Evaluation of therapeutic education on knowledge of Correct Use of Insulin Pen in inpatients: the CUIP Study

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Background: Diabetes mellitus (DM) is linked to high risk and prevalence of microangiopathy (mostly determined by hyperglycemia, which is the single most important risk factor) and macroangiopathy (whose risk is boosted by the presence of microangiopathy): those diabetic complications reduce both life quality and expectation[1]. Therapeutic education can improve adherence to correct lifestyle and therapy so improving glycemic control and reducing diabetic complications[2-4].
Aim of the study is to evaluate, after assessing knowledge of **C**orrect **U**se of **I**nsulin **P**en (CUIP) in insulin treated inpatients performed at hospital admission, efficacy of therapeutic education performed during hospitalization in improving CUIP.

Methods: Cohort prospective study. Using a 10-step checklist (**figure 1**) with correct insulin injection sequence[5] (step: 1,9 hand hygiene; 2,3,7,8 needle use and management; 4,5,6 injection technique; 10 pen storage) we performed CUIP evaluation at admission (T0) in insulin treated diabetic patients: for each correct step = point 1, for each wrong step = point 0; the higher the score the better the knowledge (possible range 0-10). Nursing team carried out therapeutic education during hospitalization, then performed a new CUIP evaluation at discharge (T1). Exclusion criteria: no insulin therapy; need for caregiver for insulin injection; critical illness with inability to cooperate. Data collected were analyzed by descriptive analysis and t-test.

Results: Among 167 patients with DM admitted from january to december, 51 met inclusion criteria and were enrolled: mean age was 77.78 ± 7.51 years, male population was 49.02%; time from previous self-reported education was extremely wide (1-444 months, mean 55.46 ± 84.66 months). Interval between T0 and T1 was 7.84 ± 2.12 days. Number of correct executions for each step of the check-list is reported in **table 1**. The worst performances were observed for step 1 and 9 (both related to hand hygiene) and for step 6 (related to duration of injection). After targeted education we observed improvement in the score for all steps, but step 1, 6 and 9 remained the worst. At the moment of admission (T0) CUIP scores were: overall 7.88 ± 1.49, men 7.84 ± 1.62, women 7.92 ± 1.38. Therapeutic education performed during hospitalization has led to a statistically significant improvement in CUIP score at discharge time (T1): overall 9.35 ± 0.93, men 9.32 ± 1.03, women 9.38 ± 0.85. No difference between gender was found (**Table 2**).

Discussion: Although only 52.94% of patients received education in the year preceding admission, we found a good score at baseline (7.88/10). However, only about 50% wash their hands (in another study 70% were observed[6]) and only about 60% wait 10 s before removing the pen from skin (in a large multicenter survey, including 13289 patients, were reported a value of 31.9%[4]): the first may be related to site infection, the latter to leakage or backflow of insulin from the skin leading to possible incorrect insulin dose administration[7]. Hospital targeted education improved significantly total CUIP score, regardless of gender, and each item of check-list. Indeed structured education is considered an important part of the care process, being aimed at acquiring and maintaining skills and showing positive effects not only on knowledge and management of the disease but also on outcomes (e.g. complications and quality of life). Correct management of drug therapy is part of the educational pathways associated with successful results and educational activity by nurses has increased its effectiveness in the short term[8]. So, short T0-T1 interval in our study might explain positive results obtained.
Limits of study: small sample; short interval between evaluations.

Conclusion: As inpatient education seems to improve CUIP, time should be spent on it, every time patients are hospitalized and clinical conditions allow it. A larger sample and a later further evaluation are needed.

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Figure 1: check-list used for evaluation

#Item	T0 Observations: 51		T1 Observations: 51		T0 + T1 Observations: 102	
	Correct (N)	Correct (%)	Correct (N)	Correct (%)	Correct (N)	Correct (%)
1	26	50.99	44	86.27	70	68.63
2	51	100	51	100	102	100
3	48	94.12	51	100	99	97.06
4	49	96.08	50	98.04	99	97.06
5	49	96.08	50	98.04	99	97.06
6	30	58.82	41	80.39	71	69.61
7	50	98.04	51	100	101	99.02
8	37	72.55	50	98.04	87	85.29
9	22	43.14	39	76.47	61	59.80
10	40	78.43	50	98.04	90	88.23

Table 1: number of correct observations divided by each check-list item (green: higher scores; red: lower scores)

Population	T0 score	T1 score	T0 vs T1
Overall (n = 51)	7.88 ± 1.49	9.35 ± 0.93	P < 0.0001
Male (n = 25)	7.84 ± 1.62	9.37 ± 1.03	P < 0.001
Female (n = 26)	7.92 ± 1.28	9.38 ± 0.85	P < 0.0001
Male vs Female	P = 0.8447	P = 0.8078	

Table 2: CUIP scores (mean±standard deviation) and P-values