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# Severe immune checkpoint inhibitor toxicity drives additional costs

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## BACKGROUND

Immune checkpoint inhibitor (ICI) therapies improve cancer outcomes but can cause immune-related adverse events (irAEs) that require additional healthcare resources.

We quantified the real-world NHS cost of managing irAEs requiring extra care to better understand their economic impact.

## METHODS

- Retrospective resource-use and cost analysis of patients recruited to the prospective observational EXACT study (NCT05331066)
- 132 patients with 289 analysable irAE episodes
- irAEs categorised by organ system and CTCAE grade
- Resource use: ED attendances and AOS contacts, outpatient & telephone appointments, inpatient & ITU days, investigations/procedures and immunosuppressive drugs
- UK provider perspective using NHS England unit costs + BNF drug costs
- One overseas episode excluded from base case

## COHORT & UTILISATION

| | |
|---|---|
| 132 | Patients |
| 289 | irAE episodes |
| 78 (27.0%) | Grade ≥3 irAEs |
| 26 | ED attendances |
| 298 | AOS contacts |
| 468 | Additional face-to-face outpatient appointments |
| 264 | Telephone appointments |
| 481 | Inpatient days |
| 38 | ICU/ITU days |

## KEY FINDINGS: COST BURDEN

**27.0%** of irAE episodes (Grade ≥3) → **76.2%** of the total additional cost

**A DISPROPORTIONATE COST BURDEN DRIVEN BY SEVERE EVENTS**

- **£793,859.55** Total additional NHS cost
- **£2,746.92** Mean cost per irAE
- **£424** Median cost per irAE (IQR £0–£1,796)
- **£117,975.55** Drug costs (14.9% of total)

### COST BY SEVERITY GRADE


- Grade ≥3 £604,719.55 (76.2%)
- Grade 1–2 £189,140.00 (23.8%)

Mean cost per episode
Grade ≥3: £7,793.07 | Grade 1–2: £509.12
~15× higher mean cost for severe (Grade ≥3) irAEs

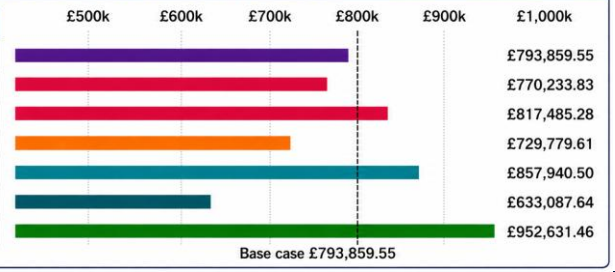
### COST BY ORGAN SYSTEM

| | % of total cost |
|---|---|
| Gastrointestinal | £368,804.85 (46.5%) |
| Endocrine | £146,462.25 (18.4%) |
| Dermatology | £76,826.27 (9.7%) |
| Hepatobiliary | £66,279.55 (8.3%) |
| Respiratory | £41,041.20 (5.2%) |
| Other | £94,445.43 (11.9%) |

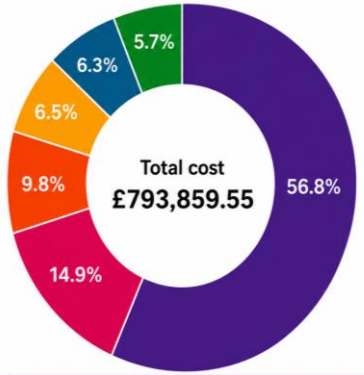
GI irAEs were 63/289 (21.8%) episodes but generated £368,804.85 (46.5%) of total cost.
Colitis alone accounted for £349,195.39 (44.0%).

### SENSITIVITY ANALYSIS: TOTAL COST REMAINS HIGH

| Scenario (one-way) | Assumption | Change vs. base case |
|---|---|---|
| Base case (primary analysis) | Base-case costs | — |
| Drug costs −20% | All drug acquisition costs decreased by 20% | −3.0% |
| Drug costs +20% | All drug acquisition costs increased by 20% | +3.0% |
| Inpatient costs −20% | All inpatient + ITU reference costs decreased by 20% | −8.1% |
| Inpatient costs +20% | All inpatient + ITU reference costs increased by 20% | +8.1% |
| All costs −20% | All unit costs decreased by 20% | −20.0% |
| All costs +20% | All unit costs increased by 20% | +20.0% |




## COST BY RESOURCE CATEGORY




- **Inpatient + ITU** £450,700.28 (56.8%)
- **Drugs** £117,975.55 (14.9%)
- **Procedures** £77,651.94 (9.8%)
- **Outpatient** £51,323.29 (6.5%)
- **ED attendances** £49,803.22 (6.3%)
- **Referrals** £45,588.27 (5.7%)

Inpatient + ITU care accounted for £450,700.28 (56.8%) of total cost.

## HIGH-COST SUBGROUPS

**Episodes requiring escalated** immunosuppression represented only 26/289 episodes (9.0%) but accounted for **£422,767.55 (53.3%)** of total cost.

**GI toxicity, particularly colitis,** represented 63/289 episodes (21.8%) but accounted for **£368,804.85 (46.5%)** of total cost.

## CONCLUSIONS

- irAEs requiring additional NHS care impose a substantial financial burden (**~£794k** over 4 years; **£2,747** mean cost per episode).
- Severe toxicity drives cost: **27%** of episodes (Grade ≥3) account for **76%** of total cost.
- Targeted prevention and early intervention for high-risk irAEs and **appropriate use** of escalation therapies could reduce this hidden burden.