

Economic Evaluation of *CYP2C19* Genotype-Guided Antiplatelet Therapy Compared to Universal Use of Ticagrelor or Clopidogrel in Qatar

Sawsan AlMukdad, Hazem Elewa, Daoud Al-Badriyeh
College of Pharmacy, QU Health, Qatar University, Doha, Qatar

Background

- Patients having *CYP2C19**2 and *3 loss-of-function alleles and receiving clopidogrel are at higher risk of adverse cardiovascular outcomes
- Ticagrelor is a more effective and expensive antiplatelet that is unaffected by the *CYP2C19* polymorphism
- Genotype-guided antiplatelet therapy (GGAT) allows the identification of *CYP2C19**2 and *3 carrier status which can help guide the selection between ticagrelor and clopidogrel
- To date, there are no economic evaluations that compares GGAT to universal use ticagrelor or clopidogrel after percutaneous coronary intervention (PCI) in patients with acute coronary syndrome (ACS) in Qatar

Objectives

- The current study sought to comprehensively assess the utilization cost of *CYP2C19* genotype-guided antiplatelet therapy, universal use of clopidogrel, and ticagrelor against their outcomes as first-line therapies in patients with ACS who underwent PCI in Qatar

Methods

- **Design**
 - One-year decision-analytic simulation model (Fig. 1) and lifetime Markov model (Fig. 2)
 - This was based on a multivariate analysis, using Monte Carlo simulation
- **Data source**
 - The probabilities of the clinical outcomes and utility values were obtained from recent meta analysis and sub-studies of the PLATO trial¹⁻⁴
 - Mutation prevalence was derived from a local observational study
- **Cost calculations**
 - Cost of resources, in Qatari Riyal (QAR, 2019/20), was obtained from the hospital perspective of Hamad Medical Corporation
- **Outcome measures**
 - Incremental cost-effectiveness ratios (ICERs)
 - incremental cost-utility ratios (ICURs)
- **Sensitivity analyses**
 - One-way and multivariate analyses were conducted

Methods ... continued

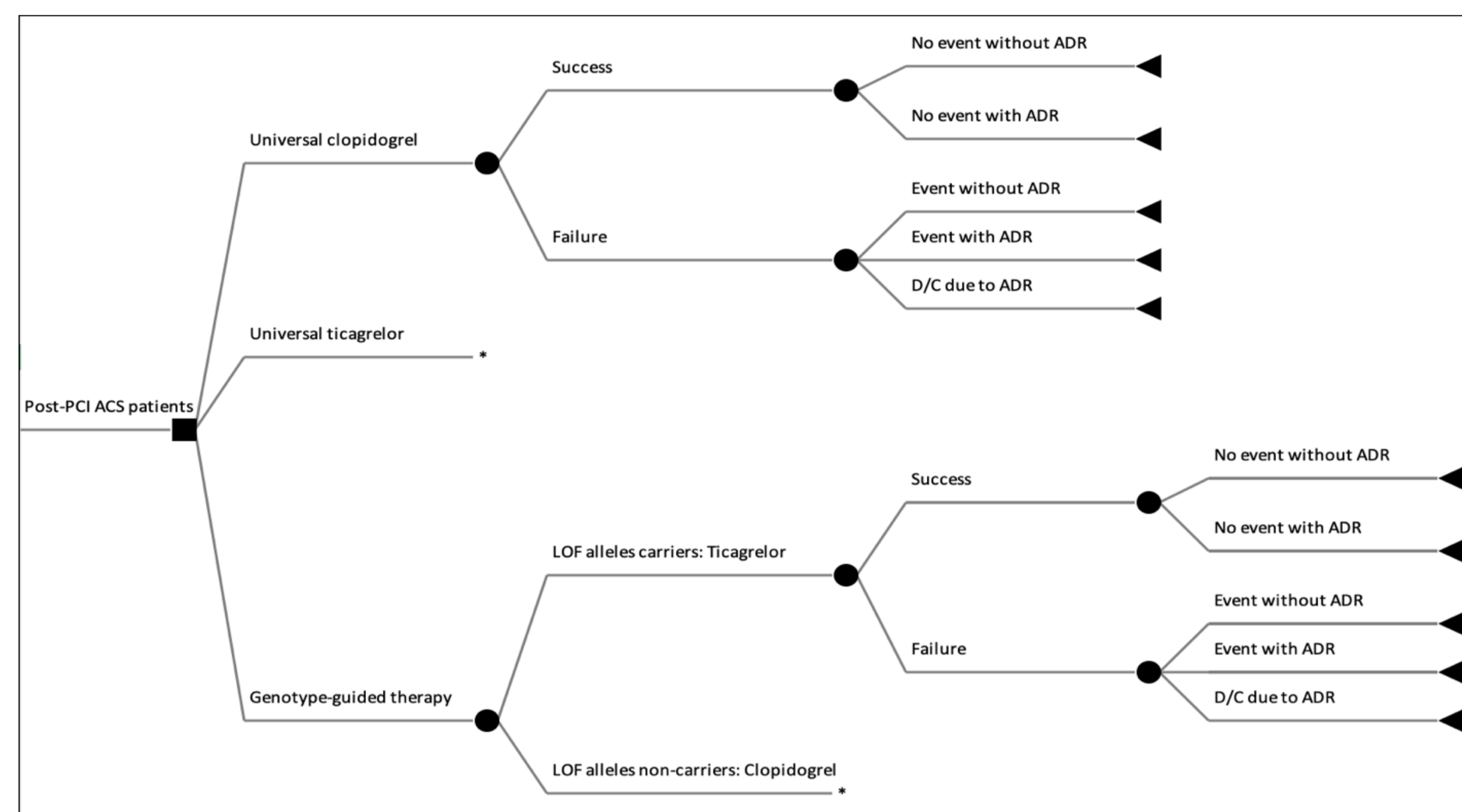


Figure 1. One-year economic decision-analytic model of the antiplatelet strategies

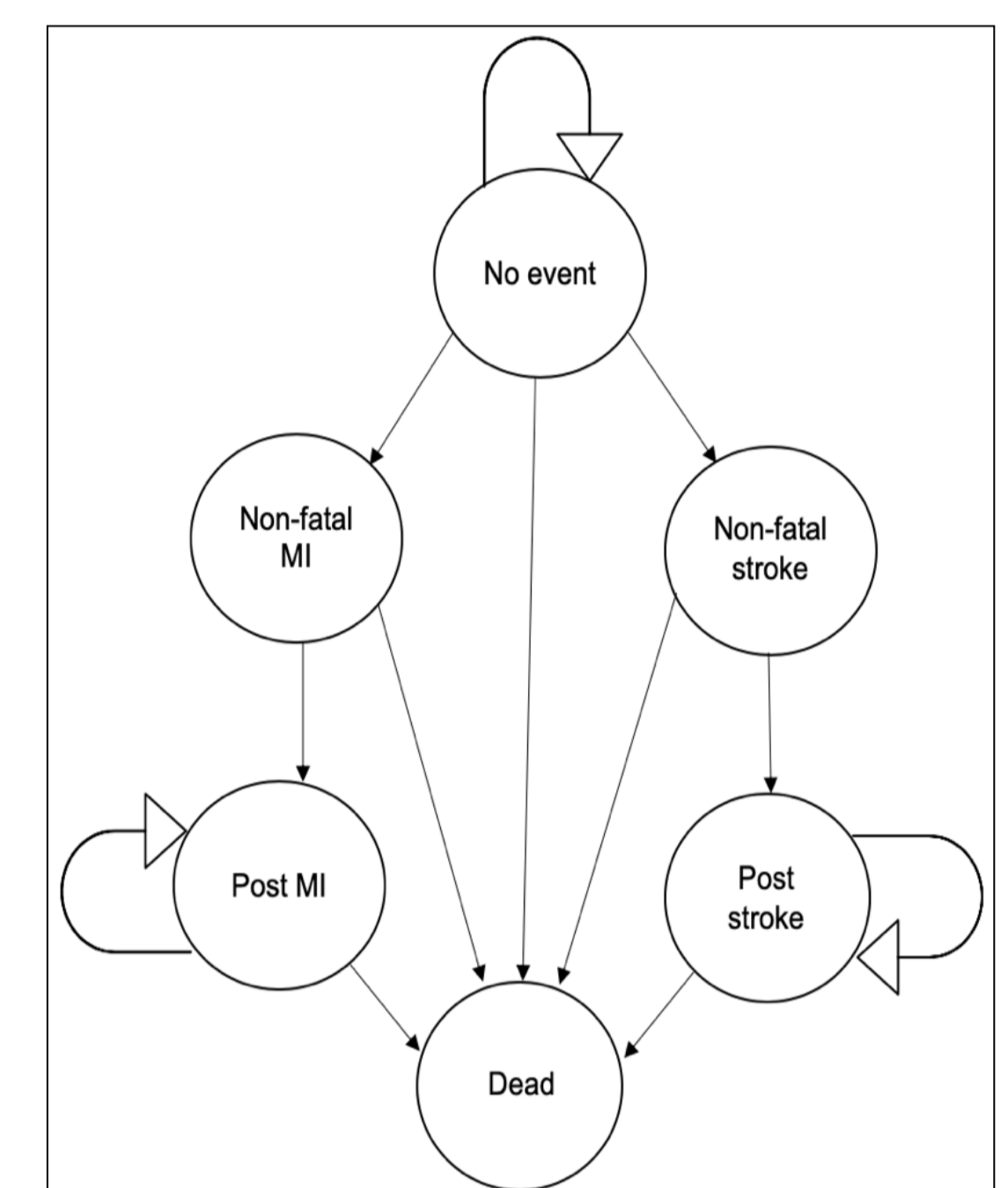


Figure 2. Long-term Markov model

* Follow up model pathways are as above

ACS: Acute coronary syndrome; PCI: Percutaneous coronary intervention; LOF: loss-of-function; D/C: Discontinuation

- Events: myocardial infraction, stroke, stent thrombosis, cardiovascular death
- Adverse drug reactions: major bleeding, dyspnoea

Results

GGAT versus universal ticagrelor

In the one-year model: GGAT was dominant in 60% of cases with the mean cost-saving of QAR 1511

In the Markov model: GGAT was cost-effective in 96% of cases, with a mean ICUR of 5,036 per QALY

GGAT versus universal clopidogrel

In the one-year model: GGAT was cost-effective in 85% of cases with a mean ICER of 22,216 per case of success

In the Markov model: GGAT was dominant in 100% of the cases with a mean cost-saving of QAR 1,813

Universal clopidogrel versus universal ticagrelor

In the one-year: Universal clopidogrel was dominant in 63% of cases with the mean cost-saving of QAR 2,137

In the Markov model: Universal clopidogrel was cost-effective in 99% of cases with a mean ICER of 38,650 per case of success

Sensitivity analyses

- The model outcomes are robust, whereby, the superiority of an antiplatelet strategy versus another was not sensitive to any uncertainty

Conclusion

- Based on the current economic evaluations in the literature, implementing *CYP2C19* genotype-guided therapy is a cost-effective approach in guiding the selection of medication in patients with ACS post-PCI

References

1. Fan ZG, et al. Comparisons between ticagrelor and clopidogrel following percutaneous coronary intervention in patients with acute coronary syndrome: a comprehensive meta-analysis. *Drug Des Devel Ther* 2019;13:719-30.
2. Cannon CP, et al. Comparison of ticagrelor with clopidogrel in patients with a planned invasive strategy for acute coronary syndromes (PLATO): a randomised double-blind study. *Lancet* 2010;375:283-93.
3. Wallentin L, et al. Effect of *CYP2C19* and *ABCB1* single nucleotide polymorphisms on outcomes of treatment with ticagrelor versus clopidogrel for acute coronary syndromes: a genetic substudy of the PLATO trial. *Lancet* 2010;376:1320-8.
4. Ali Z BL, et al. The impact of *CYP2C19* genetic mutation and non-genetic factors on the incidence of major adverse cardiovascular events in patients treated with clopidogrel in Qatar. *J Thromb Thrombolysis* 2019;74:609

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