Not Illness Trajectory but Bayesian-Estimated Rate Model Should Be Appropriately Explained When Discussing Palliative Care in Heart Disease

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Dear Editor:

Despite the recent focus on palliative care for noncancer patients, many articles have highlighted the challenges in administering palliative care for patients with heart disease. Usually, the major challenge is the uncertain and unpredictable illness trajectory of heart disease compared with that of cancer. Predicting disease prognosis is essential to plan palliative care. Unfortunately, there is no suitable model to predict the probable disease trajectory in heart disease. Here, we advocate that the *Bayesian-estimated rate model* might be preferable over the life expectancy and trajectory model, in planning palliative care for patients of heart disease (Fig. 1).

Bayesian-estimated rate model was found suitable to predict the outcome in heart disease. Although several trajectories using the life expectancy model advocated by Hupcey et al. could predict that the patients had a life-threatening disease, they could not predict the episodes such as sudden cardiac death and acute deteriorations.¹ Hence, many cardi-

ologists were of the opinion that the life expectancy model based on trajectory could not be used in clinical practice, especially when planning palliative care for patients of heart disease. Considering sudden death and acute deterioration as important outcomes due to the nature of heart disease, mortality rate such as in-hospital mortality and 30 days mortality might be more precise and useful for prognosis. Furthermore, many risk models, such as “American Heart Association Get With The Guidelines Score” for heart failure and “The Thrombolysis in Myocardial Infarction (TIMI) risk score” for myocardial infarction, have been developed and well validated to predict the mortality rate.²

Using Bayesian-estimated rate model, we can apply the prospect theory to understand the differences between patients and medical teams, while making decisions such as whether life-sustaining therapy should be initiated in patients with the potential risk of brain death during acute deterioration settings. Patients often tend to overreact to low

FIG. 1. The scheme of palliative care phase and each palliative care term by considering Bayesian-estimated rate model; “Palliative care period,” “End of life,” “Terminally ill,” “Terminal care period,” “Actively dying.” Acute and chronic phase/illness could be interchangeable at *estimated rates*.

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probability events but underreact to high probabilities, which is sometimes difficult for the physician to understand. Furthermore, as Verma et al. mentioned, the prospect theory might help us offer appropriate reference settings and frame them appropriately, which could be useful to draw up care plans in advance.³ Numerical mortality rate calculation can help in predicting future risk appropriately by estimating the patients' value. Contrarily, the trajectory and life-expectancy model does not help the patient to estimate the risk and make an appropriate choice.

Of course, Bayesian-estimated rate model can be difficult to understand not only for the patients but also for physicians, and to imagine the outcome objectively, much like a Monty Hall problem. However, the recent progress of artificial intelligence and data analysis will enable calculation of the precise numerical value to predict prognosis. We need to make a paradigm shift in outcome prediction and explaining the prognosis to patients with heart disease.

We recommend using the mortality rate models, especially when considering and planning palliative care for patients with heart disease.

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