

# Assessment of quality of treatment in insulin-treated patients with diabetes using a pre-filled insulin pen. The ORBITER Study Group

*Stefano Albano and Orbiter Study Group*

Struttura Complessa di Endocrinologia, Diabetologia e Dietetica, AUSL TA/1-Presidio Ospedaliero SS. Annunziata, Taranto, Italy

**Abstract.** International guidelines recommend that objectives for diabetes therapy include the reduction of complications associated with the disease, together with an improvement in the quality of psychosocial care and treatment satisfaction of people with diabetes. Purpose of the study was to assess the impact on the quality of treatment of replacing traditional syringe insulin injections with Novolet™ pre-filled insulin pen. The “Orbiter” observational study enrolled 1,622 insulin-treated diabetic patients from 91 Italian diabetes care centers. The survey was carried out by comparing the outcomes of the widely used Diabetes Treatment Satisfaction Questionnaire (DTSQ), at the time of enrolment (T0) and 30 days later (T+30). The following items were assessed: knowledge of the pathology, flexibility and ease of treatment, continuation and recommendation, hypoglycemia/hyperglycemia status and satisfaction. Replacement of the syringe with the Novolet™ device produced a statistically significant improvement in all items assessed by the questionnaire. Scores were particularly relevant for the items “continuation” and “recommendation” and in subjects with an active working and social life. Elderly patients also indicated that the new device was easier to use and handle, although in a slightly less marked way. On the basis of the obtained results, Novolet™ pre-filled pen might represent a useful tool to improve quality of treatment in patients with insulin-treated diabetes leading to a better disease management and compliance to insulin-therapy.

**Key words:** Diabetes, pre-filled insulin pen, quality of treatment, DTSQ

## Introduction

The foremost goals of diabetes therapy are to normalize parameters of metabolic controls and to improve Quality of Life (QoL), which is markedly decreased in patients with diabetes (1). Due to the chronic nature of the disease and its therapeutic constraints, quality of treatment dramatically influences QoL of insulin-treated diabetic patients (2). Therefore, in the attempt to reduce patients perception of a low quality of life, researchers have focused their efforts on developing flexible therapeutic regimens and new, easy to handle, treatment devices (3). Moreover, it has been shown that such achievement could

lead to an improvement of the adherence to treatment and consequently to a better glycemetic control (4).

Quality of life has been increasingly considered as a crucial parameter to be measured in randomized clinical trials aimed at assessing the efficacy of new treatments for diabetes, given that St. Vincent Declaration guidelines explicitly recommend an improvement of psychosocial care of diabetic patients so they could live “a life experience approaching that of the non-diabetic” (5, 6). Alongside with the development of worldwide collaboration in clinical research, the demand for instruments that can be internationally utilized has dramatically increased (7). Among the generic and disease-specific instruments available, for our

purposes we chose to use the Diabetes Satisfaction Questionnaire (DTSQ), which has been recommended by St. Vincent Declaration in order to monitor psychological well-being and treatment satisfaction (8). Indeed, the above questionnaire has been successfully used in several other related clinical studies (9,10) and in particular in *the multicentre Diabcare initiative* (11).

In light of this background, "Orbiter" observational study was undertaken. Aim of the investigation was to assess how the substitution of the traditional insulin injection by a pre-filled pen would be perceived by diabetes affected patients, with particular attention to the quality of treatment impact.

## Materials and methods

Between January and May 2000, 1,817 subjects were invited to participate in the "Orbiter" study, which took place in 91 Italian diabetes centers. Subjects were enrolled by using random sampling lists stratified by diabetes insulin therapy (OHA plus insulin or only insulin therapy). Only vial users subjects were recruited. Patients were considered not eligible if they were illiterate or unable to fill in the questionnaire for mental problems, or if they suffered from serious co-morbidities.

Patients, on the occasion of the encounter, were asked to fill up three anonymous self-evaluation questionnaires regarding their quality of treatment satisfaction. A specific code center and patient gave the possibility to link the anamnesis report from physician with the patient's questionnaires. Self-administered instrument (DTSQ) was chosen among those internationally recognized.

Among the total number of patients, 49% were men (mean age was 55 years), 51% were women (mean age was 59.2 years). The fact that mean age of women in this study was higher than mean age of men could be attributed to longer life span in women rather than to recruitment reasons. At the time of enrollment, diabetes duration was  $15 \pm 8.6$  years. Mean duration of insulin treatment was 8 years with no significant differences between genders. Table 1 describes characteristics of the participants. Patients perfor-

**Table 1.** Characteristics of the patients enrolled in the study

Total Number of patients	(1817)
Sex (M/F) %	49/51
Age (yrs)	
Men	55 $\pm$ 16.2
Women	59 $\pm$ 16.2
Duration of disease (years)	15 $\pm$ 8.6
Duration of insulin treatment (years)	8 $\pm$ 7.3

ming insulin injections three times a day represented 39% of the subjects, 30% performed insulin injections twice a day, 20% four times and 11% once a day. Female and male subjects under 40 years represented one fifth of the participants to the study, whereas 30% of the patients were aged between 60 and 70 years.

Among the total of 1,817 patients, 1,622 have been considered eligible, according to the inclusion criteria. Men enrolled in the "Orbiter" survey had a higher educational level if compared to women, who were mostly housewives (25%). Retired subjects represented 35% of the total number of patients, and among all professions only "office worker" reached 10% of the total. The majority of patients had a low education level, in fact fewer than 10% possessed a degree, 23% a senior high school certificate, 35% stopped up after junior high school and 37% after elementary. Hypertension, affecting more than 40% of the total number of subjects, was largely the most represented among the concomitant pathologies, whereas one third of the study population was not suffering from any other disease.

After a specific training, during which eligible patients have been instructed, by healthcare professionals, to the use of the new insulin device, patients were asked to use Novolet™ pre-filled insulin pen instead of the conventional syringe for one month. They were also asked to fill up the Diabetes Treatment Satisfaction Questionnaire (DTSQ), a validated, diabetes specific questionnaire (10), at the time of enrollment (T0) and 30 days later (T+30). The DTSQ is a diabetes-specific questionnaire, which focuses on how satisfied patients are with their diabetes therapy. The following items were assessed: knowledge of the pathology, flexibility and ease of treatment, its conti-

**Table 2.** Groups of patients according to gender, age and socioeconomics status

Group	N. of patients	Description
Elderly	437 (27%)	Mostly retire women; low educational level; long term insulin treated (>10 yrs)
Active Elderly	265 (16%)	Mostly men, workers, long term treated
Young recently diagnosed	42 (3%)	<30 yrs; Student or unemployed; type 1 diabetes
Elderly type 2 women	385 (24%)	60-70 yrs old women, low educational level, old diagnosis, recently treated
Mature recently diagnosed	225 (14%)	60-70 yrs old subject, partially still workers, early diagnosed and treated,
Upper class	181 (12%)	30-40 yrs old subjects, highly educated and employed, long term insulin treated
Young with old diagnosis	87 (5%)	<30 yrs; Student or unemployed; type 1 diabetes long term insulin treated

uation and recommendation, hypoglycemia/hyperglycemia status and satisfaction. Furthermore, at T+30 the participants were asked to answer the specific question: "What do you prefer: the traditional syringe or the pre-filled Novolet pen?". Patients were clustered by decade of age alone or in combination with socioeconomic status, as represented in Table 2.

T-Test and ANOVA (One Way) were used when comparing two groups or in multiple comparison, respectively. A  $P < 0,05$  value was considered as statistically significant.

## Results

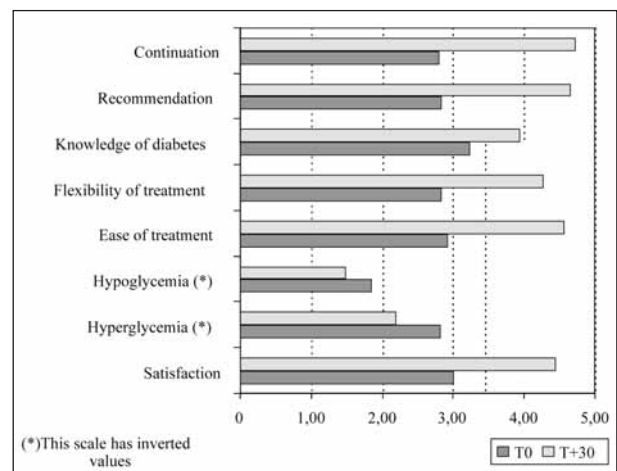
Analysis of the replies to the DTSQ questionnaire at T0 and T+30 is reported in figure 1. Statistical significance threshold was reached in all eight items (continuation, recommendation, knowledge of diabetes, flexibility of treatment, ease of treatment, hypoglycemia/hyperglycemia and satisfaction of the treatment) assessed by the DTSQ. Furthermore, it has to be noticed that "recommendation" and "continuation" parameters produced particularly favorable results, likely as a consequence of the flexibility of treatment and convenience of the device. The best score was reached by "recommendation" item. Overall, substitution of the syringe with the pre-filled pen has positively and significantly ( $p < 0.05$ ) influenced patients' perception of quality of life.

A sub-analysis was also conducted in patients clustered by decade of age. In this case T-test, comparing T0 and T+30 outcomes, confirmed in all clusters the statistically significant result of the scores with the

only exception of the item "recommendation" in the over 80 years old patients (data not shown).

Analysis of the variance, applied to the average score replies to the question: "What do you prefer: the traditional syringe or the pre-filled Novolet pen?" was carried out (figure 2A). Among all subjects interviewed, 69% considered Novolet device to be better than the syringe, 29% were undecided and only 2% preferred the traditional syringe. The results to the above addressed question sorted out by the age of patients, showed that the change was particularly appreciated in young patients, whereas >80 years old subjects were less satisfied.

Figure 2B, representing cluster analysis by type of patients, shows that 66% of elderly patients preferred the pen. This percentage increased to 71% among active elderly subjects, to 73% in young patients with an



**Figure 1.** Outcome of the replies (Mean score) to questionnaires DTS1Q (T0) and DTSQ (T+30). All differences were statistically significant in the T-Test

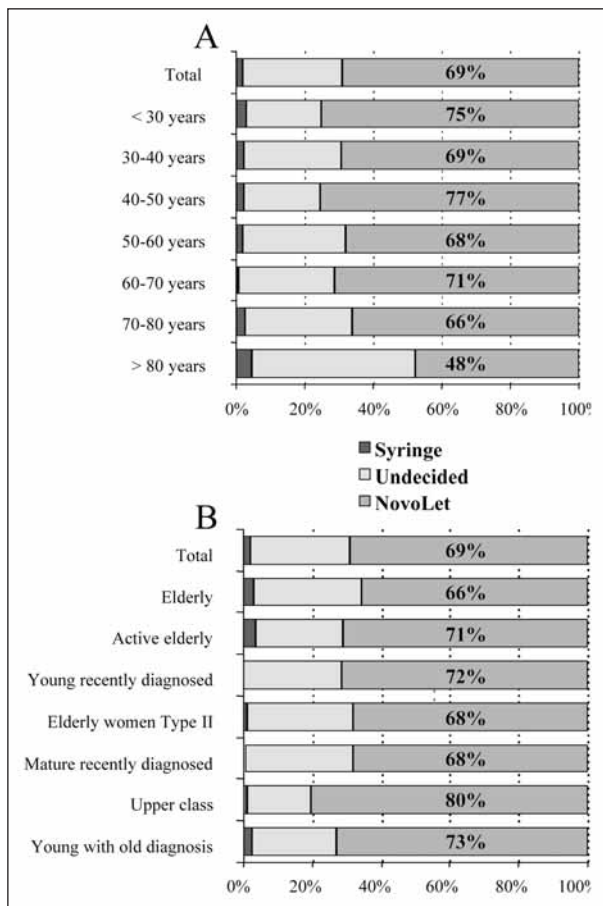


Figure 2. Cluster analysis by age (A) and by groups considering age, sex and socioeconomic status (B)

established diagnosis of diabetes (72% if the diagnosis was recent) and to 80% in the “upper class” subjects. In addition, 68% of mature individuals recently diagnosed as diabetics approved the use of the pen, 32% were undecided and no preference whatsoever was expressed for the use of the syringe in this group. No significant difference was reported in the answers among these groups of patients except for the elderly versus “upper class” comparison. It should also be pointed out that in all groups, the percentage of those favorable to syringes ranges between 0 and 3%. Hence, the variability of Novolet preferring patients has to be attributed almost totally to the percentage of undecided patients.

By metabolic point of view, no differences have been found in metabolic control and number of hypoglycaemic events (data not shown).

## Discussion

The results obtained in the “Orbiter” study are in agreement with data emerging from other investigations demonstrating how new devices are useful to improve adherence to treatment and therefore blood glucose control in patients (4, 12). Other studies, performed in over 60 years old patients, have previously shown that Novolet™ device was highly accepted in this population, and improvement in metabolic control was achieved, as measured by HbA1c levels (13, 14). Regarding quality of treatment, patients appreciated that pre-filled insulin pen was easily transportable and especially simple to use. In addition, this device ensures a more accurate dosing of insulin thus leading to better long-term outcomes. In this survey, we extended the positive results of studies mentioned above to a broader range of patients: young people with a relatively recent diagnosed diabetes, mature patients with an active working life and elderly patients with a long history of diabetes. Indeed, all items assessed showed a statistically significant difference between T0 and T+30 outcomes in all groups. T+30 high DT-SQ scores for both hyperglycemia and hypoglycemia items should be attributed to greater accuracy when administering insulin with the Novolet™ device which provided a better metabolic control in patients (fewer hyperglycemia episodes) associated with a major safety of insulin therapy (fewer hypoglycemia episodes). Overall, patients reported a strong desire to continue using insulin pens and willingness to recommend their use. Only the elderly were slightly less convinced and few of them recommended the use of the device to someone else. In fact, maximization of outcomes differences was reduced in these subjects for obvious reasons of idleness, lower scholarship and age-related lack of social intercourses.

We should not forget that quality of life, in particular for insulin-treated diabetic patients, has to be considered in a multidimensional way including physiological, psychological and social aspects; for this reason the assessment of its relative impact on treatment satisfaction could be difficult. In this context, development of informative and well-designed questionnaires, which can be used as instruments in clinical trials, has become highly valuable. For example, the Diabetes



Treatment Satisfaction Questionnaire (DTSQ) used in this study is to be considered as a helpful instrument internationally recognized to monitor diabetes treatment satisfaction. In fact, patients of a wide range of age and intellectual abilities can easily fill it up.

Recently, it has been demonstrated that quality of life in diabetic patients is dependent on the severity of the disease itself and its associated complications (1). For instance, even dietary therapy or use of oral anti-diabetic drugs could have a negative influence on quality of life in patients because of constraints, side effects, and even physiological/psychological complications they may generate (15). Besides, it has been shown that insulin therapy has an even more negative impact on the quality of life in patients (16, 17). In this context, improving quality of treatment in insulin-treated patients represents a major challenge, and new devices offering substantial upgrading in convenience, accuracy and flexibility might significantly contribute to this aim.

In conclusion, Novolet™ pre-filled pen appears to be helpful in insulin-treated diabetic patients to improve their overall attitude towards insulin therapy and gain confidence in managing their disease.

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Correspondence: Dott. Stefano Alfano,

Struttura Complessa di Endocrinologia, Diabetologia e Dietetica  
AUSL TA/1-Presidio Ospedaliero SS. Annunziata,

Via Bruno - 74100 Taranto, Italy

Tel: +39-(0)99-4585264

E-mail address: endocrinologia.ta@libero.it

**Centres involved in the study**

Aiello A. (Osp. Cardarelli, CB); Albano S. (Osp. S.S. Annunziata, TA); Arsenio L. (Osp. Maggiore, Parma); Baraldi L. (Osp. S. Orsola, Bologna); Basso A. (Vicenza); Basso R. (Osp. S. Paolo, Savona); Battezzati M. (Osp. S. Antonio e Biagio, Alessandria); Bedetta C. (Osp. Murri, Fermo); Bossi A. (U.O Treviglio, BG); Boemi M. (Osp. Inrca, Ancona); Brogna F. (Usl Lungo Dora Savona, TO); Buscemi S. (Partinico); Caramellino A. (Osp. S.Spirito, Casale M.to); Carboni L. (Osp. SS. Trinità CA.); Cavaiani P. (Cad. Osp. Abbiategrasso, Abbiategrasso MI); Chiavetta A. (Osp. Cannizzaro CT, Cannizzaro); Coletti F. (Smom G. Da Empoli); Contegiacomo V. (Osp. Civile, Carmagnola); Corda A. (Osp. Iglesias); Cutolo M. (ASL NA/4); D'Alessandro G. (ASL NA/5); D'Ambrosio M. (Este); D'Apote M. (Centro Hercolani, Bologna); De Berardinis S. (Osp. Civile, Giulianova); De Joannon U. (Osp. Civile, Piacenza); Di Alesio A. (Smom 4 Cantoni, RM); Esposito A. (AID Cava T. SA); Farina F. (Osp. SS: Trinità, Borgomanero); Festa N. (ASL FG/3); Floridi F. (Smom A. Irpino RM); Fongher C. (Contarina RO); Fresu P. (Clinica medica, SS Cad); Gadaleta G. (Cad. Osp. Di Cittiglio, VA); Gennaro R. (Valdagno); Gentile F. (ASL BA/4); Gibilras R. (Osp. Gela, Gela); Giovannini C. (Reggio Spec.); Grattieri A. (Cad. Osp. Magenta); Guastamacchia E. (Policlinico, Bari); Guidi P. (Latisana); Imperato C. (Osp. S.Andrea, La Spezia); Iovino A. (AID Nola, NA); Iurlaro V. (Francavilla F., BR); Lancia L. (Smom C. Negro); Legati F. (II Med. Sped. Riuniti, Brescia); Liguori M. (Roma); Lino M. (Osp Careggi FI); Lo Pinto S. (Smom C. Negro); M.Grazia R. (Osp. Civile, Gaeta, LT); Maioli A. (S. Carlo, Potenza); Mairino P. (Osp. S.Andrea, Vercelli); Marcone T. (Osp. Riuniti, FG); Marelli G. (Cad. Osp. Desio, MI); Marini F. (Peschiera); Mastropasqua A. (Cad. Osp. Garbagnate, MI); Mattina G. (Spec. Ambul PA); Mignano S. (ASL NA/1); Negri S. (Cad. S.Giuseppe, S.Giuseppe MI); Nodari L. (Cad. Osp. Orzinuovi, BS); Parla D. (Osp. Sciacca); Pascuzzo M. (Pacchiotti); Pellicano F. (Osp. S. Anna, Ferrara); Piergiovanni F. (Osp. S.Giovanni A., Cad Addolorata); Pieri M. (Osp Careggi FI); Pistone S. (Osp S.Carlo, PZ); Pociati S. (Osp. Civile, Foligno); Pugliesi C. (Siracusa H/Avola); Quatraro A. (Clinica S. Rita, TA); Randazzo C. (Spec. Ambul AG e CL); Rizzo M. (Osp. Buccheri, Buccheri); Romano G. (Policlinico Messina); Rosatello A. (Osp. S.Lorenzo, Alba); Rossi E. (Cad. Aversa, CE); Rufino C. (Osp. S.Corona, Pietra Ligure); Runello M.F. (Acireale); Sancandi M. (Palmanova); Sbordone P. (Servizio di Diabetologia, Reggio Emilia); Sandro P. (Rovereto); Schembri S. (Cecina, LI); Silvestri C. (Osp. Civile, Carpi); Simioni N. (Cittadella); Spanu M.A. (Lanusei); Stagno G (Palmi) Tassiello R. (ASL NA/1); Terraciano A. (AID. Caserta); Testori G. (U.O Diabetologia, Osp. Fatebenefratelli, MI); Trojan N. (S. Vito al Tagliamento); Trifirò R. (Carrara); Trojani C. (Osp. Degli Infermi, Rimini); Tufano A. (Cad. Osp. S.Donato, S.Donato Milanese MI); Viola C. (Cad. Osp. Magenta, MI); Vitacolonna E. (Osp. Civile, Pescara); Volpi A. (Montebelluna, TV).