Acta Orthop. Belg., 2020, **86**, 580-587

ORIGINAL STUDY

Introduction of the orthogeriatric co-management model increases the quality of care : a pilot study

Siddhartha Lieten, Karen Pien, Sven Van Laere, Bert Bravenboer, Thierry Scheerlinck

From the Universitair Ziekenhuis Brussel, Laarbeeklaan 101, 1090 Brussels, Belgium

Traditionally, geriatric patients with musculoskeletal or osteoarticular problems will be admitted to an orthopedic ward and will be treated by surgeons. However, these patients often suffer from comorbidities requiring geriatric management. In this study, the orthogeriatric co-management (OG-CM) model is compared to traditional orthopedic care model in a retrospective pilot study.

In this study, two patients groups were compared during two similar time periods : (1) Group 1 consisted of 119 geriatric patients admitted to an orthopedic (trauma) ward who were treated, with conventional geriatric care on demand (before OG-CM ; October 1-December 31, 2013) and (2) Group 2 consisted of 132 geriatric patients who were admitted after the implementation of the OG-CM model (after OG-CM ; October 1-December 31, 2014). Outcomes measured were : quality of care outcome, mortality and costs.

After the introduction of OG-CM, the number of diagnoses increased ($P = 0.011$) adjusting for sex, age, length of stay (LOS), urgency and getting surgery (yes/no). However, this did not lead to a significant higher severity of illness (SOI). The number of readmissions within a year were significantly lower after OG-CM (0.31 per patient) compared to before OG-CM (0.89 per patient) ($P < 0.001$). No significant difference in in-house and reported mortality after 3 months was observed. Costs increased, but no significant differences were found.

The OG-CM model demonstrated an increase in quality of care. This was indicated by an increased number of medical diagnoses resulting in having less readmissions, without affecting the mortality rates and the LOS. Future randomized multi-centered studies are required to enable causal relationships.

Keywords : Orthogeriatric care ; integrated care ; geriatricians ; orthopedics ; multidisciplinary treatment.

- Siddhartha Lieten[1],
- Karen Pien[2],
- Sven Van Laere[3],
- Bert Bravenboer[4],
- Thierry Scheerlinck[5]

[1]*Geriatrician, Department of Geriatrics, Universitair Ziekenhuis Brussel, Laarbeeklaan 101, 1090 Brussels, Belgium*

[2]*Head of the Department of Medical Registration, Universitair Ziekenhuis Brussel, Laarbeeklaan 101, 1090 Brussels, Belgium*

[3]*Statistical consultant, Interfaculty Center Data processing and Statistics, Faculty of Medicine and Pharmacology, Vrije Universiteit Brussel, Laarbeeklaan 103, 1090 Brussels, Belgium*

[4]*Head of the Department of Geriatrics, Universitair Ziekenhuis Brussel, Laarbeeklaan 101, 1090 Brussels, Belgium*

[5]*Head of the Department of Orthopedic Surgery and Traumatology, Universitair Ziekenhuis Brussel, Laarbeeklaan 101, 1090 Brussels, Belgium*

Correspondence : Siddhartha Lieten, Department of Geriatrics, Universitair Ziekenhuis Brussel, Laarbeeklaan 101, 1090 Brussels, Belgium. Tel : +32 2 477 63 66, Fax: +32 2 477 63 98.

E-mail : Siddharta.Lieten@uzbrussel.be

No benefits or funds were received in support of this study.
The authors report no conflict of interests.

INTRODUCTION

The burden of elderly patients admitted to an orthopedic-traumatology ward for musculoskeletal disorders is increasing because of an ageing population *(1)*. Traditionally, geriatric patients with musculoskeletal or osteoarticular problems will be admitted to an orthopedic (trauma) ward and treated by surgeons. However, in this approach, these patients will be at risk as the complexity of their medical underlying conditions can be underestimated *(1)*.

Most elderly patients have diminished homeostasis, multiple and often atypical pathologies with inter-related somatic, psychological and social factors *(2)*. Moreover, they often use multiple medications with an increased risk of interactions and changed pharmacokinetics *(3)*. Also, about one third of these patients have reduced cognitive function *(4)* and many patients have osteoporosis, malnutrition and sarcopenia *(5)*.

To address these issues, guidelines and recommendations have emphasized the importance of combined geriatric and orthopedic (i.e. orthogeriatric) care as an alternative to traditional treatment *(5)*. Organizing a collaboration between surgeons and geriatricians in the treatment of musculoskeletal problems remain challenging.

Recent reviews *(4,6,7)* have described four useful orthogeriatric models to treat the frailest patients, with most benefit from improved care by geriatricians :

1. Orthopedic ward and geriatric consultant service on demand.
2. Orthopedic ward and daily geriatric consultative service.
3. Geriatrician and rehabilitation ward with trauma-orthopedic consultant service on demand.
4. Geriatrician on an orthopedic ward and integrated care. This is the most sophisticated model where the orthopedic surgeon and the geriatrician manage the patient together from admission to discharge *(4,5)*. This model is also called the orthogeriatric co-management (OG-CM) model.

The Belgian health care system has a complicated reimbursement system and pays hospitals revenues through six different channels *(8)* : (i) hospital budget (Budget Financial Means, BFM) that covers (A) capital and investment costs, (B) operational costs and (C) additional costs, (ii) physician fees based on a fee-for-service system including "private fees" when patients are admitted to a private ward, (iii) payment for pharmaceutical products partly reimbursed on a product-by-product basis and partly as a lump-sum, (iv) lump-sum payments for conventions and day care, (v) room supplements paid by patients or their insurance and (vi) ancillary products.

The BFM and more specifically the payment for operational hospital costs are calculated based on "justified activities" and a national average hospital length of stay (LOS) per pathology group defined by "All Patients Refined Diagnosis Related Groups" (APR-DRG) version 28.0. The "justified LOS" per pathology group is modulated by patient's characteristics and comorbidities that are partly reflected in four grades of "Severity of Illness" (SOI).

Financial support for a geriatrician working at an orthopedic ward, can be obtained indirectly through an improved reporting and registration of comorbidities. Additionally, each geriatric consult can be financed on a pay-for-service basis *(8)*.

The aim of this pilot study was to see if the care of elderly patients with fragility fractures or other orthopedic problems, could be improved by implanting an OG-CM facility in the University Hospital of the Vrije Universiteit Brussel (UZ Brussel) in October 2014. Effects on health care and financial effects were studied retrospectively comparing the outcomes to a historical control group.

PATIENTS AND METHODS

In this pilot study, two patient Groups were compared during two time periods at UZ Brussel : Group 1 (before OG-CM) consisted of 119 patients aged 75 or more, admitted on the Orthopedic and Trauma ward of the UZ Brussel between October 1st and December 31st, 2013 (Q4 – 2013) having conventional geriatric care on demand. In this time period the orthopedic team consisted of orthopedic

and trauma surgeons, a dietician, an occupational therapist, a physical therapist, and specialized nurses including a social nurse. Orthopedic surgeons, together with trainees in general surgery or orthopedics, provided care to all patients on weekdays and during the weekend. On weekdays, a geriatric consultant service was available on request but not on a daily basis. In the weekends, there was no consultative geriatric service, but when needed a resident in internal medicine was available on request. Geriatricians or other doctors with skills in the management of elderly patients did not routinely

Table I. — Characteristics of the patients

	Group 1 Before OG-CM (Q4 - 2013)	Group 2 After OG-CM (Q4 - 2014)	P value
Number of patients	119	132	
Baseline characteristics			
Age (in years)			0.347[a]
Mean (± SD)	83.34 (± 5.58)	82.68 (± 5.41)	
Median	82	81	
Min – Max	75 - 99	75 - 96	
Sex			0.100[c]
Male	35 (29.4%)	27 (20.5%)	
Female	84 (70.6%)	108 (79.5%)	
Housing before admission			0.142[c]
Home	94 (79.0%)	89 (67.4%)	
Other hospital	2 (1.7%)	3 (2.3%)	
Rehabilitation or rest and care center	20 (16.8%)	30 (22.7%)	
Other	3 (2.5%)	10 (7.6%)	
Type of admission			0.973[c]
Urgent	80 (67.2%)	89 (67.4%)	
Elective	39 (32.8%)	43 (32.6%)	
Diagnosis on admission			0.487[c]
Hip and lower limb problems	60 (50.4%)	74 (56.1%)	
Upper limb problems	17 (14.3%)	11 (8.3%)	
Spinal problems	9 (7.6%)	9 (6.8%)	
Miscellaneous	33 (27.7%)	38 (28.8%)	
Quality of care parameters			
Number of unique diagnoses			0.015[b]
Mean (± SD)	11.99 (± 6.83)	14.00 (± 7.54)	
Median	10	12	
Min – Max	4 - 39	3 - 42	
Patient underwent surgery	93 (78.2%)	96 (72.7%)	0.320[c]
Discharged to			0.894[c]
Home	63 (52.9%)	71 (53.8%)	
Other hospital	25 (21.0%)	25 (18.9%)	
Rehabilitation or rest and care center	23 (19.3%)	29 (22.0%)	
Deceased	6 (5.0%)	4 (3.0%)	
Other	2 (1.7%)	3 (2.3%)	
Number of readmissions (within 1 year)	*N = 117*	*N = 50*	< 0.001[b]
Mean per patient (± SD)	0.983 (± 1.73)	0.379 (± 0.912)	
Median per patient	1	0	
Min - Max per patient	0 – 15	0 – 8	
In-house mortality	6 (5.0%)	4 (3.0%)	0.524[d]
Reported mortality after 3 months	11 (9.2%)	12 (9.1%)	0.967[c]

Statistical analyses were performed using the [a]T-test, [b]Mann-Whitney U-test, [c]Chi square test, [d]Fisher's Exact Test.

visit the orthopedic/trauma ward and several doctors performed consultative services depending on availability. In that same period, a Geriatric Liaison Service (GLS) coordinated a secondary fracture prevention scheme consisting in a systematic assessment and treatment of osteoporosis and falls risk prevention based on a Geriatric Risk Profile tool.

Group 2 (after OG-CM) consisted of 132 patients aged 75 or more studied from October 1st till December 31st, 2014 (Q4-2014). In that period, next to the existing team as described above, a dedicated 0.6 full-time equivalent (FTE) geriatrician was assigned to the orthopedic ward. On weekdays, geriatric and orthopedic co-management care was provided on a daily basis. In the weekends, the most fragile patients were also seen by a geriatrician. Both groups were treated for musculoskeletal problems and trauma, mainly by surgical interventions in an acute hospital setting. The treatment was performed by an interdisciplinary team of specialized health professionals, developing and executing integrated and individualized treatment plans with special focus on mobilization and early discharge. Classification of diseases was registered according to the ICD standards, version 9 (ICD-9-CM) for the years 2013 and 2014 respectively.

The discharge policy in both Groups was as follows : an early discharge policy was applied aiming at a fast return to the pre-hospitalization situation. All patients were assessed by a physiotherapist and the social nurse, and were discharged to their own home or service flat, to a rehabilitation centre or to a nursing home depending on their general condition, degree of mobility and the availability of family as informal caregivers. Those in need for additional follow-up could be referred to the geriatric day hospital.

Demographic data of both patient Groups (age, sex, housing before admission, type of admission (urgent or elective) and diagnosis on admission) were collected retrospectively from the patient's record according to the minimal hospital data (MHD) (Table I).

The following outcome measures were assessed : the number of diagnoses, the place where patients were discharged to after admission, the number of readmissions within one year and the in-hospital as well as the three months mortality rate.

To evaluate the impact of the OG-CM model on the hospital finance, we compared the hospital length of stay (LOS) and the patients' severity of illness (SOI) between both groups. Based on these data and the illnesses that were treated, we calculated the number of "justified hospitalization days". The number of justified hospitalization days was compared to the "invoiced number of hospitalization days", i.e. the real number of days our patients stayed in the orthopedic ward. We also compared the total hospital cost in both settings.

Statistical analysis

The statistical analysis was carried out in RStudio 1.1.456 running on R version 3.5.1 (RStudio, Boston, Massachusetts). In the descriptive analysis, continuous data were reported as mean and standard deviation and were compared with a student T-test after assessing homogeneity of variance with a Levene's test and adapting the T-test accordingly. When normality of data was not confirmed, a Mann-Whitney U test was used. Nominative data were compared using a Chi-square test.

To gain insights in the relationship between predictors (sex (Male/Female), patient admitted from home (Yes/No), urgent admission (Yes/No), patient underwent surgery (Yes/No), category of primary diagnosis on admission (hip and lower limb problems, upper limb problems, spinal problems, miscellaneous)) and outcome measures (number of diagnosis and number of readmissions within one year), a multivariate analysis was performed using linear regression. Here, a stepwise regression technique was adopted, using both forward and backwards modeling based on Akaike Information Criterion (AIC). The start model consisted each time of the outcome variable and the year in which patients were treated. Only significant covariates associated with the outcome variable were left in the final model. In this final step the assumptions of homogeneity of variance and normality of the residuals were checked. All P values reported are 2-sided and $P < 0.05$ was considered statistically significant.

RESULTS

The demographic data and baseline characteristics such as age, sex, housing before admission, type of admission and diagnosis at admission are presented in Table 1 and show no statistically significant differences between Group 1 and 2.

The number of diagnoses in Group 1 was 11.99 (± 6.83) and in Group 2, 14 (± 7.54) demonstrating a statistically significant difference (Table I). Readmission rates were respectively 117 and 50 for patients admitted in the fourth quarter of 2013 and 2014, showing 67 less readmissions over a period of 3 months. The fact that patients were operated or not, the place where patients were discharged to, the in-house mortality rates, and the mortality rates 3 months after discharge for Group 1 and 2 were not significantly different (Table I).

Two "quality of care" parameters improved after the introduction of an OG-CM collaboration : (i) the number of diagnoses increased ($P = 0.015$) and (ii) the number of readmissions within a year ($P < 0.001$) decreased (Table I). The other "quality of care" parameters such as if patients were operated on, the habitation they were discharged to and the mortality rates, showed no statistically significant differences.

After the introduction of an orthogeriatric model, the number of diagnoses increased in Group 2. But this did not lead to a statistically significant higher severity of illness score (SOI) (Table II). There was no difference in SOI between patients discharged from the department of orthopedics for both Groups ($P = 0.566$).

The invoiced LOS for Group 1 was 10.92 ± 10.53 days and for Group 2, 11.51 ± 10.57, which is not statistically significant ($P = 0.462$). The justified LOS for Group 1 was 11.51 ± 8.10 days and for Group 2, 13.14 ± 9.37, showed a trend towards more justified patient days in the orthogeriatric setting. However this was also not statistically significant ($P = 0.075$). Both invoiced and justified LOS showed an increase, but both differences were not statistically different. We observed that the justified LOS increased more than the invoiced LOS (1.63 days vs. 0.59 days), but also this difference was not statistically significant ($P = 0.123$).

Separate data are given in Table II for total hospital costs, costs first payer and costs second payer, showing no significant statistical differences between the 2 Groups. In this Table II, we compared the contribution of the subsidized Belgian healthcare system or Belgian "mutuality" (first payer), the costs paid by private hospital insurances (second payer) and those paid by the patient. The introduction of the OG-CM system did not increase hospital costs significantly ($P = 0.506$). However, the overall cost increased by 505 euro, based on median total hospital cost, due to the introduction of OG-CM (Table II). Of this additional cost, the patient was charged 27 euro extra on average, given that the LOS of the patient increased by one day (Table II).

The introduction of an orthogeriatric co-management collaboration was assessed using the "number of unique diagnoses" and the "number of readmissions" a multivariate analysis was performed (Table III). When normalized for age, LOS, the urgency of admission and whether the patient underwent surgery or not, we estimated that, before the introduction of an OG-CM collaboration (Group 1), an average of 9.7 diagnoses per patient were reached. After the introduction of an OG-CM collaboration (Group 2) on average two additional health conditions were diagnosed ($P = 0.011$). Compared to an elective admission, patients admitted as an emergency, had 4.5 extra diagnoses on average ($P < 0.001$). Also, for each four extra hospitalization days, on average one extra diagnosis was reached ($P < 0.001$). Both, the male sex and the fact that patients underwent surgery, tended to increase the number of diagnoses, but this was not statistically significant.

When normalized for age, the admission rate within one year was on average 0.89 per patient before the introduction of the OG-CM collaboration and 0.31 afterwards ($P = 0.001$). Male patients had a tendency to be readmitted more often than female, but this difference did not reach statistical significance.

DISCUSSION

This retrospective pilot study demonstrates that adding a geriatric specialist to the standard care

Table II. — Description of the financial indicators of patient and the spread of the hospitalization cost

	Group 1 Before OG-CM (Q4 - 2013)	Group 2 After OG-CM (Q4 - 2014)	P value
Number of patients	119	132	
Financial indicators related to LOS and pharmaceutics			
Severity of illness (SOI)			0.566[a]
1 – minor	24 (20.2%)	26 (19.7%)	
2 – moderate	55 (46.2%)	53 (40.2%)	
3 – major	32 (26.9%)	46 (34.8%)	
4 – extreme	8 (6.7%)	7 (5.3%)	
Length of stay (LOS) - invoiced (in days)			0.462[b]
Mean (± SD)	10.92 (± 10.53)	11.51 (± 10.57)	
Median	8	9	
Min – Max	1 - 63	1 - 60	
Length of stay (LOS) - justified (in days)			0.075[b]
Mean (± SD)	11.51 (± 8.10)	13.14 (± 9.37)	
Median	10.70	11.23	
Min – Max	1 - 47	1 - 60	
Difference: invoiced – justified LOS (in days)			0.123[b]
Mean (± SD)	- 0.59 (± 5.81)	-1.63 (± 4.35)	
Median	-0.64	-1.76	
Min – Max	-14.34 - 35.73	-11.83 - 19.38	
Difference: justified expenses – expenses made for the patient's pharmaceutics (in euro)			0.465[b]
Mean (± SD)	56.53 (± 208.98)	-5.20 (± 329.04)	
Median	25.01	36.86	
Min – Max	-643.36 – 1583.70	-2429.86 – 918.59	
Hospitalization costs per patient			
Total hospital costs (in euro)			0.506[b]
Mean (± SD)	4868 (± 5 120)	6070 (± 9 240)	
Median	3 726	4 231	
Min – Max	610 – 36 086	779 – 83094	
Costs first payer (mutuality) (in euro)			0.423[b]
Mean (± SD)	3980 (± 4 284)	4741 (± 6 343)	
Median	3087	3 647	
Min – Max	0 – 34 454	0 – 58 802	
Costs second payer (private hospitalization insurance) (in euro)			0.824[b]
Mean (± SD)	199 (± 1 100)	271 (± 1 581)	
Median	0	0	
Min – Max	0 – 9 819	0 – 14 098	
Cost second payer for those patients who had a private insurance (in euro)	*N = 9 (7.6%)*	*N = 9 (6.8%)*	0.931[b]
Mean (± SD)	2641 (± 3 255)	3974 (± 4936)	
Median	725	1 331	
Min – Max	93 – 9 919	69 – 14 098	
Cost paid by patients (in euro)			0.598[b]
Mean (± SD)	688 (± 1 400)	1 058 (± 2 968)	
Median	247	274	
Min - Max	0 – 9 493	0 – 24 292	

Statistical analyses were performed using the [a]Chi square test, [b]Mann-Whitney U-test.

Table III. — Multivariable linear regression analysis for explaining the outcomes number of unique diagnoses and the number of readmissions (within 1 year from admission)

	Beta (± SE)	Significance
	Number of unique diagnoses	
Intercept	9.741 (± 0.945)	-
Setting		**0.011 ***
Before OG-CM (Q4 - 2013)	*ref.*	
After OG-CM (Q4 - 2014)	2.011 (± 0.788)	0.011
Length of stay (LOS) – *centered*	0.251 (± 0.038)	**<0.001 *****
Sex		**0.077**
Female	*ref.*	
Male	1.621 (± 0.913)	
Urgency		**<0.001 *****
Urgent	*ref.*	
Elective	-4.497 (± 0.924)	<0.001
Patient underwent surgery		**0.084**
Yes	*ref.*	
No	1.632 (± 0.939)	0.084
	Number of readmissions (within 1 year)	
Intercept	0.885 (± 0.137)	
Setting		**0.001 *****
Before OG-CM (Q4 - 2013)	*ref.*	
After OG-CM (Q4 - 2014)	-0.575 (± 0.172)	0.001
Sex		**0.097**
Female	*ref.*	
Male	0.333 (± 0.120)	0.097

Levels of significance: If a P-value is less than 0.05 it is flagged with one star (*) ; if a P-value is less than 0.01 it is flagged with two stars (**) ; and if a P-value is less than 0.001 it is flagged with three stars (***)

on an orthopedic ward, increased the number of diagnosed comorbidities and reduced the number of readmissions within a year, without generating a significant difference in costs. The presence of a geriatrician within the orthopedic team did neither affect the in-house and three months mortality rate significantly, nor the overall LOS. However, as the number of diagnoses per patient increased after the introduction of an OG-CM collaboration, there was a tendency towards more "justified" hospitalization days. Costs related to the hospitalization were similar with a statistically non-significant median increase of 505 EUR in total hospital costs, including a median increase of 27 EUR to be paid by the patient.

To the best of our knowledge, this is the first study that analyses the impact of the introduction of an orthogeriatric co-management to assess and treat all patients above 75 years of age, regardless of the diagnosis and admission type. Most studies *(9-11)*, analyzed the effect of different ways to integrate a geriatrician within an orthopedic ward, but focused on a specific class of diagnoses, e.g. hip fractures. In a randomized controlled trial *(9)*, Prestmo et al compared patients over 70 years of age with a hip fracture treated in an orthopedic ward, to those treated in a dedicated care unit. They showed that, patients with a hip fracture treated in a comprehensive geriatric setting, had an improved mobility. Another recent pilot study in Germany *(12)* evaluating fracture treatment, confirmed a higher quality of care in an orthogeriatric setting based on a ward visit model. However, Frenkel Rutenberg et al. *(11)*, comparing elderly patients with displaced femoral neck fractures admitted to a geriatric or an orthopedic ward, did not demonstrate differences in hospitalization time or in-hospital complications. Nevertheless, an orthogeriatric collaboration is also supported by a systematic review and meta-analysis *(6)* demonstrating an improved mortality

rate after a hip fracture. As such, guidelines *(13)* also recommend integrated orthogeriatric care.

Possible weaknesses of our study are its retrospective nature, a single center design and the limited number of patients. Moreover, only data available within the Minimal Health Care dataset could be compared and the populations were not stratified or randomized, which could have introduced a selection bias. However, both populations were recruited at one year interval, during a similar period of time (4th quarter of both periods), had comparable demographics and no other treatment of hospitalization strategies were modified.

Of course the reimbursement of hospital costs is based on the Belgian system and is not immediately applicable in other countries.

From our study, we concluded that the OG-CM collaboration improved the quality of care at the orthopedic and trauma department of the UZ Brussel (more diagnoses and less readmissions) without affecting the LOS and the mortality rates. Moreover, the impact on the total hospital costs was limited and the costs paid by patients marginal. Therefore, we recommend the OG-CM model, because less readmissions are interesting for every hospital and in every health system.

REFERENCES

1. **Mudge AM, Banks MD, Barnett AG, Blackberry I, Graves N, Green T,** *et al.* CHERISH (collaboration for hospitalised elders reducing the impact of stays in hospital) : protocol for a multi-site improvement program to reduce geriatric syndromes in older inpatients. *BMC Geriatr.* 2017 17(1) ; 11 : 1-9.
2. **Hung WW, Egol KA, Zuckerman JD, Siu AL.** Hip fracture management : tailoring care for the older patient. *JAMA*. 2012 ; 307(20) : 2185-94.
3. **Hubbard RE, O'Mahony MS, Woodhouse KW.** Medication prescribing in frail older people. *Eur. J. Clin. Pharmacol.* 2013 ; 69(3) : 319-26.
4. **Kammerlander C, Roth T, Friedman SM, Suhm N, Luger TJ, Kammerlander-Knauer U.**, *et al.* Orthogeriatric service – a literature review comparing different models. *Osteoporosis Int.* 2010 ; 21(Suppl 4) : S637-46.
5. **Merloz P.** Optimization of perioperative management of proximal femoral fracture in the elderly. *Orthop. Traumatol. Surg. Res.* 2018 ; 104(1s) : S25-S30.
6. **Grigoryan KV, Javedan H, Rudolph JL.** Orthogeriatric care models and outcomes in hip fracture patients : a systematic review and meta-analysis. *J. Orthop. Trauma*. 2014 ; 28(3) : e49-55.
7. **Pioli G, Giusti A, Barone A.** Orthogeriatric care for the elderly with hip fractures : where are we? *Aging Clin. Exp. Res.* 2018 ; 20(2) : 113-22.
8. **Van de Voorde C, Van den Heede K, Obyn C, Quentin W, Geissler A, Wittenbecher F,** *et al.* Conceptual Framework for the Reform of Belgian Hospital Payment System. 2019 ; Contract No. : D/2014/10.273/68. [Last accessed : March 21, 2019].
9. **Prestmo A, Hagen G, Sletvold O, Helbostad JL, Thingstad P, Taraldsen K,** *et al.* Comprehensive geriatric care for patients with hip fractures : a prospective, randomised, controlled trial. *Lancet*. 2015 ; 385(9978) : 1623-33.
10. **Bertram M, Norman R, Kemp L, Vos T.** Review of the long-term disability associated with hip fractures. *Inj. Prev*. 2011 ; 17(6) : 365-70.
11. **Frenkel Rutenberg T, Daglan E, Heller S, Velkes S.** A comparison of treatment setting for elderly patients with hip fracture, is the geriatric ward superior to conventional orthopedic hospitalization? *Injury*. 2017 ; 48(7) : 1584-8.
12. **Knobe M, Bottcher B, Coburn M, Friess T, Bollheimer LC, Heppner HJ,** *et al.* [Geriatric Trauma Center DGU(R) : Evaluation of clinical and economic parameters : A pilot study in a german university hospital]. Unfallchirurg 2018.
13. **Sabharwal S, Wilson H.** Orthogeriatrics in the management of frail older patients with a fragility fracture. *Osteoporos. Int.* 2015 ; 26 : 2387-2399.