

To estimate the **Potential Peak Sales** for melphalan flufenamide (Pepaxto) in the specified indication (relapsed or refractory multiple myeloma, or RRMM, after at least four prior lines of therapy) in the US, EU5 (France, Germany, Italy, Spain, UK), China, and Japan, as well as the **\$ value of a 1% share of treated patients** in these geographies, we need to follow a structured approach. This involves estimating the eligible patient population, market share, pricing, and treatment duration. Since specific data may not be publicly available for all variables, I will use reasonable assumptions based on industry standards, epidemiology data, and market dynamics for oncology drugs. Please note that these are illustrative calculations, and actual figures may vary based on proprietary data or real-world evidence.

Step 1: Indication and Patient Population

Melphalan flufenamide is approved for adult patients with relapsed or refractory multiple myeloma (RRMM) who have received at least four prior lines of therapy and are refractory to at least one proteasome inhibitor, one immunomodulatory agent, and one CD38-directed monoclonal antibody. This is a heavily pre-treated, niche patient population often referred to as "triple-class refractory" RRMM.

Epidemiology of Multiple Myeloma (MM) and RRMM

- **Multiple Myeloma Incidence and Prevalence:** MM accounts for about 1-2% of all cancers. The prevalence of MM is higher than incidence due to longer survival with modern therapies.

- **RRMM and Triple-Class Refractory Population:** Only a subset of MM patients progress to RRMM with ≥ 4 prior lines of therapy and triple-class refractory status. Studies suggest that ~10-15% of MM patients reach this stage.

- **Geographic Prevalence Estimates** (based on published data and assumptions):

- **US:** ~130,000 prevalent MM patients; ~10-15% are triple-class refractory → ~13,000-19,500 eligible patients.

- **EU5:** ~100,000 prevalent MM patients; ~10-15% are triple-class refractory → ~10,000-15,000 eligible patients.

- **Japan:** ~20,000 prevalent MM patients; ~10-15% are triple-class refractory → ~2,000-3,000 eligible patients.

- **China:** ~80,000 prevalent MM patients (lower diagnosis rates and access to therapies); ~5-10% are triple-class refractory due to limited access to novel therapies → ~4,000-8,000 eligible patients.

For simplicity, we take the midpoint of these ranges:

- US: ~16,000 patients

- EU5: ~12,500 patients

- Japan: ~2,500 patients

- China: ~6,000 patients

- **Total Eligible Patients:** ~37,000 patients across these geographies.

Step 2: Market Share Assumption

The problem states a **20% to 30% share of treated patients**. For peak sales estimation, we assume the midpoint of **25% market share** among eligible patients. This accounts for competition from other therapies (e.g., CAR-T therapies like idecabtagene vicleucel, bispecific antibodies, and other novel agents) in the RRMM space.

- Treated Patients at 25% Market Share:

- US: $16,000 \times 25\% = 4,000$ patients
- EU5: $12,500 \times 25\% = 3,125$ patients
- Japan: $2,500 \times 25\% = 625$ patients
- China: $6,000 \times 25\% = 1,500$ patients
- **Total Treated Patients:** ~9,250 patients

Step 3: Pricing and Treatment Duration

Pricing for oncology drugs in the RRMM space is high due to the unmet need and small patient population. Melphalan flufenamide (Pepaxto) pricing in the US was reported to be ~\$19,000 per cycle (based on initial launch data), with treatment typically involving multiple cycles.

- **US Pricing:** Assume ~\$19,000 per cycle, with an average of 6 cycles per patient (based on clinical trial data and real-world treatment patterns) → Annual cost per patient = \$114,000.

- **EU5 and Japan Pricing:** Typically 50-70% of US pricing due to healthcare system negotiations. Assume ~60% of US price → Annual cost per patient = \$68,400.

- **China Pricing:** Significantly lower due to market access challenges and pricing controls. Assume ~30% of US price → Annual cost per patient = \$34,200.

Annual Revenue per Patient by Region:

- US: \$114,000
- EU5: \$68,400
- Japan: \$68,400
- China: \$34,200

Step 4: Potential Peak Sales Calculation

Peak sales are calculated by multiplying the number of treated patients by the annual cost per patient in each region.

- **US:** 4,000 patients \times \$114,000 = **\$456 million**
- **EU5:** 3,125 patients \times \$68,400 = **\$213.75 million**

- **Japan:** 625 patients × \$68,400 = **\$42.75 million**
- **China:** 1,500 patients × \$34,200 = **\$51.3 million**
- **Total Peak Sales:** \$456M + \$213.75M + \$42.75M + \$51.3M = **~\$763.8 million**

Thus, the **Potential Peak Sales** for melphalan flufenamide in this indication across the US, EU5, China, and Japan, assuming a 25% market share, is approximately **\$764 million**.

Range Based on 20% to 30% Market Share:

- At 20% market share: Total treated patients = ~7,400 → Peak sales = ~\$611 million
- At 30% market share: Total treated patients = ~11,100 → Peak sales = ~\$917 million
- **Peak Sales Range: \$611 million to \$917 million**

Step 5: \$ Value of 1% Share of Treated Patients

A 1% share of treated patients corresponds to 1% of the total eligible patient population being treated with melphalan flufenamide.

- **Total Eligible Patients:** 37,000
- **1% of Eligible Patients:** 370 patients

Breakdown by region:

- US: 16,000 × 1% = 160 patients
- EU5: 12,500 × 1% = 125 patients
- Japan: 2,500 × 1% = 25 patients
- China: 6,000 × 1% = 60 patients

Revenue for 1% share:

- **US:** 160 patients × \$114,000 = **\$18.24 million**
- **EU5:** 125 patients × \$68,400 = **\$8.55 million**
- **Japan:** 25 patients × \$68,400 = **\$1.71 million**
- **China:** 60 patients × \$34,200 = **\$2.05 million**
- **Total Revenue for 1% Share:** \$18.24M + \$8.55M + \$1.71M + \$2.05M = **~\$30.55 million**

Thus, the **\$ value of a 1% share of treated patients** across these geographies is approximately **\$30.6 million**.

Final Answers

1. **Potential Peak Sales** for melphalan flufenamide in the specified indication (RRMM, ≥ 4 prior lines, triple-class refractory) across the US, EU5, China, and Japan, assuming a 20% to 30% market share:

- Range: **\$611 million to \$917 million**

- Midpoint (25% share): **\$764 million**

2. **\$ Value of 1% Share of Treated Patients** across these geographies:

- **\$30.6 million**

Notes and Caveats

- These calculations are based on assumptions for patient population, pricing, and treatment duration. Real-world data may differ due to market access, competition, payer dynamics, and clinical adoption.

- Melphalan flufenamide faced scrutiny in the US (e.g., FDA concerns over confirmatory trial data in 2021-2022), and Oncopeptides withdrew the drug from the US market temporarily before resubmission. This could impact market share and peak sales.

- China's market potential is uncertain due to access to novel therapies and pricing constraints.

- Peak sales typically occur 5-7 years post-launch, assuming no major regulatory or competitive disruptions.

If you have access to specific data (e.g., exact pricing, patient numbers, or market share projections), these estimates can be refined further.