Organizational and environmental impact of switching from intravenous to subcutaneous Immune Checkpoint Inhibitors (ICIs) in France: A Real-World analysis using PMSI data

Putnam
Inizio Advisory

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Introduction & Objective

- Immune checkpoint inhibitors (ICIs) have transformed cancer treatment, but their intravenous (IV) administration generates a substantial burden on hospitals. Data from the French national hospital database (Programme de Médicalisation des Systèmes d'Information, PMSI) show that 58,590 and 68,815 patients received one of the four most prescribed ICIs (pembrolizumab, nivolumab, durvalumab, and atezolizumab) in 2021 and 2022, accounting for 396,537 and 459,567 hospital stays respectively (see the results of this study, poster reference HSD95 – ISPOR Session 4).
- Subcutaneous (SC) formulations of ICIs offer a promising alternative to IV administration with potential benefits in organizational efficiency, economic sustainability, and environmental impact.
- This study aimed to quantify these benefits associated with transitioning from IV to SC administration of the four most prescribed ICIs: pembrolizumab, nivolumab, durvalumab, and atezolizumab in France's ambulatory care setting.

Methods

- Three scenarios were compared:

Scenario 1 "Ambulatory 100% IV"
All ICIs injections administered intravenously during ambulatory stays in day-hospital sessions

Scenario 2 "Ambulatory 50% IV & 50% SC"
Half of injections administered subcutaneously during ambulatory stays in day-hospital sessions

Scenario 3 "Ambulatory 50% IV & 40% SC + 10% of SC in home hospitalization "
20% of SC injections performed in the home hospitalization setting

- Results from the 2022 PMSI study (poster reference HSD95 – ISPOR Session 4), focusing on ambulatory hospital stays related to IV administration of the four most prescribed ICIs across cancer types, were used. Key data included the number of ambulatory stays, patients, administrations and vials used per ICI.

Organizational impact

Assessed via time spent by healthcare professionals (HCPs) and patients. They were monetized using HCP average public hospital salaries[1] and the French minimum wage for patients.[2] Chair-time savings for patients were also converted into average additional day hospital sessions.

Environmental impact

Covered carbon emissions from drug preparation, administration and travels. CO_2 emissions were monetized using France's official valuation.[3]

Results

A total of 459,567 hospital stays were extracted from the PMSI study in 2022. Among these, 441,990 were ambulatory stays involving 65,159 patients, 453,841 administrations and 866,251 vials of ICIs selected.

Organizational impact

Time saved with SC versus IV administration

HCPs: ≈35 minutes **Patients**: ≈43 minutes

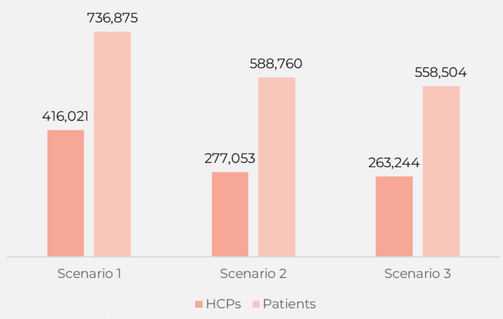

Figure 1. Time spent across scenarios (hours)

Table 1. Comparison of time spent across scenarios

Time saved (hours)	Scenario 2 vs. 1	Scenario 3 vs. 1	Scenario 3 vs. 2
HCPs	138,968	152,777	13,808
Patients	148,115	178,371	30,256

A 50% shift from IV to SC administration would save **139k hours for HCPs** and **148k hours for patients each year**. Adding 10% SC administrations in home hospitalization would further increase time savings to 153k and 178k hours, respectively.

Impact on day-hospital activity

Figure 2. Comparison of additional day hospital sessions across scenarios

Switching from a fully IV strategy (Scenario 1) to a 50% SC mix (Scenario 2) results in **209,302 additional day-hospital sessions**. When 10% of SC administrations are delivered through home hospitalization (Scenario 3), the total **increases slightly to 212,825** vs. Scenario 1, a difference of +3,524 compared with Scenario 2.

Economic valuation

Table 2. Economic value of time saved, and workforce-equivalent capacity gained across scenario comparisons

	Scenario 2 vs. 1	Scenario 3 vs 1	Scenario 3 vs 2
HCPs			
Economic valuation of time savings	2,577,060 €	2,833,127 €	256,067 €
Workforce equivalent savings	86	95	9
Patients			
Economic valuation of time savings	1,392,278 €	1,676,685 €	414,207 €
Workforce equivalent savings	74	89	22

Moving from all-IV to a 50% SC mix yields **€2,577,060 in monetized staff time** (**≈86 full-time equivalent**) and **€1,392,278 in patient time savings** (**≈74 employees**). Adding 10% home SC raises totals to €2,833,127 for staff (≈95 full-time equivalent) and €1,676,685 for patients (≈89 employees).

Environmental impact

Transitioning from full IV administration (Scenario 1) to a 50% SC use (Scenario 2) would **reduce annual carbon emissions by 736 tons CO_2-eq,** corresponding to an environmental value **of €188,496 per year**. Expanding SC administration to include 10% of injections performed in home hospitalization (Scenario 3) would further lower emissions by an additional 60 tons CO_2-eq.

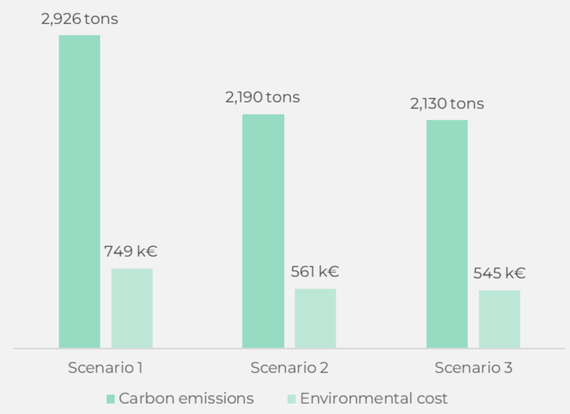

Figure 3. Carbon emissions (tCO_2e) and environmental cost (k€) across scenarios

Table 3. Carbon emissions (tCO_2e) and environmental cost (k€) across scenarios

	Scenario 2 vs. 1	Scenario 3 vs. 1	Scenario 3 vs. 2
Reduced carbon emissions (tons of CO2-eq)	-736	-796	-60
Savings (k€)	-188	-204	-15

Discussion & Conclusion

Transitioning from IV to SC administration demonstrates consistent benefits across environmental, organizational, and economic dimensions. A 50% switch to SC substantially reduces carbon emissions, hospital workload, and time spent by both healthcare professionals and patients, translating into notable economic and efficiency gains. Extending SC administration to home settings further amplifies these advantages, albeit modestly within the current adoption rate. Overall, integrating SC and home-based delivery pathways represents a promising opportunity to optimize healthcare resources, enhance patient experience, and reduce the environmental footprint of oncology care.

References

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