


**THE ECONOMIC BURDEN OF INSULIN INJECTION-INDUCED LIPOHYPERTOPHY.
ROLE OF EDUCATION: THE ISTERP-3 STUDY.**

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*** ANIAD = Associazione Nazionale Italiana Atleti Diabetici (Italian National Association of Athletes with Diabetes)*

Education

Each general IT education group session involved ten people, lasted approximately 60 minutes, and employed BD Educational Starter Kits (Becton Dickinson, Inc., Franklin Lakes, NJ, USA), including site rotation grids and educational injection techniques leaflets, and a blood glucose logbook. The LH “look and feel” teaching method used a BD Lipobox, which provided visual and tactile clues for identifying typical LH lesions. After learning how to rotate injection sites correctly and being instructed not to reuse needles to avoid generating new LHs or worsening existing LHs, all patients received a leaflet with bullet points highlighting the role of IT in optimizing glucose control through unaltered insulin pharmacokinetics and pharmacodynamics [9,33]. An individualized training session then followed addressing real-life problems that affect injection pen handling, including cheiroarthropathy, dysphoria, and reduced self-sufficiency. This stage focused on the relevance of (i) palpating the skin before injection to avoid thicker/stiffer sites or LH nodules, (ii) keeping the pen button pressed down for at least 10 sec at the end of the injection, (iii) performing all previously learned IT-related maneuvers autonomously while exploiting any cm² of healthy skin sequentially, (iv) adjusting the insulin dose as needed, and (v) using the unexplained hypoglycemia and glycemic variation wheel developed by the Forum for Injection Technique (FIT) [34]. Trained HCPs tested participants for their adherence to the three usual insulin titration protocol rules (see below) using a validated questionnaire that included the following four closed answers: (1) no; (2) yes; (3) yes most of the time; (4) no most of the time. Answers (1) and (4) were recorded as “no” the other two answers were recorded as “yes” as previously described [35].

34) Forum for injection Technique (FIT). <https://www.fit4diabetes.com/about-this-site/>. Accessed December 23, 2021

35) International Forum for Injection Technique (FITTER; Rome 2015) Optimize insulin delivery to help improve your patients’ lives and reduce the burden of care. Rome 2015. <https://www.fitter4diabetes.com/pages/the-rome-congress>. Accessed December 23, 2021

Table 1S. Cost comparison among various care activities required for the CG and the IG for severe and symptomatic hypoglycemia in the three subsequent 6-month observation periods (pre-randomization [T-6/T0]; first [T0/T+6] and second [T+6/T+12] follow up semesters). Costs were calculated from average National Health Service rates, as already reported (19). PHV = physician home visit; ER = emergency room visit and treatment; EMS = emergency medical service call; FM= family member; C = caregiver: WD = working day; DMC = daily hospitalization cost.

Event type	Cost/Event (€)	Control Group n.318												Intervention Group n. 395											
		Severe Hypos						Symptomatic Hypos						Severe Hypos						Symptomatic Hypos					
		T-6/T0		T0/T+6		T+6/T+12		T-6/T0		T0/T+6		T+6/T+12		T-6/T0		T0/T+6		T+6/T+12		T-6/T0		T0/T+6		T+6/T+12	
	Events n.	€	Events n.	€	Events n.	€	Events n.	€	Events n.	€	Events n.	€	Events n.	€	Events n.	€	Events n.	€	Events n.	€	Events n.	€	Events n.	€	
		89		72		80		316		277		311		91		38		12		308		59		25	
PHV	25.8	28	722.4	25	712.5	27	696.6	96	2476	79	2038.2	88	2270.4	20	516	12	309.6	6	1548	93	2399.4	18	464.4	8	206.4
ER	241.0	85	20485	83	20002	84	20.244	2	482	1	241	1	241	91	21931	40	9640	3	723	2	482	1	241	0	0
EMS	128.5	16	2056	15	1926.5	16	2.056	0	0	0	0	0	0	17	2184.5	14	1799	7	899.5	0	0	0	0	0	0
FM/C						348	27.352,8	80	6288	65	5109	70	5502	370	29082	116	9117.6	80	6120	82	6445.6	13	1670.5	6	471.6
WD	78.6	356	27981.6	333	25173.8																				
DHC	750	24	18000	23	17.250	24	18.000	0	0	0	0	0	0	25	18750	14	10500	5	3750	0	0	0	0	0	0
Total cost (€)			69245		66064.8		68349.4		9246		7388.2		8013.4		77107.5		20866.2		13045.5		9327		2375.9		678
Δ%					-4.6		-1.3				-20.1		-13.3				-72.9		-83.1				-74.5		-92.7