

# 100 Years After the Discovery of Insulin and in the Era of New Generations of Insulins, What Do Our Patients and Care Staff Know About Insulin Therapy?

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## Abstract

According to "Never Events", insulin administration errors are serious preventable adverse events that should not have occurred if adequate preventive measures had been implemented. The event "insulin administration error" is on the ANSM list published in 2012. The National Health Service's (NHS) "Never Events insulin" has developed a module on insulin therapy management entitled "Preventing insulin-related medication errors". Proper use and knowledge of insulin management can prevent these events. Our study presents the results of a survey designed to assess both the knowledge of healthcare personnel and a group of diabetic patients in the Souss Massa region of Morocco. Our survey was an opportunity to re-educate our patients and review the knowledge of a group of staff interviewed, underlines the important deficit in knowledge and practice of nursing staff and insulin-treated patients, suggests that urgent intervention should be considered, particularly with young nursing staff, and also to review the therapeutic education of insulin-treated diabetics in order to improve their knowledge and better prepare them for the advent of new generations of insulin.

**Keywords:** Insulin, insulin-treated patients, health care personnel, therapeutic education.

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## INTRODUCTION

In 1921, one of the greatest discoveries in the history of medicine was made: that of insulin by a team of Canadian researchers at the University of Toronto [1]. According to the "Never Events", errors related to insulin administration are serious and avoidable adverse events, which should not have occurred if adequate preventive measures had been implemented [2, 3]. The event "insulin administration error" is listed by the French National Agency for Medical Safety (ANSM) in 2012 [4]. Proper use and knowledge of insulin management methods can prevent these events [5]. Our study is a survey designed to assess the knowledge of nursing staff and insulin-treated diabetic patients in the Souss Massa region of Morocco.

## MATERIALS AND METHODS

The survey involved 250 people, divided into two groups: 135 healthcare staff working in different sectors and a group of 115 insulin-treated diabetic patients seen in consultations and hospitalization. Our two questionnaires (one for the paramedical staff and one

for the patients) were drawn up on the basis of the recommendations and guidelines issued by the ANSM, and included four main aspects: knowledge of the different types of insulin, injection technique, conservation methods, attitude to hypo- and hyperglycemia events and sources of information for both groups. The responses to both questionnaires were recorded and analysed in Excel. A review of the literature was carried out in parallel using the Google Scholar search engine with the following keywords: nurses, knowledge, insulin, therapeutic education. Finally, a reminder of good practice in insulin administration was provided for both groups.

## RESULTS

Our study concerns 135 health care personnel, 87.3% of whom are nurses and 12.7% are midwives, working in different sectors: public, private and military. 46.7% of the staff were aged between 30 and 40 years, 24.4% between 20 and 30 years, 20.7% between 40 and 50 years and 7.4% between 50 and 60 years. 46.7% of them had an experience between 5 and 10 years, 21.5% had an experience of less than 5 years, 20% between 10

and 15 years and 11.9% had an experience of more than 15 years. 37.2% have already worked or are still working in a diabetic department, 83.7% of the staff have not had a practical workshop on insulin therapy and 38.8% admit that they are not comfortable with the administration of insulins for fear of hypoglycemia.

As for the patients, there were 115: 55% men and 45% women with an average age of 45.7 years. 70.4% have type 2 diabetes, 19.4% have type 1 diabetes, 3.7% had gestational diabetes and 5.6% had cortico-induced diabetes. 53.8% were treated with human insulin, mostly with 2 premixes and 36.2% were treated with analogs. 45.6% of the patients had no idea about the notion of insulin kinetics (rapid, mixed, semi-slow and slow) and 38.2% did not know the presentation of insulin in pen.

### Nursing Staff and Injection Techniques

- 38.6% check for the absence of lipodystrophy.
- 61.4 % are unaware of the concept of lipodystrophy (figure 1).
- 34.1% do not disinfect the injection site compared to 65.9% who do.
- 16.3% % do not carry out a perpendicular injection.
- 45.9% do not respect the withdrawal time due to lack of knowledge and 54.1% of staff respect it (figure 2).
- 40.7% used the needle only once, 25.6% used it twice and 33.7% used it more than 3 times.
- 21.5% of staff did not recognise the value of changing needles.

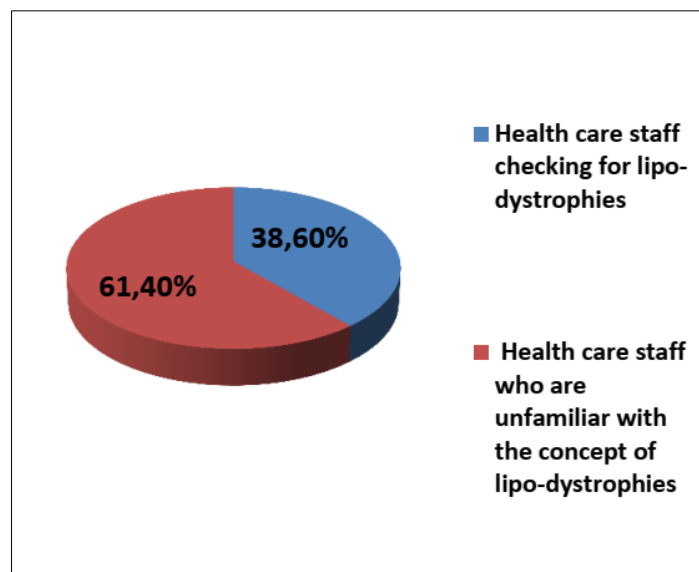


Figure 1: Staff responses on checking for lipodystrophy before injection.

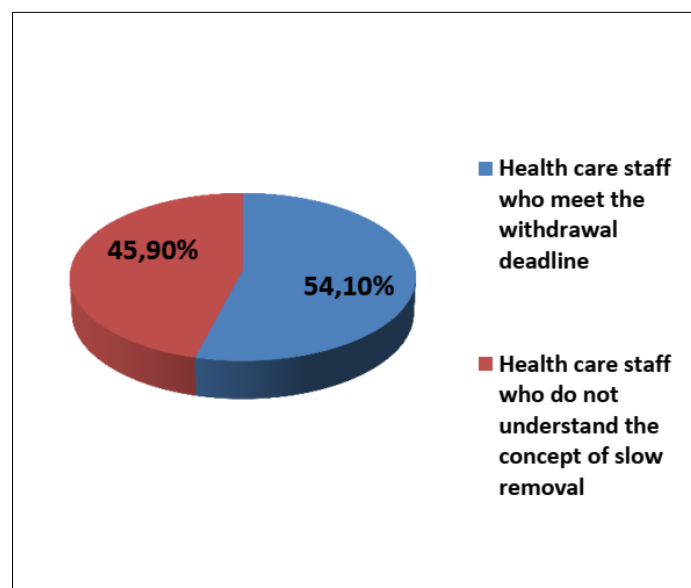
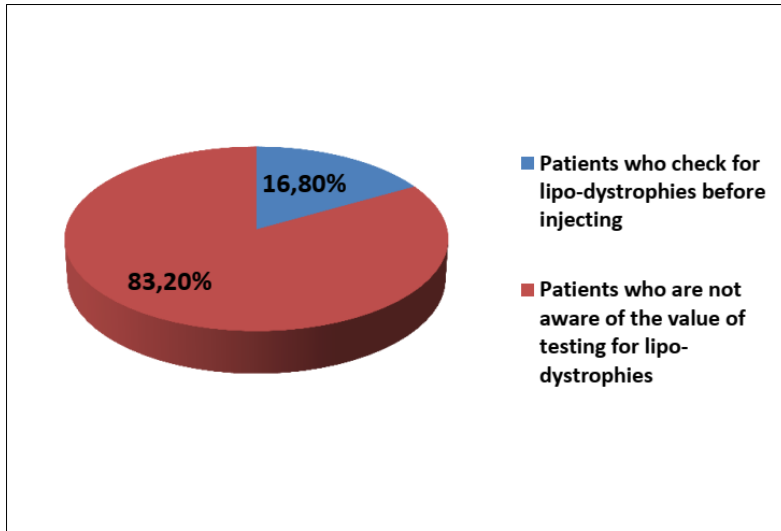


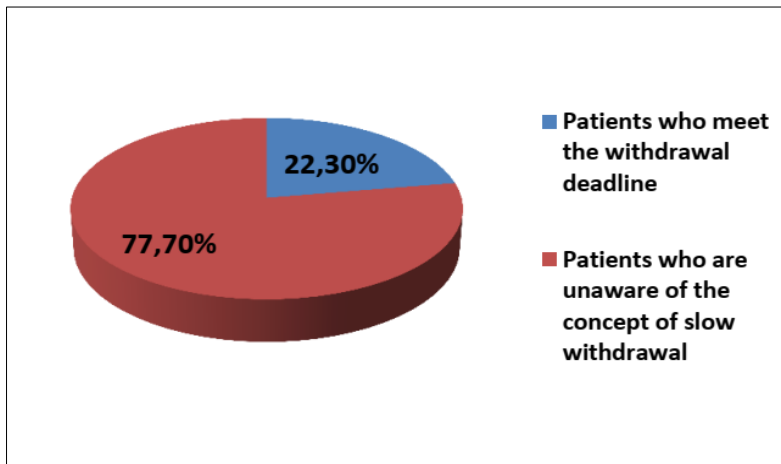
Figure 2: Staff responses on time to withdrawal after insulin injection.

**Patients and Injection Techniques**

- 28.3% did not wash their hands before injection.
- 83.2% of patients do not check for lipodystrophy due to lack of knowledge, compared to only 16.8% who do.
- 17.4% do not inject perpendicularly.
- 77.7% do not respect the 10-second withdrawal time against only 22.3% who do.
- Only 7.4% of patients use the needle only once, 6.5% use it twice and 86.1% use it more than three times.
- 12.5% of patients do not know the importance of changing the needle and 87.5% do not do so for economic reasons.



**Figure 3: Patients' responses on lipodystrophies.**



**Figure 4: Patients' responses on the time to withdrawal after insulin injection.**

**Conservation Conditions**

- 69.3% of staff knew that the insulin vial or pen should not be used for more than one month if opened compared to 30.7% who did not know.
- 88.7% of patients were unaware that insulin should not be used for more than one month if opened, compared to only 11.3% who were aware of this.
- 17.8% did not check blood sugar levels 15-20 min after resugaring.
- 45.2% do not give the usual dose of insulin to patients fearing a new hypoglycaemic episode, while 30.4% do so and 7.4% do not know what to do.

**Attitude to Hypoglycemia**

- ✓ Responses from health care staff:
  - 52.6% answered that they ask patients to consume slow sugar.
- ✓ Patient responses:
  - ✓ 76.8 % of patients re-sugar using slow sugar, compared to only 23.2% who re-sugar using fast sugar.
  - ✓ 39.4% of patients control capillary blood glucose after sugar intake.

- ✓ Only 32.6% know how to reduce insulin doses if hypoglycaemia is recurrent.

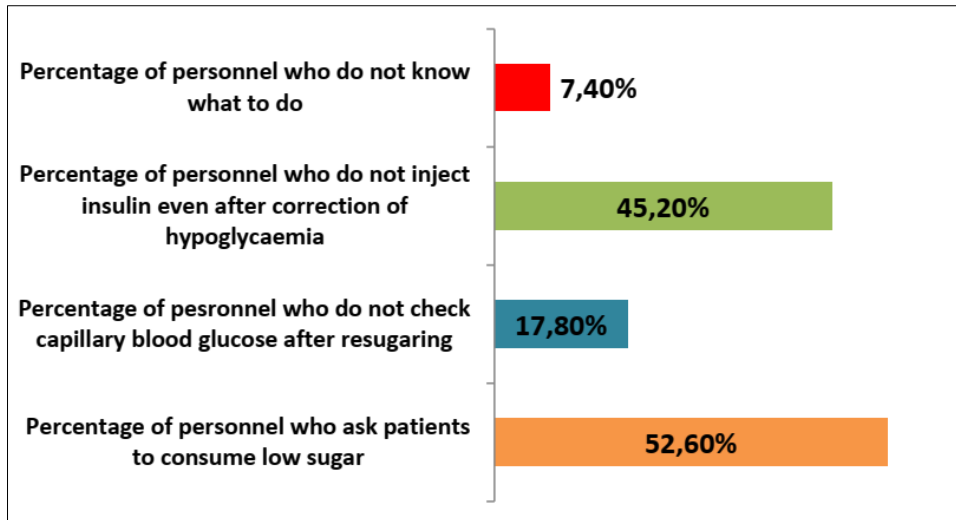


Figure 5: Health care staff response on their attitude to hypoglycaemia.

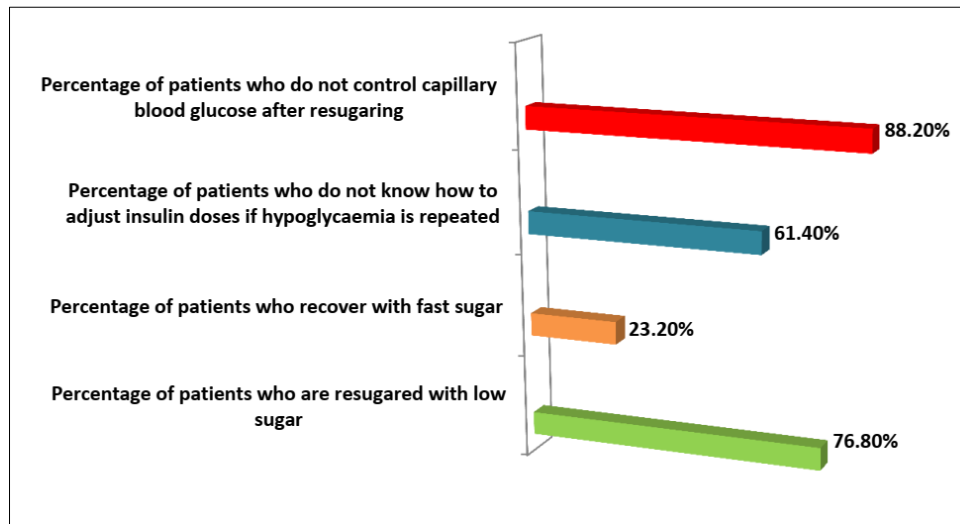


Figure 6: Patients' attitudes to hypoglycaemia.

#### Attitude to Hyperglycaemia

- Health care staff: 52.6% use saline, 45.2% inject a bolus of rapid insulin, 16.3% prefer not to do anything because they are afraid of hypoglycaemia and 8.1% do not know the modalities of correction.
- Patients: 87.% do not increase their insulin dose and do not know the correction methods.

#### Attitude towards Stopping Eating or Vomiting in a Type 1 Diabetic Patient

- Staff response: 53.8% think that all insulins should be stopped, only 34.5% think that basal insulin should be maintained and 11.7% do not know what to do.
- Patient response: 15% of patients stop all insulins and 85% maintain basal insulin and stop rapid insulin.

#### After the Basal Insulin Injection is it Compulsory to Eat?

- Staff response: 47.4% answered that it is compulsory to eat, 22.6% thought it was not compulsory to eat and 30.1% did not know.
- Patients' responses: 78.5% think that you should eat and 21.5% do not.

#### Sources of Information for Both Groups

- Health care staff: 54.1% received information in theory, 88.1% during their practice, 73.3% asking other health care professionals and only 17% consulting electronic media.
- Patients' sources: 83.5% answered that their exclusive source of information is medical and paramedical staff and only 16.5% consult the internet.

### Involvement of Health Care Staff in Patient Education on Insulin Therapy

- 24% are willing to participate if they have enough knowledge.

- 62.8% already do it.
- 13.2% are not willing to do so and consider that it is not part of their job.

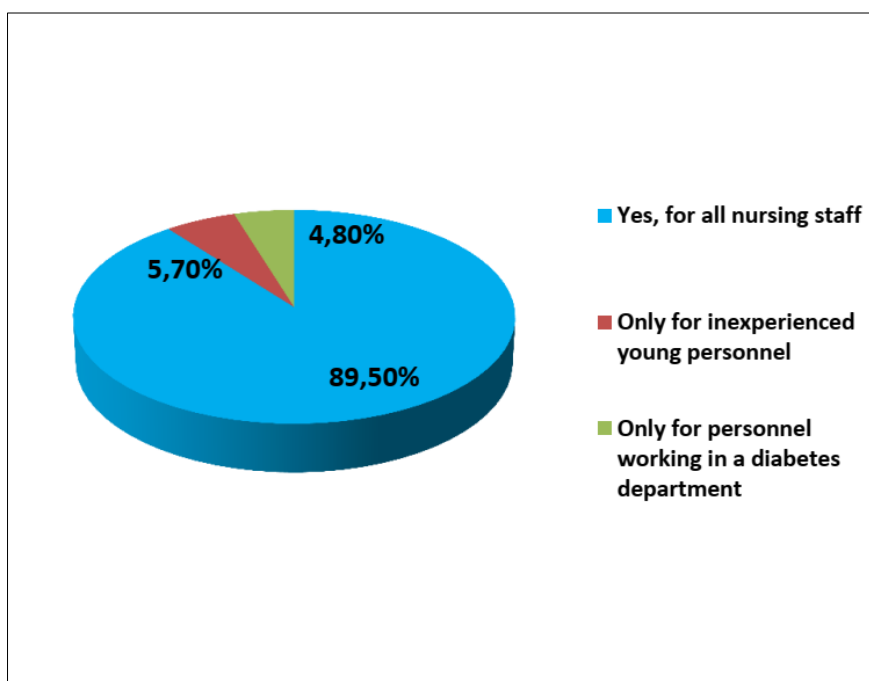


Figure 7: Personnel responses on their desire for insulin therapy training.

## DISCUSSION

Insulin is one of the riskiest drugs, and insulin administration errors are serious preventable adverse events that should not have occurred if adequate prevention measures had been implemented [3-5]. The National Health Service (NHS) has developed a module on insulin therapy management entitled 'Preventing insulin-related medication errors' [2-6].

A report by the NHS National Patient Safety Agency (NPSA) found that there were over 16000 reports of medication incidents involving insulin between 1 November 2003 and 1 November 2009 (NPSA, 2010; 2011) [3, 4]. These included many errors related to the misadministration of insulin due to the similarity of the names of several insulins. As part of the response [3, 4].

As paramedical staff, nurses are front-line professionals. They are called upon to administer insulin correctly, to know how to manage hypoglycaemic and hyperglycaemic events and to participate in the therapeutic education of patients and their relatives [7, 8].

Thus, their knowledge, practice and commitment are key factors in glycaemic control and in educating patients for correct insulin administration [7-9].

The results of our study show a significant and alarming knowledge deficit among both caregivers and patients, which is probably due to the lack of practical courses or workshops on insulin injection techniques, storage modalities, and attitudes towards hypo- and hyperglycaemia.

Our secondary objective is to complete the study by reviewing the theoretical knowledge taught in the different nursing training centres in order to investigate the reason for this deficit and to propose to the teaching staff perhaps to organise practical workshops so as to enrich and develop the skills acquired during the training and which are later reinvested in the real work situation, given that the rate of false answers was particularly high among young staff who lack experience and among those who have never practised in a diabetic department.

Nursing staff are a good target group for strengthening patient education, as a significant percentage of the staff surveyed already give advice on insulin therapy to diabetic patients and others are willing to do so.

As for the lack of knowledge of our patients, we found that the rate of correct answers was more pronounced in type 1 diabetics, probably because they are young and therefore frequently consult the internet for the necessary information and because they have

benefited from repeated therapeutic education sessions in hospitals since they are subject to frequent hospitalisations, compared to type 2 diabetics who are generally older and content with the information given by their doctor or nurse.

Another point that could explain this lack of knowledge is probably the lack of medical staff and the heaviness of their workload, which explains the lack of time dedicated to therapeutic education.

## CONCLUSION

### Our Survey

- Was an opportunity to re-educate our patients and review the knowledge of a group of staff interviewed.
- Underlines the important deficit in knowledge and practice of nursing staff and insulin-treated patients.
- Suggests that urgent intervention should be considered, particularly with young nursing staff, and also to review the therapeutic education of insulin-treated diabetics in order to improve their knowledge and better prepare them for the advent of new generations of insulin.

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