

Cost-Effectiveness of PluroGel® - a new Micelle-matrix-based dressing with 1% silver sulphadiazine – in the management of non-healing wounds

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Objectives

Complex wounds present a substantial economic burden on healthcare systems, costing billions of dollars in Europe and the US. The prevalence of complex wounds is a significant patient and societal healthcare concern and cost-effective wound-care management remains unclear. The model compares the following strategies for the wound-types venous, diabetic, arterial and mixed: PluroGel® vs. Silver-dressing, Hydrogel-dressing, Medical-honey, Impregnated-dressings and Good-wound-care (GWC). All reimbursed products, corresponding to the reimbursement rule, were considered.

Methods

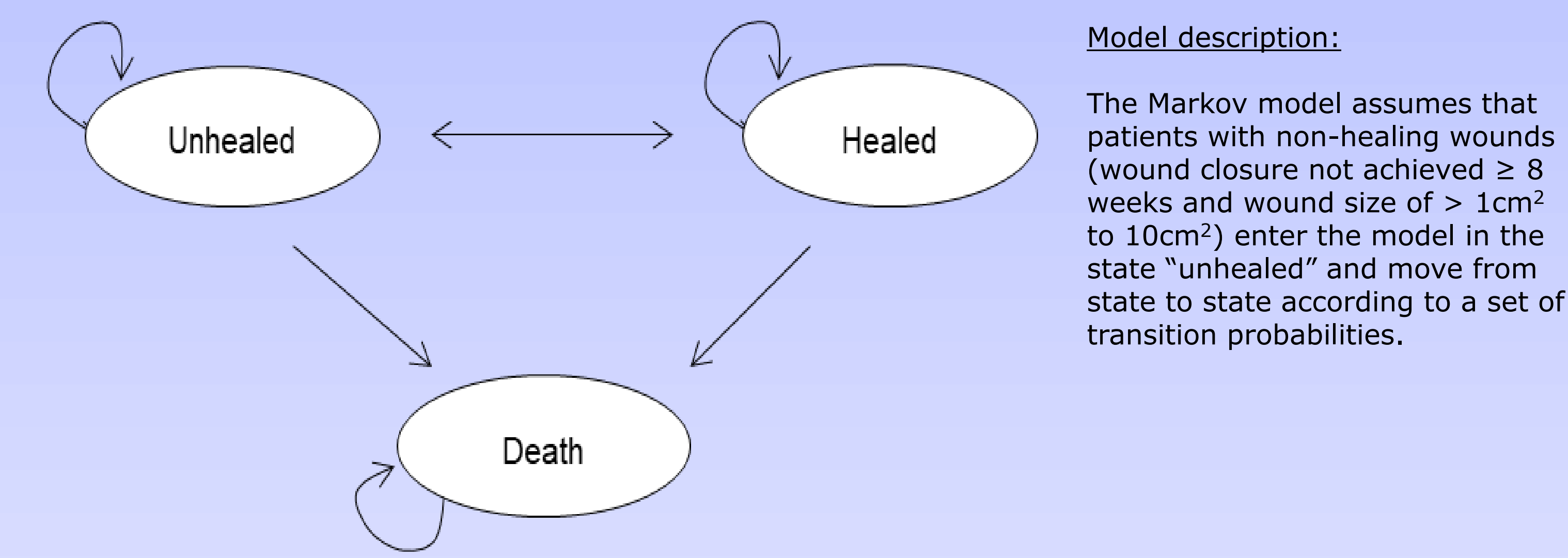
To investigate the impact of using PluroGel® versus silver-dressings, hydrogel-dressings, medical-honey, impregnated-dressings and GWC a six arm probabilistic model was developed. Markov-modeling techniques were used to estimate wound healing (=wound closure) according to wound types. The simulation included three states: unhealed, healed and death. The model considers treatment changes and relapse. According to treatment specific healing-rates patients may move weekly from the health state “Unhealed” to the “Healed” state.

The model compares the following wound care:

- PluroGel®: a multifunctional surfactant-based biomaterial dressing with 1% silver sulphadiazine plus GWC.
- Silver-dressings: alternatives with silver without foam dressing plus GWC.
- Hydrogel-dressings: gels for moisture balance of the wound plus GWC.
- Medical-honey: honey dressings with antibacterial effects plus GWC.
- Impregnated-dressings: each alternative with an active substance (e.g.: Ibuprofen, collagen) plus GWC.
- GWC: contains all alternatives with no active substance and compression bandages plus GWC.

This research utilized the outcomes data of a published 1,036 patient, 10-center clinical-study for PluroGel®. Healing-rates were derived from a systematic literature review from the medical literature for all wound types and comparators. A 1-year time horizon was incorporated to determine the number of ulcer-free-weeks and the expected costs of therapies. Cost data represent direct medical costs (2017 €) for Austria. The payer’s perspective was adopted and only direct costs of care were considered. Sensitivity analyses were performed to gauge model parameter uncertainty.

Fig. 1: Model Design



Model description:

The Markov model assumes that patients with non-healing wounds (wound closure not achieved ≥ 8 weeks and wound size of > 1cm² to 10cm²) enter the model in the state “unhealed” and move from state to state according to a set of transition probabilities.

Source: developed based on a model which have been previously published by Carter et al. (2014)

Clinical Data

Healing rates, defined as wound closure, for the selected comparators were determined by the systematic literature research. Data out of 7 clinical trials (Palumbo 2016, Michaels. 2009, Kitka 1988, Bevis 2011, Jull 2008, Graumlich 2003, Mostov 2005) were used for calculation.

Resource Use and Costs

Data on the resource use of wound healing procedure was collected in two steps. First, the medical resources were derived by literature and wound expert opinions. In a second step this literature review was transferred to the Austrian setting.

The following direct medical costs were included:

- Dressing costs
- Physician consultation costs
- Hospitalization costs
- Laboratory and investigation costs
- Debridement and skin graft costs
- Medication costs

Austrian costs were derived from a number of publicly available sources like the DRG catalogue (LKF), from Austrian price lists and tariff catalogues and the Austrian official drug price list (Warenverzeichnis). When necessary, prices were adjusted to 2017 prices using the consumer price index.

Results

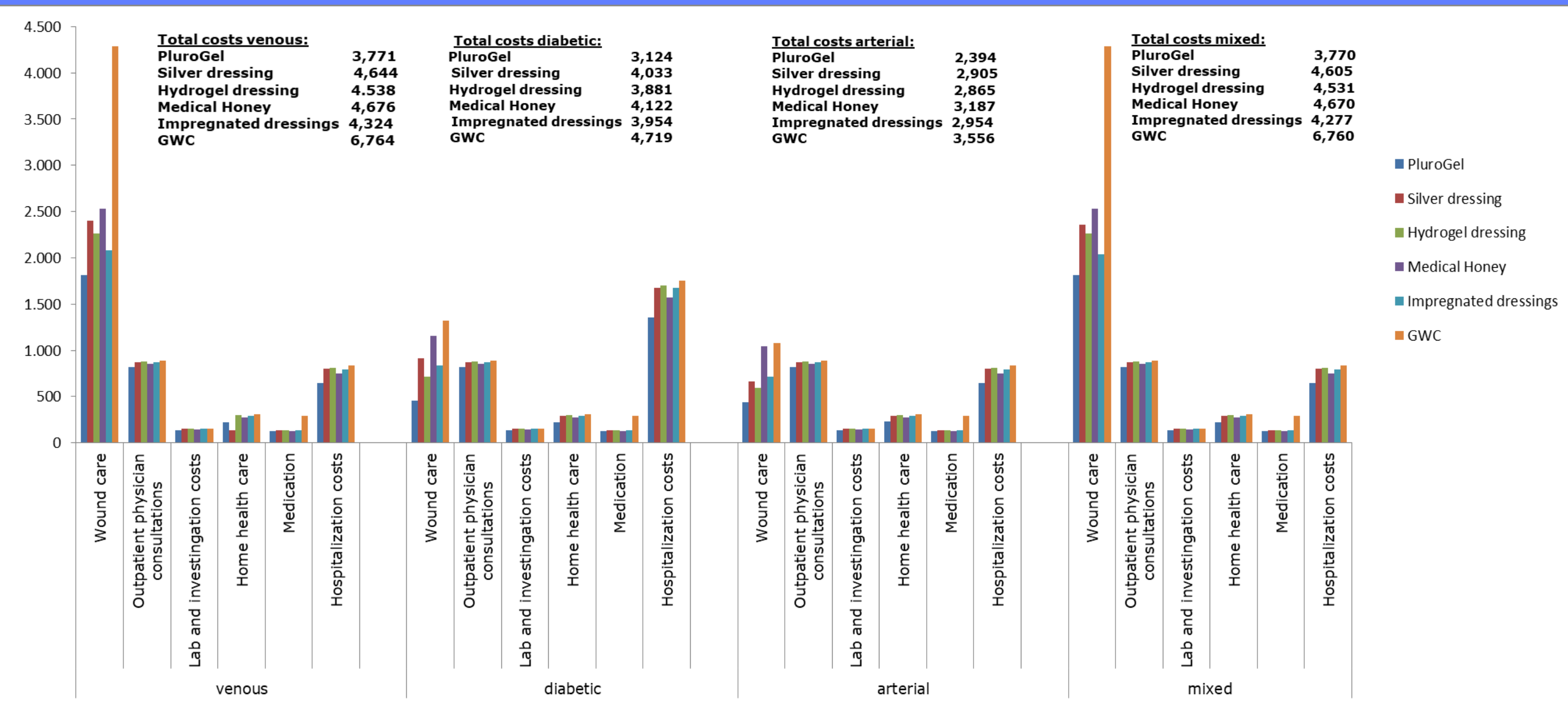
In all wound types PluroGel® is associated with the lowest costs. In venous wounds PluroGel® total costs amount to 3,771 € (silver-dressings: 4,644 €; hydrogel-dressings: 4,538 €; medical-honey: 4,676 €; impregnated-dressings: 4,324€; GWC: 6,764 €). Total cost for other wound types were displayed in **Tab. 1**. Markov model predicted results presents significantly lower dressing costs with a PluroGel® based strategy compared to comparator strategies (1,813.94 € vs. 2,083.12 € - 4,288.64 € in case of venous wounds). Dressing costs per dressing change amounts to 22.30 € for PluroGel® vs. comparator 22.14 € (hydrogel-dressing) - 31.66 € (medical-honey) (**Fig. 2**).



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Fig. 2: Results total costs per per patient , 2017



Source: own calculations

With PluroGel®, patients reach the median healing-rate after 17 weeks. All comparators need prolonged healing-time (silver-dressings: 21 weeks; hydrogel-dressings: 21 weeks; medical-honey: 19 weeks; impregnated-dressings: 21 weeks; GWC: 22 weeks). Ulcer-free-weeks of PluroGel® account for 31 weeks. All treatment alternatives show significantly fewer ulcer-free weeks (24.5 to 27.5 weeks).

Tab 1: Results cost-effectiveness per patient and year, 2017

	Comparator	Costs (€)	Incremental costs (€)	Effectiveness	Incremental effectiveness	Incremental cost effectiveness (€)
venous	PluroGel	3,771.32		30.7		
	Silver dressing	4,643.74	872.42	25.8	-4.96	DOMINATED
	Hydrogel dressing	4,538.20	766.88	25.4	-5.36	DOMINATED
	Medical Honey	4,675.51	904.19	27.5	-3.27	DOMINATED
	Impregnated dressings	4,323.97	552.65	25.7	-4.98	DOMINATED
	GWC	6,764.20	2,992.88	24.5	-6.25	DOMINATED
diabetic	PluroGel	3,123.83		30.6		
	Silver dressing	4,032.69	908.86	25.6	-4.97	DOMINATED
	Hydrogel dressing	3,881.22	757.39	25.2	-5.37	DOMINATED
	Medical Honey	4,121.65	997.82	27.3	-3.27	DOMINATED
	Impregnated dressings	3,953.87	830.04	25.6	-4.95	DOMINATED
	GWC	4,719.08	1,595.25	24.4	-6.22	DOMINATED
arterial	PluroGel	2,393.65		30.7		
	Silver dressing	2,905.46	511.81	25.8	-4.96	DOMINATED
	Hydrogel dressing	2,865.28	471.63	25.4	-5.36	DOMINATED
	Medical Honey	3,187.30	793.65	27.5	-3.27	DOMINATED
	Impregnated dressings	2,953.59	559.94	25.7	-4.98	DOMINATED
	GWC	3,556.46	1,162.81	24.5	-6.25	DOMINATED
mixed	PluroGel	3,769.72		30.7		
	Silver dressing	4,605.47	835.76	25.8	-4.96	DOMINATED
	Hydrogel dressing	4,530.96	761.25	25.4	-5.36	DOMINATED
	Medical Honey	4,670.21	900.49	27.5	-3.27	DOMINATED
	Impregnated dressings	4,276.53	506.81	25.7	-4.98	DOMINATED
	GWC	6,759.55	2,989.83	24.5	-6.25	DOMINATED

Source: own calculations

Sensitivity Analysis

The probabilistic sensitivity analyses (PSA) show the robustness of the model. Monte-Carlo PSA, results of 500 trials plotting incremental cost versus incremental effects, demonstrated that PluroGel® is the dominant strategy among all wound types. (**Fig. 3**)

Fig. 3A: PSA PluroGel® vs. comparator in venous wounds

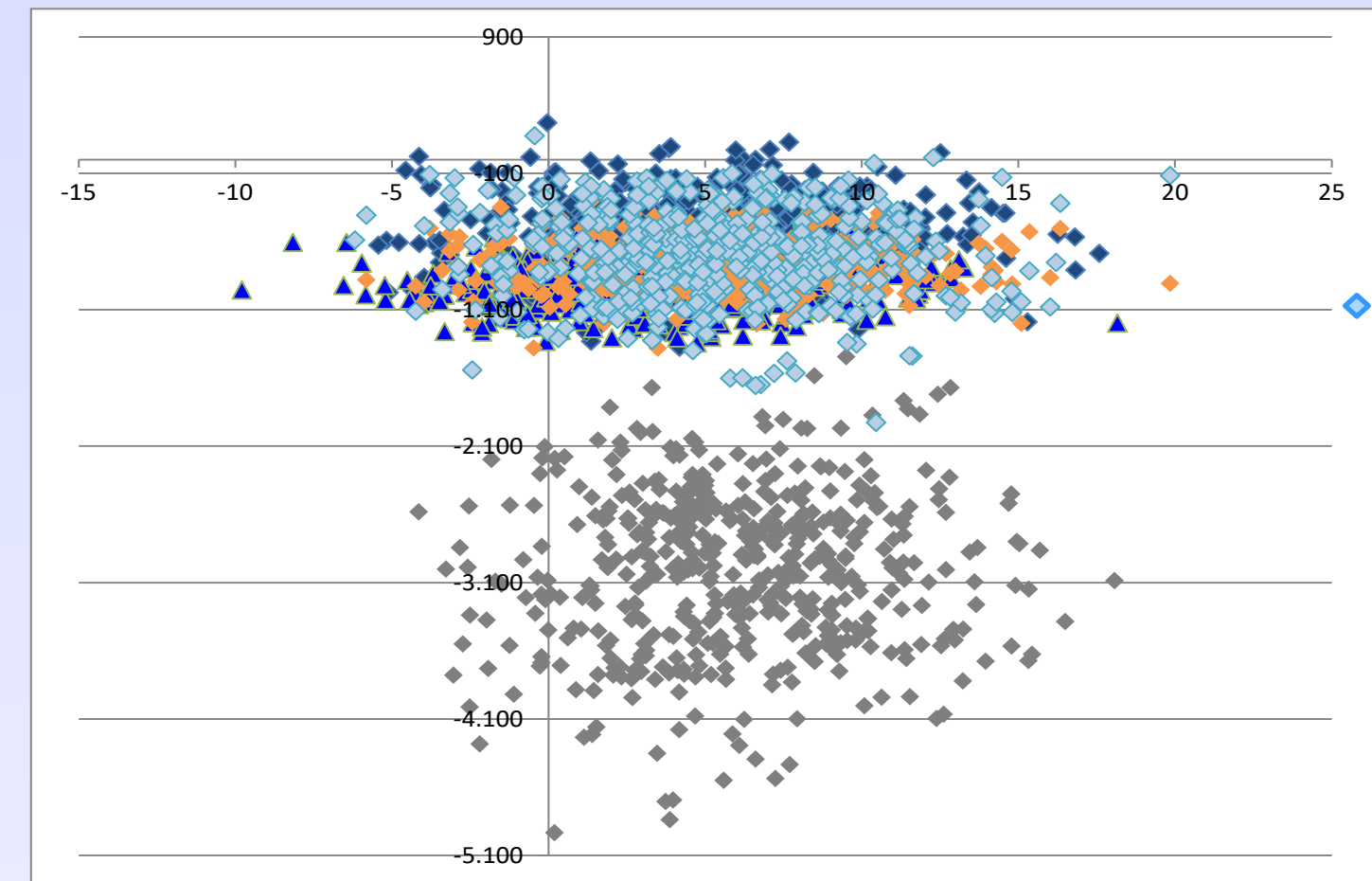


Fig. 3B: PSA PluroGel® vs. comparator in diabetic wounds

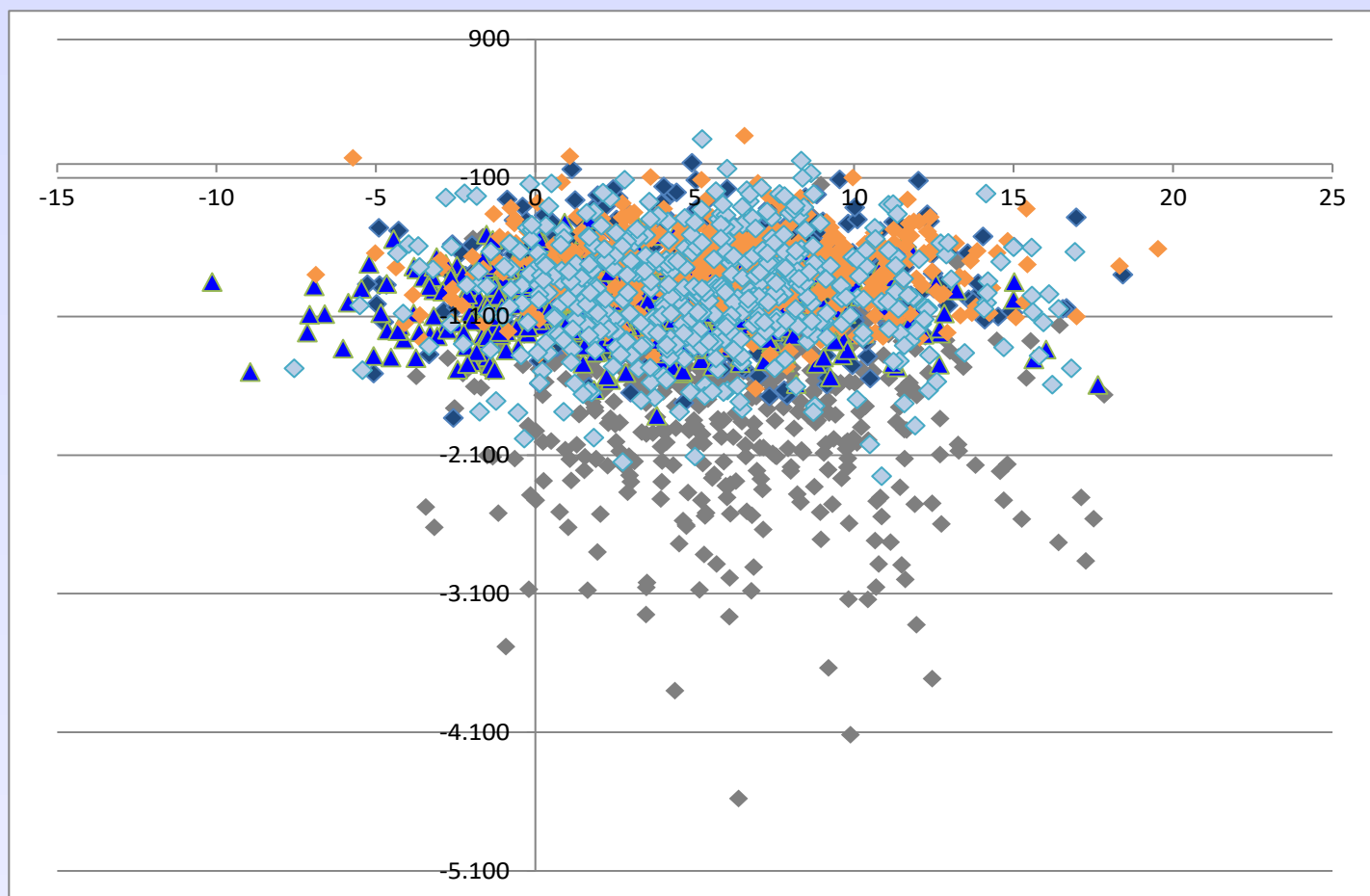


Fig. 3C: PSA PluroGel® vs. comparator in arterial wounds

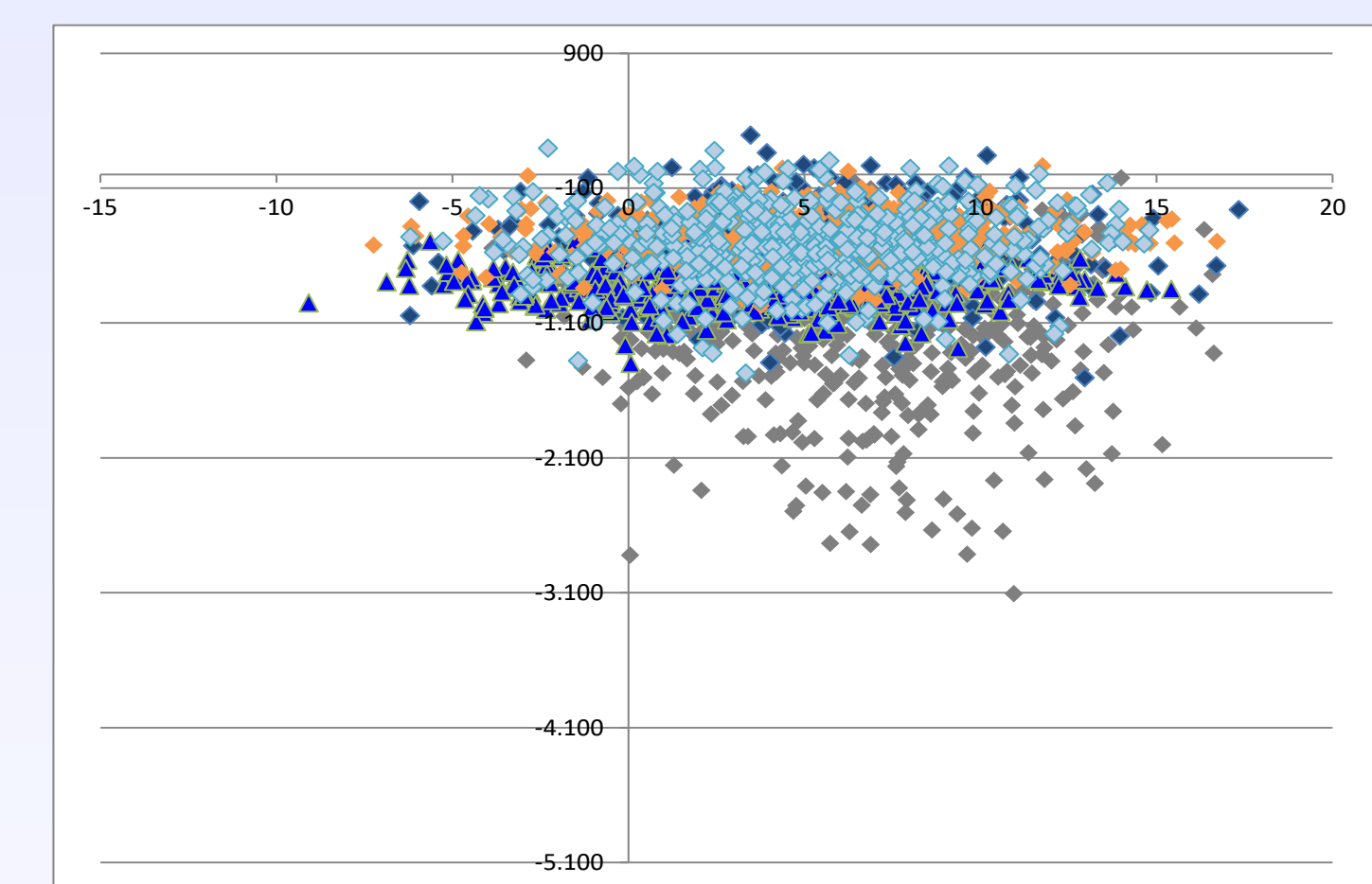
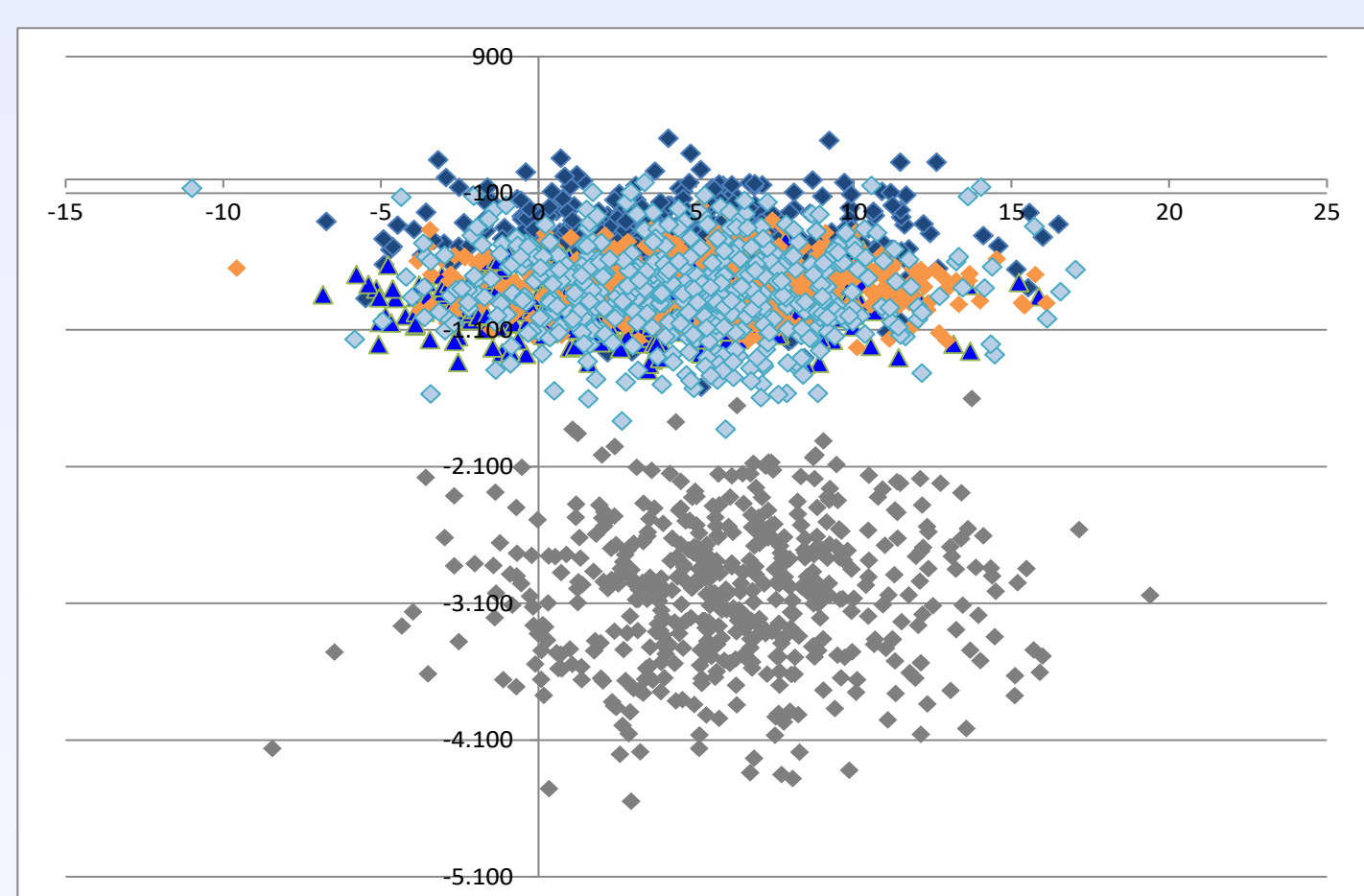


Fig. 3D: PSA PluroGel® vs. comparator in mixed wounds



- ◆ PluroGel® vs. silver-dressings
- ◆ PluroGel® vs. hydrogel-dressings
- ▲ PluroGel® vs. medical-honey
- ◆ PluroGel® vs. impregnated-dressings
- ◆ PluroGel® vs. GWC

Source: own calculations

Conclusion

From the Austrian health-care-systems perspective PluroGel® is the most cost-effective wound care product and yield potential cost-savings.

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Additional Literature with the author