Lifetime cost of orphan therapies in paediatric indications in Europe

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INTRODUCTION

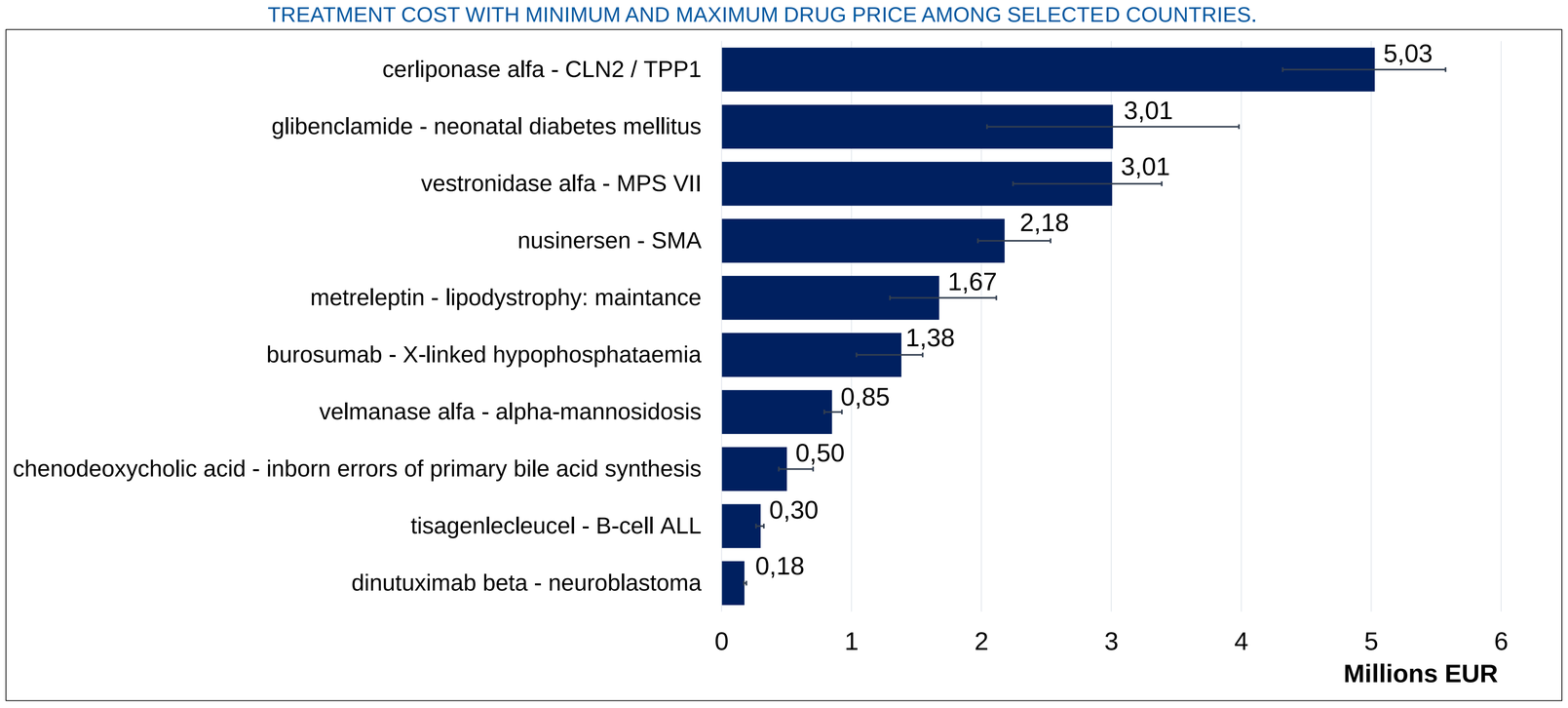
The annual cost of treatment with orphan drugs is higher than that with nonorphan drugs. Based on data for 2011, the median annual cost of orphan therapies is €32,242 and ranges from €1,251 to €407,631 across European countries [1].

However, a more recent study found relatively small differences in the annual cost between European countries and between disease areas [2], although there were significant variations between treatments: £726 and £378,000, with no association between treatment efficacy and cost [3]. An analysis conducted in the United States reported a moderate variation in the annual cost of orphan therapies, while there was over a 20-fold difference in the lifetime cost [4]. We aimed to estimate the lifetime cost of a sample of therapies that were found to differ in terms of the magnitude of treatment effect [5].

METHODS

Systemic therapies for paediatric indications with an orphan medicinal product designation granted by the European Medicines Agency (EMA) between January 2017 and March 2020 were identified using the OrphaNet [6] and EMA databases [7]. The cost of treatment was estimated based on list prices obtained from the Pricentric One database [8] for 10 European countries: Belgium, Denmark, France, Germany, Italy, the Netherlands, Poland, Spain, Sweden, and the United Kingdom. Drug dosing was assumed to follow the EMA's summary of product characteristics, with wastage accounted for (i.e., full bags of tisagenlecleucel preparation; entire capsule with chenodeoxycholic acid per day; other drug consumption rounded to the nearest integer multiple of the lowest drug dose). Body weight and height were based on World Health Organization (WHO) growth reference data for children up to 10 years of age [9]. The body surface area was estimated using the Mosteller formula. The cost of chronic treatments was estimated for 10 and 20 years as a proxy of lifetime treatment duration and discounted at 3.5% annually. The variance percentage was calculated as a difference between the maximum and minimum price divided by the minimum price.

FIG. 1. THE COST OF ORPHAN DRUG TREATMENT AMONG 5-YEAR-OLD PATIENTS IN THE 10-YEAR TIME HORIZON. THE ERROR BARS INDICATE TREATMENT COST WITH MINIMUM AND MAXIMUM DRUG PRICE AMONG SELECTED COUNTRIES.

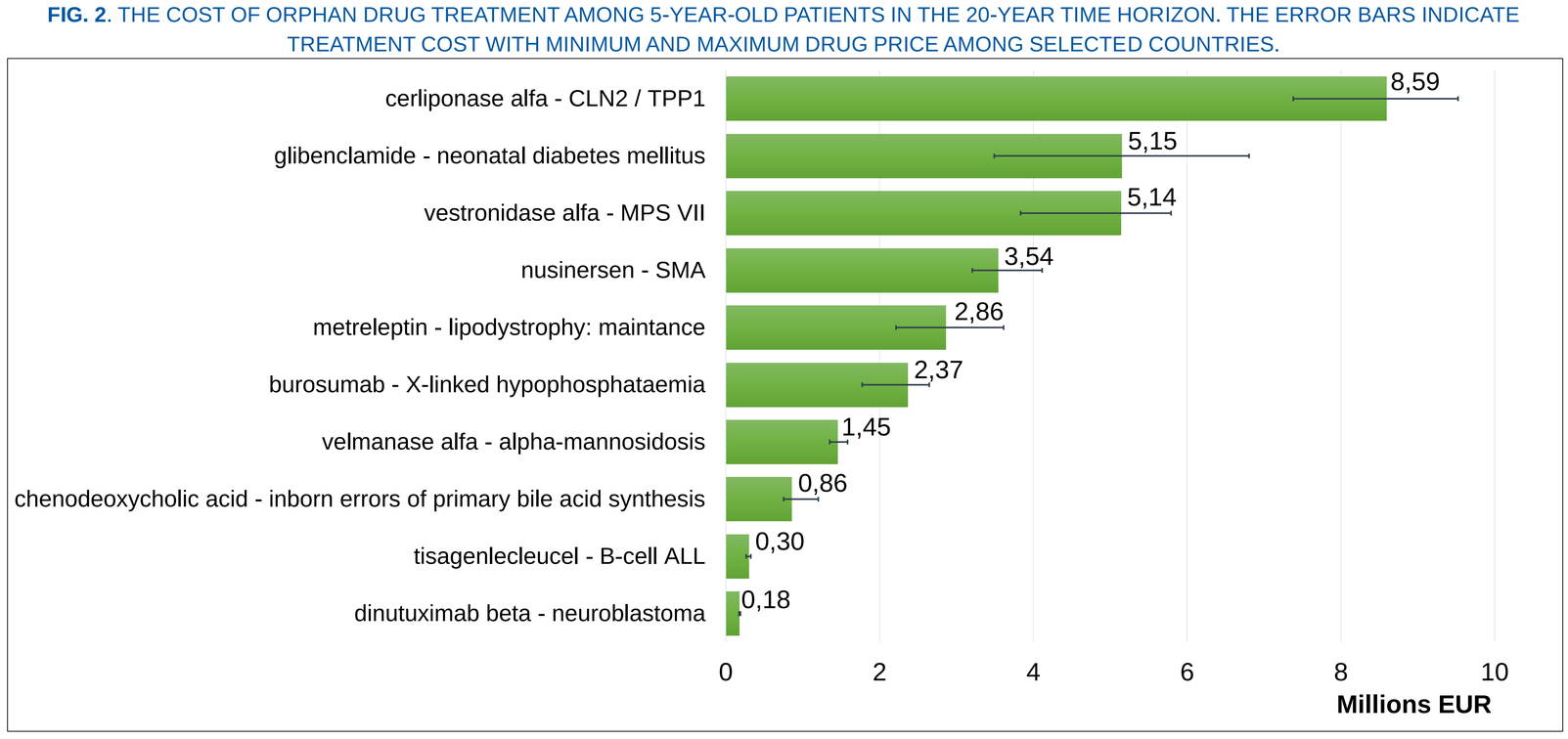


RESULTS

Eleven therapies were identified: burosumab, cannabidiol, chenodeoxycholic acid, cerliponase alfa, dinutuximab beta, glibenclamide, metreleptin, nusinersen, tisagenlecleucel, velmanase alfa, and vestronidase alfa. The prices for cannabidiol were not listed. Dinutuximab beta and tisagenlecleucel, the only treatments with a duration shorter than 1 year, were associated with the lowest cost. The lifetime cost of treating a 5-year-old patient was the lowest for dinutuximab beta: €175,956 both at 10 and 20 years, while it was the highest for cerliponase alfa: €5,027,586 at 10 years and € 8,591,737 at 20 years (Fig. 1 and Fig. 2). The variance percentage ranged across countries from 10.8% for dinutuximab beta to 95% for glibenclamide. The mean cost of all therapies at 10 and 20 years was the lowest in Poland (€859,506 and €1,296,982, respectively) and the highest in Italy (€1,782,985 and €2,987,556, respectively).

Treatment ranking was not affected by patient age. On the other hand, the cost of glibenclamide and vestronidase was highly sensitive to patient age (Fig. 3), while wastage had negligible impact.

FIG. 2. THE COST OF ORPHAN DRUG TREATMENT AMONG 5-YEAR-OLD PATIENTS IN THE 20-YEAR TIME HORIZON. THE ERROR BARS INDICATE TREATMENT COST WITH MINIMUM AND MAXIMUM DRUG PRICE AMONG SELECTED COUNTRIES.



CONCLUSIONS

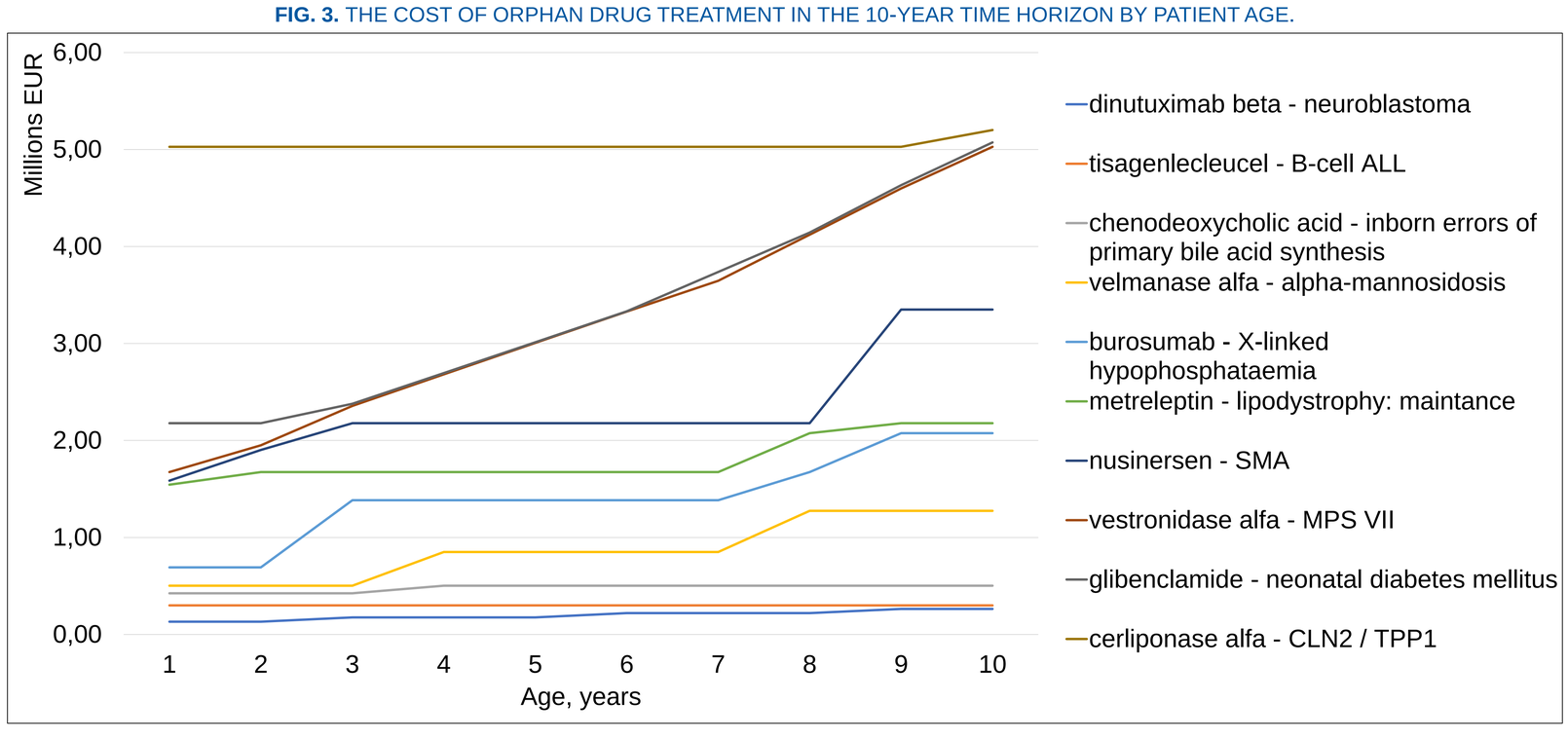
In Europe, lifetime costs of orphan drug therapies show up to a 50-fold difference between therapies and a 2-fold difference between countries. Treatment duration is a major contributor to the cost estimate.

Our results are in line with previous findings showing that the clinical benefit is not associated with the lifetime cost and that potentially curative therapies offer a good value to payers.

LIMITATIONS

- List prices were used.
- The duration of treatment was assumed to be maximal over analysed time horizon due to lack of detailed comparative information on each treatment.
- WHO reference weight data were used due to lack of detailed information on patient from each population.

FIG. 3. THE COST OF ORPHAN DRUG TREATMENT IN THE 10-YEAR TIME HORIZON BY PATIENT AGE.



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