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Cost-effective Intervention Thresholds for Treating Patients with Osteopenia with Oral Bisphosphonates in Singapore

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Introduction

In Singapore, pharmacological treatment of osteopenia follows the 2008 United States (US) National Osteoporosis Foundation recommended risk thresholds: 10-year risk of hip fracture [HF] at 3%, or 10-year risk of major osteoporotic fracture [MOF] at 20%. These thresholds, based on US data,¹ do not reflect local epidemiology and current costs.

Method

A Markov model (Figure 1) was developed to evaluate the cost effectiveness of initiating oral bisphosphonate therapy at various fracture risk thresholds for patients aged 50-84 years. The model utilised 10-year horizon and adopted the Singapore healthcare system's perspective, incorporating direct healthcare costs and quality-adjusted life years (QALYs). Threshold analysis was conducted by varying the absolute risk of age-specific fracture probabilities and calculating the associated cost and QALYs at various fracture risks, to ascertain the cost-effective intervention thresholds at commonly accepted willingness-to-pay (WTP) threshold. Drug efficacy data and health utilities were sourced from published literature, whilst transition probabilities, resource use and costs were derived from Ministry of Health datasets. The ACE Clinical Guidance (ACG) Expert Group (EG) assessed the model results alongside clinical and feasibility considerations.

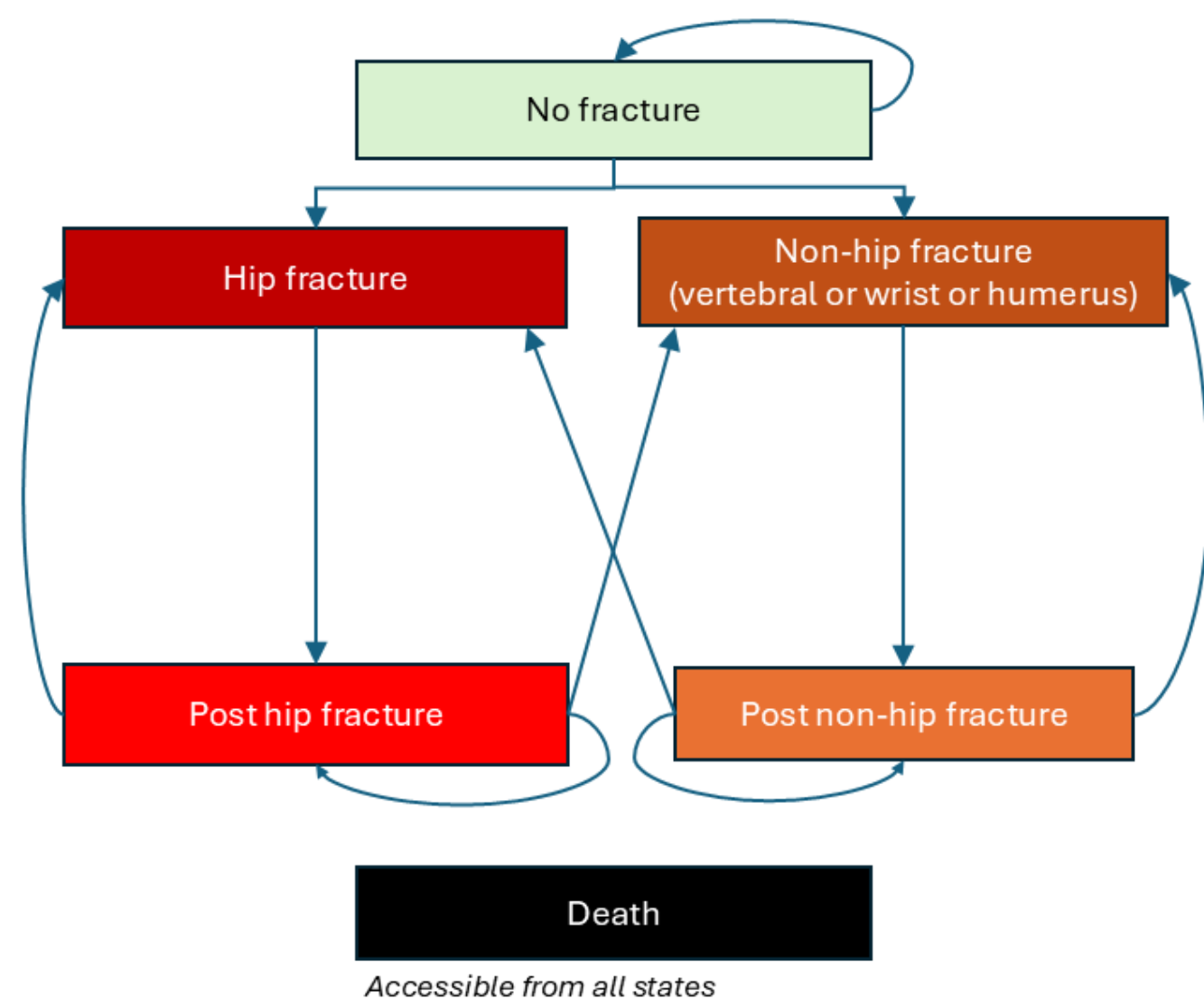


Figure 1. Graphical representation of model

Results

- For both females and males, cost-effective hip fracture intervention thresholds increased with age and plateaued after 70 years of age (Figure 2). This could be due to greater baseline mortality with older age, as well as lower baseline QALY status.
- The ACG EG deliberated on these findings by overlaying considerations such as risks associated with long-term bisphosphonate exposure and implementation factors. For younger patients, treatment would be cost-effective at HF risk below 3%, but experts maintained the 3% threshold due to concerns about long-term bisphosphonate exposure from early treatment. For patients aged 70 and above, they considered various options: a 5% threshold would be a more cautious approach, whilst a 4% threshold would keep treatment cost-effectiveness above 40% probability. The EG decided on the lower 4% threshold as HFs predominantly occur in those aged 80 years and above.²
- Based on the EG's deliberations, the final age-stratified thresholds were established (Purple lines in Figure 2): for individuals below 70 years, treatment is likely cost-effective at the **3% HF threshold** for both sexes, and **15% and 18% MOF threshold** for men and women respectively. For those over 70 years, the recommended thresholds were set at **4% HF** or **15% MOF** for men, and **4% HF** or **18% MOF** for women.
- As cost-effectiveness of alendronate and risedronate were similar, the EG noted that the intervention thresholds are most applicable to these bisphosphonates.

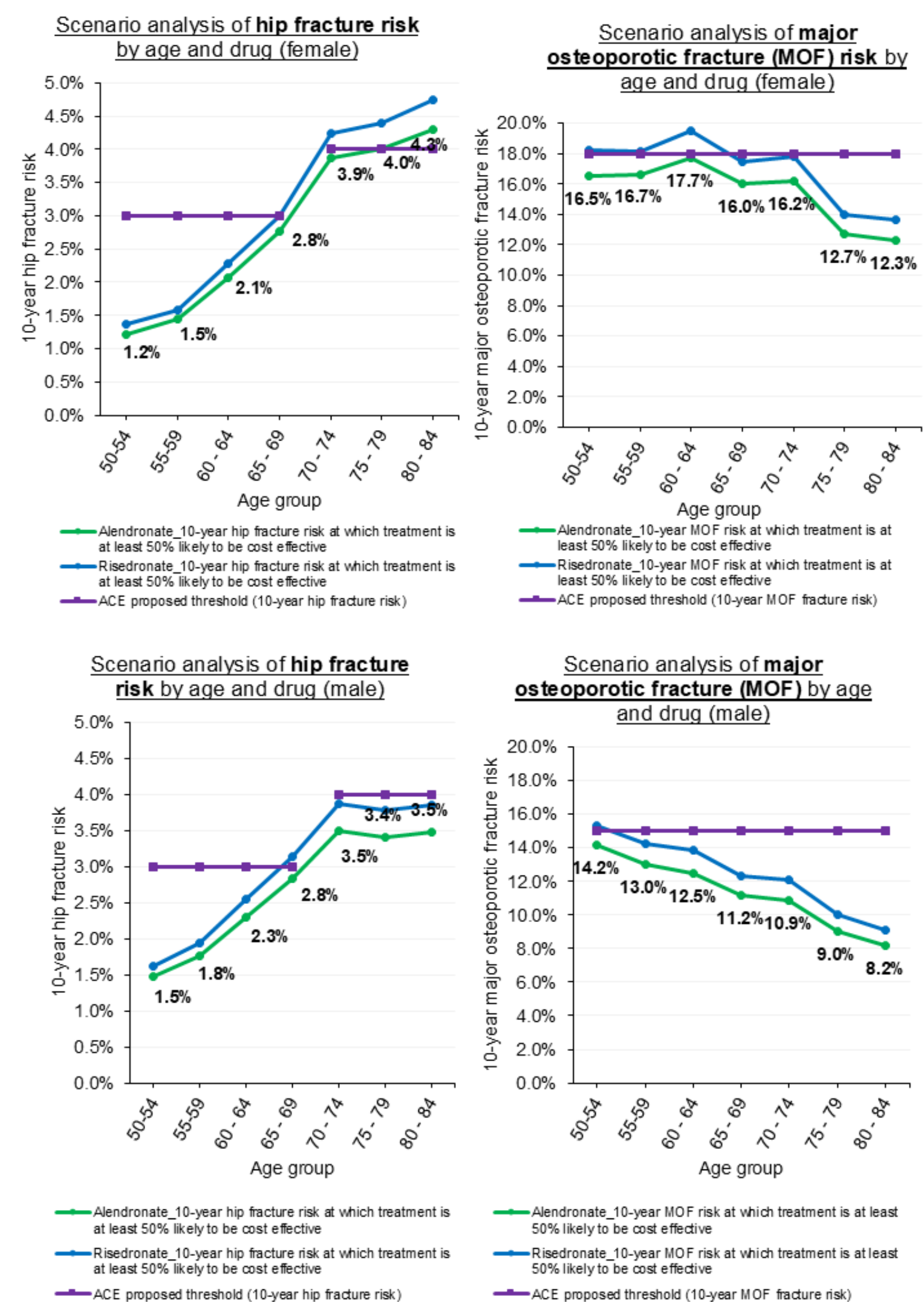


Figure 2. Cost-effectiveness analysis results for female and male population

Discussion

- This is the first local CEA which included updated local epidemiology and cost for both sexes. This local CEA was developed with multi-disciplinary clinical inputs as well as implementation considerations, with findings integrated into a national-level clinical guideline.
- Limitations of the model include assumptions in treatment efficacy for males; may not fully capture cumulative impact of multiple fractures on quality of life.
- The higher HF intervention thresholds for older patients (≥ 70 years old) should be considered in the context of local fracture epidemiology: the average hip fracture risk is considerably greater for patients ≥ 70 years old compared to younger patients. Therefore, even with a higher HF intervention threshold, older patients would more commonly reach their intervention threshold compared to younger patients.
- The EG emphasised that these thresholds should serve as guidelines rather than strict cut-offs, with treatment decisions being individualised for each patient.

Conclusion

The identified cost-effective thresholds for treatment provide a value-based starting point for decision-making in local clinical practice.

For more info on the Osteoporosis ACG, scan the QR code on the right



Acknowledgements

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References

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