Cost-Effectiveness Analysis of Teriparatide versus Alendronic acid in the treatment of osteoporosis in postmenopausal Egyptian patients

Health Technology Appraisal

Issued: October 2016

- **بيانات المستحضر محل الدراسة:**

Intervention	Teriparatide
Trade name	Forteo
Company name	Lilly
Comparator	Alendronic acid

- **الهدف:**

- تقييم الفعالية لقاء التكلفة لمستحضر teriparatide مقارنه بمستحضر alendronic acid في علاج مرض هشاشة العظام في السيدات وذلك لضمان أفضل النتائج العلاجية بالنسبة للمريض وبأقل تكلفة ممكنة من خلال الإلتزام بالخطوط العلاجية الاسترشادية العالمية وفي ضوء الممارسة الإكلينيكية المحلية. وذلك في ضوء التوصية بإجراء دراسة جدوي اقتصادية COST EFFECTIVENESS بناء علي اجتماع لجنة وحدة إقتصاديات الدواء بالسادة مديري قطاعات الصيدلة بالتأمين الصحي والمؤسسات العلاجية والأمانة العامة للمستشفيات والهيئة التعليمية.

- علما ان الدراسة التي قامت باجرائها وحدة اقتصاديات الدواء شملت بيانات التكلفة الخاصة بالمستحضرات والتي تم تجميعها من مناقصات مستشفيات وزاره الصحة، بالاضافة إلى باقي التكلفة المرتبطة بالإقامة بالمستشفى والأدوية والتبعات المحتملة عن علاج حالات الكسر بأنواعها والناتجة عن استخدام كل بروتوكول على حدة، وطبقا لتسعيرة التأمين الصحي.

- تم تجميع البيانات الخاصة بالقيمة العلاجية الناتجة عن جودة الحياة المعيشية للمريض "QUALITY OF LIFE" ونسبة الحالات المستجيبة للعلاج من الدراسات المنشورة عالميًا.

- وقد اجتمعت اللجنة بتاريخ ٢٠١٦/٦/١٥ لمناقشة الدراسة، وكان القرار كالتالي:

في ضوء متابعة إجراء دراسة جدوي إقتصادية (cost effectiveness study) لتحديد القيمة العلاجية المضافة مقابل التكلفة لمستحضر Teriparatide.

فقد تبين ان مستحضر Teriparatide يحقق فائدة علاجية أفضل في منع الكسور الفقرية والغير فقرية "vertebral and non-vertebral fractures" عن نظيره Alendronate.

وقد خلصت الدراسة إلي ان مستحضر Teriparatide يعتبر هو الأكفأ من حيث الفعالية لقاء التكلفة (cost effective) مقارنة بمستحضر Alendronate في علاج مرض osteoporosis. وذلك في ضوء السعر المقترح من الشركة وهو ٢١٨٥.٥ جنيه مصري للقلم ٢٠ ميكروجرام.

English Summary:

Economic evaluation of Teriparatide versus Alendronic acid for the treatment of osteoporosis in postmenopausal Egyptian Patients

- **Introduction**

Osteoporosis, a disease characterized by low bone mass and micro architectural deterioration of bone tissue (1), increases the risk of fractures and results in a significant morbidity, mortality and financial burden. The consequences of osteoporosis-related fractures are expected to increase in the future because of demographic changes and improved life expectancy, and also partly due to the increasing age-specific incidence of fractures (2, 3). Therefore, there is a place in the treatment armamentarium for new bone formation agents with proven efficacy.

Current pharmacological therapy for prevention and treatment of osteoporosis mainly focused on antiresorptive (AR) agents, such as the bisphosphonates, hormone replacement therapy (HRT), calcitonin and the selective oestrogen receptor modulators (raloxifene) (4). All these agents preserve bone architecture although suppression of bone resorption and remodelling, which is usually associated with a modest or moderate risk reduction of fragility fractures, approximately 30–50%.

However, teriparatide injection is a bone-forming treatment for osteoporosis with demonstrated efficacy in increasing bone mineral density and reducing the risk of vertebral and non-vertebral fractures in postmenopausal women (5).

Objective

To evaluate the cost-effectiveness of Teriparatide compared to Alendronic acid in postmenopausal patients suffering osteoporosis from the Health Insurance perspective.

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- **Economic evaluation Key Features:[6]**

Key Features:	
year of the document	May 2016
Affiliation of authors	Pharmacoeconomic Unit, Central Administration For Pharmaceutical Affairs
Purpose of the document	Evaluate the Cost-Effectiveness of using teriparatide versus alendronic acid for the treatment of osteoporosis
Standard reporting format included	Yes
Disclosure	Yes
Target audience of funding/ author's interests	Public, decision makers
Perspective	Health Insurance
Indication	Treatment of osteoporosis in postmenopausal women
Target population	covered patients by the Egyptian health care system
Subgroup analysis	No Subgroup analysis
Choice of comparator	Alendronic acid
Time horizon	Over 10-year period
Assumptions required	Yes
Analytical technique	Cost-effectiveness analysis
Costs to be included	Direct medical costs include costs of treatment and managing strategies, beside the costs of managing fractures according to the Egyptian current practice.
Source of costs	The Ministry of Health Hospitals
Modeling	Markov model
Systematic review of evidences	Yes
Preference for effectiveness over efficacy	Yes
Outcome measure	The outcomes of the two treatments were measured in terms of QALY
Method to derive utility	The published literature
Equity issues stated	All lives and life years are valued equally, regardless of age, gender, or socioeconomic status of individuals in the population
Discounting costs	A discount rate of 3.5 % per year
Discounting outcomes	A discount rate of 3.5 % per year
Sensitivity analysis-parameters and range	Critical component(s) in the calculation is varied through a relevant range or from worst case to best case.
Sensitivity analysis-methods	One-way sensitivity analysis is performed.
Presenting results	Teriparatide is cost-effective intervention compared to Alendronic acid in patients with osteoporosis
Incremental analysis	Yes

Total costs vs. effectiveness (cost/effectiveness ratio)	Yes
Portability of results (Generalizability)	The generalizability and extent to which the clinical efficacy data and the economic data are representative is identified and discussed.

- **Discussion**

It is important to identify the most cost-effective treatment in patients with osteoporosis from a range of different alternatives that work with different mechanisms. To support reimbursement decision-making in Egypt, decision analysis is a quantitative method for synthesizing data from numerous sources for the evaluation of treatment alternatives and was developed to determine the cost-effectiveness of the teriparatide strategy, as compared to alendronic acid.

The literature search was conducted in Medline, PubMed and Cochrane Library to identify relevant published English articles from January 2000 to May 2016. The decision analytical model was constructed to assess the costs and consequences associated with teriparatide compared with alendronic acid.

The clinical parameters were derived mainly from a systematic review. The review comprised 45 randomized clinical trials (RCTs), where all osteoporotic agents were included and fractures were assigned as the primary outcome. Only one study compared alendronate and compared it to placebo where 447 men and women were indulged, whereas one study for teriparatide met the inclusion criteria and studied 51 postmenopausal women (7).

As for the teriparatide RCT, 51 postmenopausal women were randomized to treatment with teriparatide 400 IU daily subcutaneously or to no treatment. One of 18 patients sustained fractures in the control group, whereas none occurred in 26 patients in the teriparatide group. The decrease in vertebral fracture risk (0.23) was not significant (95% CI 0.01 to 5.45). Also, there was no significant effect on non-vertebral fracture risk (RR 0.82; 95% CI 0.13 to 5.39) (7).

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The utility values used in the model were obtained from the published literature. Normal mortality rate and an excess rate due to fractures were used from the World Health Statistics 2012 and the systemic review mentioned above (7). The study used for obtaining the utility scores was a Danish one where an economic evaluation was based on the Fracture Intervention Trial (8). Utility scores were derived from EuroQol-5D questionnaire and the SF-36 questionnaire.

Direct medical costs were obtained from the Health Insurance hospitals in Egypt. Deterministic sensitivity analyses and discounting were conducted.

Total costs for teriparatide and alendronic acid were EGP 719,017 and EGP 440,565 respectively. QALYs for teriparatide and alendronic acid were 2751.038 and 2745.681 respectively. The incremental cost-effectiveness ratio (ICER) for teriparatide versus alendronic acid was 51,984.5 EGP/QALY. This study showed that teriparatide is a cost effective choice compared to alendronic acid in treating osteoporosis in postmenopausal Patients. One way sensitivity analysis showed that relative risk of getting non-vertebral fractures using teriparatide, relative risk of vertebral fractures using alendronate, and relative risk of vertebral fractures using teriparatide have the greatest impact on the results.

The main limitation of this study is that we rely on one RCT for each agent (not head to head trials). Also, local data couldn't be found on the effectiveness and safety of any of the agents.

As in all modeling exercises, several assumptions were made in this study leading to uncertainties in the results. In this analysis, we explicitly accounted for these uncertainties by assigning confidence intervals and plausible ranges of the relative risks, utilities, and costs based on published sources. To assess the influences of other model structures and assumptions on the cost-effectiveness estimates, one-way sensitivity analyses of various parameters were performed.

A recent systematic review that comprised two cost effectiveness studies concluded that evidences support the teriparatide use only for women with severe postmenopausal osteoporosis and therapeutic failure to alendronate and that other developed countries recommend the limited use of this technology (9). NICE guidance of January 2005 states that teriparatide use is restricted only to women aged 65+ and who are intolerant to bisphosphonates (10). In 2006, a cost effectiveness analysis revealed that alendronate compares favorably to interventions accepted as cost-effective. Therapy with teriparatide alone is more expensive and produces a smaller increase in QALYs than therapy with alendronate (11). On the other hand, a Swedish cost effectiveness study concluded that selection of teriparatide versus oral bisphosphonates as a first-line treatment for the high risk postmenopausal and glucocorticoid-induced osteoporosis cohorts evaluated is justified at a cost per QALY threshold of €50,000 (12).

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- **Conclusion**

Results from this study suggest that employing teriparatide technology is cost effective intervention compared to alendronic acid in postmenopausal patients with osteoporosis, based on the willingness to pay threshold stated by world health organization (3xGDP/capita) for low and middle income countries. These findings will help inform health care decisions regarding the allocation of health care system resources to improve the health of the Egyptian population.

- **Declaration of interest**

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

- **PEU project team**

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- **Appraisal Committee members**

Each technology appraisal is appraised by the PE Committee, which is one of CAPA's standing advisory committees and consist of members who represent different specialties such as statistics, clinical evidence, economics, medicine, clinical pharmacy and pharmacoeconomic. A list of the Committee members who took part in the discussions for this appraisal appears below:

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