
Results: No differences were observed in terms of demographic data, comorbidity, blood transfusion requirements or destination upon discharge between the 4 groups. The AG group had a shorter total and postoperative length of stay than the other groups; these lengths of stay were also shorter in PNCG than in the PCG group. These differences were statistically significant. No differences were found between groups PNCG and NCG. There was a higher rate of complications in groups PNCG and NCG.
Conclusion: Implementation of clinical guidelines for prosthetic knee surgery is na useful tool to reduce mean length of hospital stay without increasing complications.

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PALABRAS CLAVE
Vía clínica;
Prótesis total
de rodilla;
Tiempo de ingreso

Efecto de la implantación de una vía clínica de cirugía protésica de rodilla en el tiempo de ingreso

Resumen
Objetivo: Comprobar la eficacia de la implantación de una vía clínica de prótesis total de rodilla (PTR) como herramienta para reducir el tiempo de ingreso.
Material y método: Se realizó un estudio retrospectivo de casos y controles en 464 sujetos intervenidos de PTR. Se compararon 4 grupos de sujetos. Un grupo de estudio denominado grupo GC, que utilizó la vía clínica, y 3 grupos control: un grupo de sujetos intervenidos por el mismo cirujano del grupo GC antes de que utilizara la vía clínica, denominado grupo PGC, y 2 grupos de sujetos intervenidos por otros cirujanos que no usaron la vía clínica, antes y durante su aplicación, denominados grupos PNGC y NGC, respectivamente. En cada grupo se analizaron datos demográficos, índice de comorbilidad de Charlson, tiempo de ingreso preoperatorio, postoperatorio y total, bolsas de sangre transfundidas, destino al alta, reingreso antes de los 30 días y complicaciones.
Resultados: No se apreciaron diferencias demográficas, de comorbilidad, en el porcentaje de transfusión sanguínea ni en el destino al alta entre los grupos. El grupo GC presentó un tiempo medio de ingreso total y postoperatorio inferior al resto de los grupos y el grupo PNGC presentó un tiempo medio de ingreso total y postoperatorio inferior al grupo PGC, diferencias estadísticamente significativas. No hubo diferencias entre los grupos PNGC y NGC. Se presentó un mayor número de complicaciones en los grupos PNGC y NGC.
Conclusión: La implantación de una vía clínica para el proceso de PTR es una herramienta útil para reducir el tiempo de ingreso medio sin aumentar las complicaciones.

Introduction

Total knee replacement (TKR) is an expensive surgical procedure. As it affords excellent functional results in the treatment of destructive painful knee conditions, its use has become more and more frequent in the last few years.

Avoiding increases in the waiting-lists and the costs associated to this procedure has long been a concern in the Spanish healthcare system. The first way of achieving this goal would be to reduce the number of patients subjected to this operation either by limiting access to TKR (a socially unacceptable measure) or by optimizing patient selection by means of scientifically effective tests. The second option would be to increase levels of activity or of productivity and control costs without jeopardizing quality.

Reductions in length of hospital stay decreases the amount of services rendered to the patients thereby decreasing costs and increasing patient turn-over; all of this may lead to an increase in the number of surgical procedures and in the ratios of productivity almost without changing staffing levels. Nonetheless, increase in the number of procedures carried out in a period of time increases the global expenditure over that period.

Clinical guidelines are a set of principles and recommendations drawn up to improve clinical efficacy, cost-effectiveness and quality of care of patients in specific clinical situations from initial diagnosis to hospital discharge. Implementation of clinical guidelines has shown itself to be effective in controlling costs and in improving healthcare quality since it standardizes materials, surgical technique, length of hospital stay, nursing care and rehabilitation before, during and after admission[1-6]. Clinical guidelines may also be useful to establish criteria for waiting-list management.

The present study was designed in order to assess the usefulness of implementing clinical guidelines for TKR as a Management tool aimed at reducing length of hospital stay without interfering with the quality of care provided to the patient.

Material and methods

A set of clinical guidelines for TKR surgery were developed and implemented at the Bellvitge University Hospital in January 2002. The guidelines were proposed by a multidisciplinary group (orthopedic surgeons from the Knee Unit, nursing staff, rehabilitators and physical therapists) and approved by the hospital management.

The guidelines defined a pathway that started when the patient was admitted into hospital. Once they were operated, they were kept for a few hours in the recovery unit and then transferred to the ward, where their hospitalization continued (Annex 1). The aim of the guidelines was to systematize and improve nursing and physical therapy care from patient admission to discharge 7 days later.

The impact of these guidelines was evaluated in 464 patients subjected to unilateral TKR unilateral (code 81.54), from January 2000 to June 2003. The surgical procedure was carried out in subjects diagnosed with the following: unspecific localized (primary or secondary) arthritis in a

limb (code 715.36), localized secondary arthritis in a limb (code 715.26), rheumatoid arthritis or rheumatic atrophic polyarthritis (code 714.0) and aseptic necrosis of the medial femoral condyle (code 733.43). The data were extracted from the hospital discharge data base.

Subjects were divided into 4 groups: one study group and 3 control groups. The study group, where the guidelines were implemented, was called GC Group and was made up of 47 subjects operated consecutively by a single surgeon (between January 2002 and June 2003). The first control group (no guidelines applied), called NGC Group, was made up of 177 subjects operated consecutively by surgeons not using the guidelines at the same time as the guidelines were implemented in the GC group. The second control group (previous to implementation of the guidelines) was called PGC group and was made up of 37 subjects operated consecutively by the same surgeon as the study group (GC group) prior to implementation of the guidelines (between January 2000 and December 2001). The last control group (previous to implementation of the guidelines) was called PNGC group and was made up of 203 subjects operated consecutively by other surgeons over this same period prior to implementation of the guidelines (between January 2000 and December 2001).

The study group (GC group) was compared to the control group (NGC) to analyze the differences created by introduction of the guidelines. Control groups previous to introduction of the guidelines (PGC and PNGC groups) were compared with each other to analyze any spontaneous differences between them prior to implementation of the guidelines; these previous groups were also compared to the situation following introduction of the guidelines. Moreover, the GC group was compared to the PGC group to analyze the impact of the guidelines on the subjects operated by the same surgeon. Finally, the NGC control group was compared to the PNGC group to analyze the spontaneous evolutional trend of subjects that were not controlled by means of the guidelines.

The following epidemiologic and demographic data were recorded for all groups: age, gender, diagnostic and associated conditions (reflected in Charlson's weighted index of comorbidity); these parameters were analyze in order to ascertain whether the groups were comparable to one another.

All subjects were operated with a similar surgical technique: a middle longitudinal approach, longitudinal section of the quadriceps and internal anatomy. The prosthesis implanted was in all cases a posterostabilized model in groups GC and PGC, and either a posterostabilized or a PCL-retaining prosthesis in groups NGC y PNGC (this difference is base don surgeon preference).

The impact of the clinical guidelines was evaluated by considering preoperative, postoperative and total hospitalization time for each group. Quality control was carried out by determining the number of blood bags transfused, destination on discharge, number of subjects readmitted within 30 days from discharge and complications in each Group during the first year. All the information was obtained from the hospital data base.

Comparative statistical analysis between the different groups was carried out by means of a variance analysis test for qualitative and continuous variables and through the χ^2 test for qualitative variables; a p value <0.05 was taken as statistically significant.

Results

Epidemiological data (table 1)

There were no age, gender or diagnosis related differences between the different groups. Mean age was 71,89±6,90 years for the PGC group (75.7%were females), 72.25±8.09 years for the PNGC group (74.4%were females), 71.72±8.78 years for the GC group (78.7%were females) and 72.22±7.49 years for the NGC group (73.4%were females). The most usual diagnosis was primary unspecific localized arthritis (from 91.5 to 95%of cases) (code 715.36).

In the PNGC group there was a significantly lower percentage of subjects with associated diseases than in the PGC and NGC groups as well as a lower Charlson index of comorbidity in a higher percentage of subjects. The remaining groups did not present with significant differences regarding comorbidity.

Length of hospital stay (table 2)

A. Differences between surgeons before and after application of the clinical guidelines. After implementation of the clinical guidelines, a significant decrease was observed (2.57±0.46 days) in the total length of hospital stay of the GC group (10.40±2.21) as compared with the NGC group (12,97±4,36). There were no significant differences in preoperative length of stay, although these periods tended to be shorter in the GC group (0.96±0.2) vis-à-vis the NGC group (1.11±1.83). There was a decrease of 2.43±0.44 days in the preoperative length of stay of the GC group (9.43±2.17) as compared to the NGC group (11.86±3.99).Before application of the clinical guidelines, differences were in the opposite direction: there was a significant difference (2±0.74 days) in total length of stay of the PNGC group (12.81±7.22) with respect to the PGC group (14.81±3.29). There were no significant differences in preoperative length of stay, whereas postoperative length of stay was 2.08±0.50 days shorter in the PNGC group (11.54±5.57) than in the PGC group (13.62±2.70).
B. Differences for the same surgeon before and after implementation of the clinical guidelines. Surgeon studied (groups GC y PGC): a significant decrease was observed (4.41±0.60 days) in total length of stay in the GC group (10.40±2.21) with respect to the PGC group (14.81±3.29). Although there was a slight trend towards shorter preoperative stays (–0.23±0,62), most of this reduction was achieved at the expense of shortening postoperative hospitalization by 4.20±0.53 days (from 13.62±2.70 to 9.43±2.17).

Control group surgeons (NGC and PNGC groups): no significant differences were observed between the total number of days in hospital in the PNGC (12.81±7.22) and NGC (12.97±2.21) groups. Nor were any significant

Table 1 Epidemiological data for the groups

	Prior to clinical guidelines (2000–2001)		Following clinical guidelines (2002–2003)	
Groups	PGC, n (%)	PNGC, n (%)	GC, n (%)	NGC, n (%)
Diagnosis				
Code 715.36	34 (91.9)	190 (93.6)	43 (91.5)	168 (95)
Code 715.26	1 (2.7)	7 (3.4)	3 (6.4)	5 (2.8)
Code 714.0	2 (5.4)	5 (2.5)		1 (0.6)
Code 733.43		1 (0.5)	1 (2.1)	3 (1.7)
Charlson's weighted index of comorbidity (%)				
0	75.7	85.7	72.3	68.4
1	16.2	12.3	23.4	25.4
2	5.4	1.0	4.3	5.6
3	2.7	1.0		0.6
EA				
Sin EA	5 (13.5)	90 (44.3)[a,b]	2 (4.3)	13 (7.3)
1-3 Ads	22 (59.5)	96 (47.3)[a,b]	29 (61.7)	117 (66.1)
≥4 Ads	10 (27)	17 (8.4)[a,b]	16 (34)	47 (26.6)

ADs: associated diseases; GC: study group that used the clinical guidelines; NGC: first control group without clinical guidelines; PGC: second control group prior ro clinical guidelines, same surgeon as in the study group using the clinical guidelines; PNGC: last control group prior to clinical guidelines, same surgeons as in the first control group without clinical guidelines. Diagnoses: code 715.36: localized unspecific (primary or secondary) arthritis in the limb. Code 715.26: localized secondary arthritis in the limb. Code 714.0: rheumatoid arthritis, rheumatic atrophic polyarthritis. Code 733.43: aseptic necrosis in the medial femoral condyle. Charlson's weighted index of comorbidity from lower (0) to higher (3) comorbidity.

[a] $p<0.05$ between PNGC and NGC groups, prior and followijng implementation of guidelines.

[b] $p<0.05$ between PGC and PNGC groups, prior to implementation of guidelines.

Table 2 Preoperative, postoperative and overall length of hospital stay (days±standard deviation)

	Prior to clinical guidelines		Following clinical guidelines	
Groups	PGC	PNGC	GC	NGC
Preoperative length of stay (days)	1.19±1.33	1.28±2.38	0.96±0.2	1.11±1.83
Postoperative length of stay (days)	13.62±2.70	11.54±5.57[b]	9.43±2.17[a,c]	11.86±3.99
Total length of stay (days)	14.81±3.29	12.81±7.22	10.40±2.21[a,c]	12.97±4.36

GC: study group that used clinical guidelines; NGC: first control group without clinical guidelines; PGC: second control group prior to implementation of clinical guidelines, same surgeon as in the study group; PNGC: last control group prior to implementation of clinical guidelines, same surgeons as the first control group.

[a] $p<0.05$ between the PGC and GC groups, prior to and following implementation of clinical guidelines.

[b] $p<0.05$ between the PGC and PNGC groups, prior to clinical guidelines.

[c] $p<0.05$ between the GC and NGC groups, following clinical guidelines.

differences found between these groups in terms of preoperative and postoperative days in hospital.

Blood transfusion, complications, destination on discharge and readmissions within 30 days

Between 42.6 and 56.7% of cases did not require a blood transfusion and no significant differences were observed between the groups as regards the number of blood bags transfused (table 3).

Twelve subjects developed surgery-related complications (6 subjects in the PNGC and 6 in the NGC group). The most frequent complication was hematoma or sero-hematic drainage through the wound in 2 subjects in the PNGC Group and in 4 subjects in the NGC group. In the PNGC and NGC groups, one instance of each of the following complications was diagnosed: wound dehiscence, pneumonia, pulmonary embolism, cardiopulmonary arrest and deep venous thrombosis. No complications were observed in the PGC and GC groups.

On discharge, 100% of subjects in the PGC group, 99.5% of subjects in the PNGC group, 97.9% of subjects in the GC

Table 3 Blood transfusion, complications, status on discharge and readmission within 30 days

	Pre clinical guidelines		Post clinical guidelines	
Groups	PGC	PNGC	GC	NGC
Blood transfusion (n. bags)	%	%	%	%
0 bags	48.6	56.7	42.6	55.4
1 bag	5.4	4.4	8.5	3.2
2 bags	24.3	29.1	29.8	31.1
3 bags	16.2	5.4	14.9	6.2
4 bags		3	2.1	2.8
5 bags	5.4	1	2.1	
>6 bags		0.5		1.2
Complications	n.	n°	n.	n.
Suture dehiscence		1		1
Hemorrhage. hematoma or seroma		2		4
Wound infection		1		1
Pneumonia		1		1
Pulmonary embolism		1		1
Cardiopulmonary arrest		1		1
DVT		1		1
Total patients	0	6	0	6
Destination on discharge	%(n.)	%(n.)	%(n.)	%(n.)
Home	100 (37)	99.5 (202)	97.9 (46)	98.9 (175)
Acute patient facility		0.5 (1)		0.6 (1)
Medium-long stay facility			2.1 (1)	
Assisted facility				0.6 (1)
Readmission within 30 days	2	2	0	4

GC group: study group. post clinical guidelines. NGC group: control group. post clinical guidelines. PGC group: control group pre clinical guidelines. same surgeon as GC group. PNGC group: control group pre clinical guidelines. same surgeons as NGC group.

group and 98.9% of subjects in the NGC group were sent home. Taking the PNGC, GC and NGC groups together, one subject was sent ton acute patient facility, another one to a medium and long-stay facility and another to an assisted facility.

Two subjects in the PNGC group, 2 in the PGC group and 4 in the NGC group had to be readmitted within 30 days from discharge for surgery-related problems.

Discussion

TKR has become an extremely popular surgical procedure because of its effectiveness in relieving pain, correcting deformities and improving function in subjects with degenerative or inflammatory diseases that can destroy the knee. This had led to an increased demand for this type of surgery and to a huge increment in the number of procedures performed.

A total of 7.327 primary and revision TKRs were implanted in Catalonia in 2002, a sharp increase in this type of surgeries with respect to the last few years. Adding up the figures for public and private hospitals In the city of Barcelona for the period 1998-2002 reveals an 81.8% increase in the number of primary TKRs implanted: the figure went from 1,212 TKRs in 1998 to 2.004 TKRs in 2002. Likewise, the number of revisions carried out went up by 132% the figure of 75 revisions in 1998 rose to 174 revisions in 2002. Similarly, in the Bellvitge University Hospital the number of TKRs implanted from 1999 (99 TKRs) to 2003 (203 TKRs) increased by 51%

This increased activity, however, has not resulted in a reduction of waiting-lists. On the contrary, waiting-lists have tended to increase. At 30 June 2003, the total number of subjects on a surgical waiting-list in Catalonia was 7,599. 23.4% of these (1,781 subjects) corresponded to the Costa de Ponent region. 43.4% of subjects on the Costa de Ponent waiting-lists (773 subjects) was included in the Bellvitge University Hospital waiting list, which represents a 46% increase in the hospital's waiting-list with respect to 1999 (417 subjects).

It has been claimed that improved productivity reduces waiting times but increases the number of subjects on waiting-lists, since the more efficient the system becomes the more people demand the services in question[7]. Longer waiting-lists are probably due not only to this factor but also to others, such as progressive ageing of the population, which increases the prevalence of knee injury, and the increased indication of this procedure at the expense of others characterized by less predictable results (such as osteotomy).

Among the initiatives aimed at improving efficiencies in the management of waiting lists and reducing the costs inherent in them, there is the possibility of reducing

patients' length of hospital stay. It has been shown that it is possible to control length of stay by using clinical guidelines[1-6]. The Bellvitge University Hospital set about standardizing the TKR process by implementing a set of clinical guidelines. This decision was first implemented in January 2002, when the goals of improving patient security and care standards, of controlling costs and of reducing waiting-lists were established. One of the goals was to reduce patient length of stay, which entailed using fewer resources and services, thereby decreasing the cost per procedure and making more beds available without making any structural changes. The greater availability of beds, coupled with an evening prosthetic surgery program (to make a more effective use of operating theaters) would allow an increase in the number of surgeries and a reduction in waiting-lists[1].

The epidemiological data in this series show a typical (predominantly female) population of a mean age over 70 years, with a prevalent diagnosis of unspecific (primary or secondary) arthritis and a degree of complexity determined by the related diseases, comparable between the different groups and with other series devoted to the same process[1,2,5].

The present study, in line with others in the literature[1-6], shows that clinical guidelines are a useful tool to reduce hospitalization time of subjects implanted a TKR. A direct consequence of this reduction is the decrease in per-procedure costs and the increase in bed utilization rates. All of this allows more admissions and more operations and, as a result, diminishes waiting times and the number of subjects on waiting lists. Application of clinical guidelines reduced length of hospital stay with respect to the control group and made it possible to reverse the difference in length of stay between the groups before and after implementation of the clinical guidelines. The unalteredness of length of stay between control groups before and after implementation of the clinical guidelines shows that the changes observed are the result of applying the clinical guidelines rather than of a spontaneous evolution toward improvement caused by new developments in services, materials or techniques[3,8]. The degree of bias in the results attributable to the nursing staff was minimal since the nursing personnel was the same for all subjects.

The higher percentage of subjects without associated diseases in the PNGC group (as compared with those in the PGC and NGC groups) could explain why these subjects had a shorter mean length of stay since as these cases were less complex their hospital stay would be shorter[9,10]. Likewise, the greater complexity of subjects in the GC group with respect to the PNGC group strengthens the contention that the shorter length of hospital stay is due to implementation of the clinical guidelines.

It should be made clear that the majority of our subjects is sent home on discharge; this is something that has remained unclear in most of the available studies[1,3]. In other hospitals, hospitalization times have been reduced by referring patients to rehabilitation centers[5]. This policy involves a transfer of the economic cost: it saves the hospital money but a new expense is generated, which is generally defrayed by the same service provider. Nevertheless, this may be a useful policy to increase bed utilization rates.

The mean reduction in hospitalization time following application of the clinical guidelines is close to the 30% of other series[3]. Mean length of stay in the study group (GC) (10.40±2.21 days) is higher than that reported by other series published in the literature (mean: 5.75 days[3]). If it is compared with other facilities in the same area over the same period, it beats the length of stay for hospitals in the Barcelona Public Hospital Network (XHUPB) (12.40 days), it is similar for the Catalonia average (10.80 days) and it is slightly higher than the figure for private hospitals in Barcelona (9.04 days). Mean length of stay of control groups (NGC, PNGC y PGC) is comparable to the mean length of stay of the XHUPB hospitals. The mean length of stay prescribed by the clinical guidelines (7 days) was not achieved, probably due to the small number of subjects included in the sample of the GC group (any individual deviation has a huge repercussion on the final average).

Shortening hospitalization and rehabilitation times could promote a reduction in Joint mobility in the initial treatment phases[11], but the majority of studies show that the incidence of complications is either equal or lower[1,3]. In the group using the clinical guidelines there was no increase in the percentage of blood transfusion and the incidence of complications was lower than in the PNGC and NGC groups (the results for these groups show percentages similar to those in the literature). In order to ascertain that these clinical guidelines fulfilled their purpose, it is necessary to show that, in addition to reducing hospitalization time and not increasing complications, they yield similar[3,5] or better[1] clinical results; that part of the study is still pending.

At a time when orthopedic surgeons will more and more frequently be required to participate in cost control programs, they need to be aware that patient care and clinical results must be a priority for any physician. One of the main ethical duties of a medical doctor is to safeguard their patients' interests, especially in a context of economic difficulties and evaluate clinical guidelines to determine their efficacy[8]. It may be feasible to reduce hospitalization times in the short term with the use of tools like clinical guidelines without damaging the standards of care provided.

Conflict of interests

The authors have not received any financial support in the preparation of this article. Nor have they signed any agreement entitling them to receive benefits or fees from any commercial entity. Furthermore, no commercial entity has paid or will pay any sum to any foundation, educational institution or other non-profit-making organization to which they may be affiliated.

Annex 1

Total knee replacement (clinical guidelines) (Annex).

Annex

Procedure	A+P	0-24 h**	2nd day	3rd day	4th day	5th day	6th day	7th day
Nursing care								
Admission interview								
Review of documentation								
1. Check compliance pre-op protocol								
2. Confirm blood reservation								
3. Prothrombin time (if patient was on dicumarinics)								
Pre-op protocol								
1. Shower								
2. Shaving surgical area (1 h before SP)								
Control of:								
1. Vital signs (every 8 h)								
2. Neurovascular function of LL								
3. Venous line								
4. Drains								
5. Surgical dressings								
6. Diuresis								
7. Feces								
8. Liquid intake								
9. Knee immobilizer								
10. Pain (VAS)								
Hygiene								
Heparin introduced in venous line								
Withdraw bladder catheter								
Remove IV line								
Remove Redovac								
Dress wound								
Assess family support; call SW								
Check hemogram at 6 and 18 h from surgery								
Prevention of								
1. Pressure lesions								
2. Falls from bed (bed rails)								

Annex *(continued)*

Procedure	A+P	0-24 h**	2nd day	3rd day	4th day	5th day	6th day	7th day
Nursing care								
1. Mobilization in bed		■						
2. LL. mobilization		■						
3. Getting out of bed			■					
4. Sitting correctly			■					
5. Assessment and healing of surgical wound						■	■	■
6. Heparin administration						■	■	■
Delivery of documents to patient								■
Making sure patients understands instructions								■
Diet								
String fasting (6 h pre-op)	■							
Progressive, as tolerated (from 6th h post-op)		■						
Normal			■	■	■	■	■	■
Medication								
Usual patient medication	■	■	■	■	■	■	■	■
Anxiolytic	■							
Fluid therapy		■						
Discontinue fluid-therapy (if food intake is tolerated)			■					
IV analgesia, according to protocol		■	■	■	■	■	■	■
Prophylaxis for thromboembolism		■	■	■	■	■	■	■
Gastric prophylaxis		■	■	■	■	■	■	■
Cryotherapy (every 8 h)			■	■	■	■	■	■
Laxative (if constipated)			■	■	■	■	■	■
Oral iron (on empty stomach)			■	■	■	■	■	■
Activity								
Instructions on movements in bed	■							
Instructions on respiratory physical therapy	■							
Bed-rest		■						
Minimize risk of sustaining a fall		■						
Mobilizations		■						
Sitting			■	■	■	■	■	■

Annex *(continued)*

Procedure	A+P	0-24 h**	2nd day	3rd day	4th day	5th day	6th day	7th day
Physical therapist								
1. Respiratory physical therapy								
2. Isometric exercises								
3. Passive mobilization								
4. Active mobilization								
Ambulation								
Progressive weightbearing								
Total weightbearing								
Stair climbing								
Programming seen at rehabilitation								
Make sure patient understands instructions								

A+P: admission + pre-op period; LL: lower limbs; SW: social worker; VAS: visual analog scale; SP: surgical procedure.

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