

# Orthogeriatric co-management model to improve outcome and cost-effectiveness of fragility hip fractures: abridged secondary publication

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## KEY MESSAGES

1. The orthogeriatric co-management model significantly shortens the length of stay in both acute and rehabilitation hospitals among geriatric patients with fragility hip fractures.
2. The orthogeriatric co-management model significantly improves functional outcomes on discharge from the rehabilitation hospital among geriatric patients who underwent surgery for fragility hip fractures.
3. Benefits of the model are achieved at minimal additional cost.

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## Introduction

Geriatric hip fractures are common fragility fractures in Hong Kong. In 2007, a geriatric hip fracture clinical pathway was adopted to address the escalating needs of the community.<sup>1</sup> The pathway has shown to shorten the length of stay by 6.1 days in acute hospitals (and hence improve clinical outcomes including pneumonia) and decrease the average manpower cost per hip fracture case.

The average age of our patients with hip fracture is 84 years; many have multiple comorbidities and polypharmacy problems. These patients require considerable support during early postoperative period and after discharge to prevent deterioration of physical and mental health that may lead to repeated hospital readmissions and prolonged hospital stays.

Since November 2018, a new orthogeriatric co-management model, with a geriatrician involving in daily management in both acute and rehabilitation phases, has been implemented to improve the outcome and cost-effectiveness of the management process.

## Methods

Data of geriatric hip fracture patients from 1 April 2018 to 30 October 2018 under the conventional orthopaedic care model were compared with data of geriatric hip fracture patients from 1 February 2019 to 31 August 2019 under the orthogeriatric co-management model. Efficiency was reflected by the total length of stay in acute and convalescence hospitals.

## Results

Of 401 eligible patients, 194 received conventional orthopaedic care and 207 received orthogeriatric co-management (Table 1). The mean age of patients was 84.2 years; 290 (72.3%) patients were female; 217 (54.1%) patients had femoral neck fractures and 178 (44.4%) patients had pertrochanteric fractures.

Under the orthogeriatric co-management model, the median length of stay in acute and rehabilitation hospitals decreased by 1 day and 2 days, respectively ( $P=0.001$ ). The orthogeriatric co-management model was associated with higher median modified Barthel Index on discharge from the rehabilitation hospital (81 vs 63.5,  $P<0.001$ ). Linear regression model showed all variables (orthogeriatric co-management model, modified Barthel Index on admission to rehabilitation hospital, and abbreviated mental test score) predicted modified Barthel Index on discharge from rehabilitation hospital:  $F(3, 158)=69.275$ ,  $P<0.001$ ,  $R^2=0.568$  (Table 2). All three variables added significantly to the prediction.

More patients under the orthogeriatric co-management model were prescribed osteoporosis medications within 1 year after the index fracture (66.7% vs 12.9%,  $P<0.001$ ). There was no significant difference between the two models in terms of the 28-day unplanned readmission rate, complication rate, mortality rate, and Elderly Mobility Scale score on discharge from the rehabilitation hospital. The cost per episode of hip fracture was similar between the two models.

TABLE 1. Geriatric fracture hip patients under conventional model and orthogeriatric model

	Conventional (n=194)*	Orthogeriatric (n=207)*	P value
Age, y	84.8±7.6	83.6±8.2	0.165
Sex			0.704
Male	52 (26.8)	59 (28.5)	
Female	142 (73.2)	148 (71.5)	
Abbreviated mental test score on admission	5.1 (5.8)	7 (8.1)	0.079
Modified Barthel Index on admission to rehabilitation hospital	48 (24)	49 (27)	0.055
Pre-morbid residence			0.042
Old age home	53 (27.3)	38 (18.4)	
Home	141 (72.7)	169 (81.6)	
Pre-morbid mobility			0.581
Unaided	61 (31.4)	69 (33.3)	
With aids	121 (62.4)	124 (59.9)	
Chairbound	11 (5.7)	10 (4.8)	
Bedbound	1 (0.5)	4 (1.9)	
Fracture site			0.127
Neck of femur	97 (50.0)	120 (58.0)	
Petrochanteric	94 (48.4)	84 (40.6)	
Surgery			0.149
Replacement	65 (33.5)	84 (40.6)	
Fracture fixation	129 (66.5)	123 (59.4)	
Charlson comorbidity index	2 (5)	2 (5)	0.129
Preoperative haemoglobin level, g/dL	11.4±1.8	11.6±1.9	0.387
Preoperative albumin level, g/L	38.9±3.9	39.2±4.3	0.449

\* Data are presented as mean±standard deviation, median (interquartile range), or No. (%) of participants

TABLE 2. Linear regression analysis for predictors of modified Barthel Index on discharge from rehabilitation hospital

Predictor	Unstandardised coefficient (B) [95% confidence interval]	P value
Group (orthogeriatric model vs conventional model)	5.37 (0.23-10.51)	0.04
Abbreviated mental test score	2.23 (1.40-3.06)	<0.001
Modified Barthel Index on admission to rehabilitation hospital	0.57 (0.42-0.71)	<0.001

## Discussion

In the conventional model, the geriatric consultative service is on request of the orthopaedic surgeon in charge. Thus, there is a time lag for patients to be seen by the geriatrician. In the orthogeriatric co-management model, patients are co-managed by both the orthopaedic surgeon and the geriatrician. Joint ward rounds are up to 3 times weekly to enable earlier detection of medical problems and timely intervention. The orthopaedic surgeon and geriatrician deliberate the optimal plan of medical treatment in unison. Patients were transferred from acute hospital to rehabilitation hospital earlier

because of the enhanced geriatrician support in the rehabilitation hospital.

Discharging patients prematurely may be detrimental to patient health. It is important to ensure proper rehabilitation is achieved prior to discharge of patients. Both conventional and orthogeriatric models had similar unplanned readmission rates and mortality. Reductions in length of stay in acute and rehabilitation hospitals were due to the new measures in the orthogeriatric model that eliminated unnecessary delays in decision making.

Patients need a safe, quick, and efficient recovery to return to their normal lives after surgery.

A multidisciplinary management programme can help to speed up functional recovery.<sup>2</sup> In the present study, the modified Barthel Index on discharge from the rehabilitation hospital was significantly higher under the orthogeriatric model than under the conventional model. This is consistent with one study that reported significant improvement in Functional Independence Measure motor and cognitive scores under a comprehensive orthogeriatric approach, with the rate of successful rehabilitation doubled.<sup>3</sup> An accelerated rehabilitation study reported an increase in the activities for daily living score and a reduction in the length of hospital stay.<sup>4</sup> Prolonged bed rest and patient immobility is known to be associated with functional decline in activities of daily living and increased complications and mortality.

The conventional care model lacks formal osteoporosis management in the pathway. A more holistic approach to patients with hip fractures is important.<sup>5</sup> In the orthogeriatric co-management model, geriatricians may initiate osteoporosis treatment while the patient is still in the rehabilitation hospital. Follow-up of osteoporosis treatment is continued even after discharge to the geriatric clinic, where education and fall prevention programmes are provided by nurses. All these help reduce the risk of future fractures. In the present study, subsequent fractures within 1 year of index fracture reduced (but not significantly) under the orthogeriatric model (1.4% vs 3.1%,  $P=0.27$ ). We anticipate that the effect of osteoporosis management will become more apparent over a longer period.

There was a decreasing trend for 3-, 6-, and 12-month mortality under the orthogeriatric co-management model. We are unable to conclude whether the study was underpowered to detect changes in mortality, because power analysis was calculated based on length of stay.

Cost per episode was similar between the conventional and orthogeriatric models. The decreased cost from acute hospitals was offset by the increased cost in rehabilitation hospitals. The decreased length of stay resulted in decreased total inpatient bed days for geriatric hip fractures and a decreased ratio of geriatric hip fracture among orthopaedics overall inpatient bed days. However, there was a shortage of manpower in the rehabilitation hospital during the conventional model owing to staff turnover. This shortage was recovered next year with new recruits when the orthogeriatric model was running.

In Hong Kong public healthcare system, the number of medical staff is determined by the annual government budget, and hardware (medication, implants, prostheses, and consumables) is bulk purchased by the hospital management. After

implementation of the orthogeriatric model, the only additional resource is the increase in geriatrician manpower. Inpatient length of stay has been used as the cost-effectiveness measure in the Hospital Authority. The cost per patient day in hospital (acute and rehabilitation) was estimated to be \$6310 in 2021/22. Reduction in length of stay in both acute and rehabilitation hospitals is likely to improve cost-effectiveness.

## Conclusion

Geriatric hip fractures are a major burden to the healthcare system. The orthogeriatric co-management model for geriatric patients with hip fracture is effective in shortening the total length of stay in acute and rehabilitation hospitals and in improving functional outcomes of patients. Such benefits are achieved at minimal additional cost.

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## Disclosure

The results of this research have been previously published in:

1. Yee DKH, Lau TW, Fang C, Ching K, Cheung J, Leung F. Orthogeriatric multidisciplinary co-management across acute and rehabilitation care improves length of stay, functional outcomes and complications in geriatric hip fracture patients. *Geriatr Orthop Surg Rehabil* 2022;13:21514593221085813.

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