

Glucose Control in Acutely Ill Patients: A Survey of Israeli Internal Medicine Departments

Avishay Elis MD^{1,2*}, Adi Shacham-Abulafia MD^{1*} and Michael Lishner MD^{1,2}

¹Department of Medicine, Sapir Medical Center, Kfar Saba, and ²Sackler Faculty of Medicine, Tel Aviv University, Ramat Aviv, Israel

ABSTRACT: **Background:** Tight glucose control has been shown to improve the outcome of patients with severe acute illnesses who are hospitalized in intensive care units and on intravenous insulin-based regimens.

Objectives: To clarify the attitudes of internists towards tight control of glucose levels in acutely ill patients hospitalized in general medical wards.

Methods: A questionnaire on intensive glucose control in acutely ill patients hospitalized in medical wards was mailed to each of the 100 heads of internal medicine departments in Israel.

Results: Fifty physicians responded. Of these, 80% considered tight glucose control to be a major treatment target, but only two-thirds had defined it as a goal in their ward. Furthermore, only about half had a defined protocol for such an intervention. Most physicians considered patients with acute coronary syndrome, stroke and infectious diseases as candidates for a tight glucose control protocol. The most frequently used modalities were multiple blood glucose measurements and repeated injections of short-acting subcutaneous insulin. The main reasons given for not having a defined protocol were lack of guidelines, no evidence of a clear benefit during hospitalization on a medical ward, and a shortage of adequately trained staff.

Conclusions: Inconsistencies in physicians' attitudes and in treatment protocols regarding tight control of glucose levels in acutely ill patients hospitalized on a medical ward need to be addressed. Evaluation of the feasibility, effectiveness and side effects of a defined protocol is needed before any regimen can be approved by the heads of the internal medicine departments.

IMAJ 2009; 11: 652-654

KEY WORDS: internal medicine, glucose level control, acutely ill patients, survey, hospitalization

trolled studies conducted in intensive care units and based on intravenous insulin regimens [1-4].

Most patients with acute illnesses are admitted to general medicine departments, which often lack sufficient nursing staff with the expertise to administer intravenous insulin-based protocols. Although it is generally recommended that glucose levels be well controlled in patients admitted to medical departments, the recommendations are non-specific and based largely on clinical experience [5]. Furthermore, there is no evidence that maintaining intensive glucose control for patients on medical wards has any short- or long-term benefits [6].

The aim of this study was to clarify the attitudes of the physicians heading the departments of medicine in Israel with regard to various aspects of intensive glucose control in acutely ill patients hospitalized in their departments.

SUBJECTS AND METHODS

A questionnaire regarding various aspects of tight glucose control among acutely ill patients hospitalized in the medical ward was mailed to all 100 heads of internal medicine departments in Israel, in February 2007. The survey was resent 3 months later to those who had not replied.

The questionnaire evaluated the views of the department heads in Israel concerning intensive control of glucose levels in acutely ill patients hospitalized in their department, which patients should have tight glucose control, and whether their department had a defined policy for this purpose. Further questions for those with a defined protocol concerned the target glucose levels, the measures used to control glucose levels, the estimated rate of patients who achieve the target level, and the rate of hypoglycemic events. The reasons for not having a defined protocol were also queried. The survey is shown in Table 1. Replies were anonymous. Data retrieved from the questionnaires were entered into an Excel (Microsoft) spreadsheet.

RESULTS

Half of the internal medicine department heads in Israel (n=50) returned the questionnaire. Most (80%) considered tight glucose control to be a major target of treatment in acutely ill patients hospitalized in the medical wards, but

Tight control of glucose levels has been shown to improve the outcome of hospitalized patients with severe illnesses, such as acute coronary syndrome, sepsis and cerebral stroke. These findings are derived primarily from prospective con-

*The first authors contributed equally to the study

Table 1. Questionnaire on tight glucose levels control in acutely ill patients hospitalized in a department of medicine

1. Should tight glucose control be one of the major targets of treatment of acutely ill patients in the department of medicine?
 - a. Yes
 - b. No
2. Is tight glucose control in acutely ill patients a defined goal in your department?
 - a. Yes
 - b. No
3. Of the following patients, who should have tight glucose control during hospitalization? (you may mark more than one)
 - a. Patients with acute coronary syndrome
 - b. Patients with acute infectious diseases
 - c. Patients with acute stroke
 - d. All patients with hyperglycemia at admission
 - e. Only patients with previous diagnosis of diabetes mellitus
 - f. Only patients with severe hyperglycemia (> 350 mg/dl)
 - g. Only patients with renal failure
 - h. None of the above
 - i. Other. Specify: _____
4. Does your department have a defined protocol for tight glucose control in acutely ill patients?
 - a. Yes (go to q. 5)
 - b. No (go to q. 10)
5. Which measures do you use for glucose control in acutely ill patients? (You may mark more than one)
 - a. Multiple glucose level measurements
 - b. Multiple short-acting insulin injections
 - c. Insulin Mixtard-based protocol
 - d. Insulin NPH-based protocol
 - e. Basal insulin [LANTUS/LEVEMIR]-based protocol
 - f. Oral hypoglycemic and insulin-based protocol
 - g. Oral hypoglycemic-based protocol
 - h. Other. Specify: _____
6. What is the target glucose level in these patients?
 - a. 100–120 mg/dl
 - b. 120–140 mg/dl
 - c. 140–160 mg/dl
 - d. Other. Specify: _____
7. By using your protocol, does hypoglycemia present a clinical problem?
 - a. Yes
 - b. No
8. By using your protocol, estimate the rate of patients who reach your target levels
 - a. 30–45%
 - b. 45–60%
 - c. 60–75%
 - d. > 75%
9. Would you be interested in using a protocol based on repeated glucose level measures, followed by LANTUS/LEVEMIR or NPH and short-acting insulin injections?
 - a. Yes
 - b. No. Reasons: _____
10. What are the reasons for not having a specific protocol? (You may mark more than one)
 - a. There is no clear benefit from tight glucose level control during hospitalization in the department of medicine
 - b. There are no guidelines for tight glucose level control for hospitalized patients in the department of medicine
 - c. Each physician has his own protocol
 - d. Complications may outweigh the benefit
 - e. Shortage of medical and/or nurses' staff
 - f. Other. Specify: _____
11. Would you be interested in using a protocol based on repeated glucose measures, followed by LANTUS/LEVEMIR or NPH and short-acting insulin injections?
 - a. Yes
 - b. No. Reasons: _____

Figure 1. Indication for tight glucose levels control during hospitalization. n=50, more than one answer was allowed. ACS = acute coronary syndrome, Ac. Infec. = acute infectious disease, hyperglyc. at admis. = hyperglycemia at admission, sev. hyperglyc. = severe hyperglycemia (> 350 mg/dl), prev. diag. = previous diagnosis of diabetes mellitus, renal fail. = renal failure, noa = none of the above.

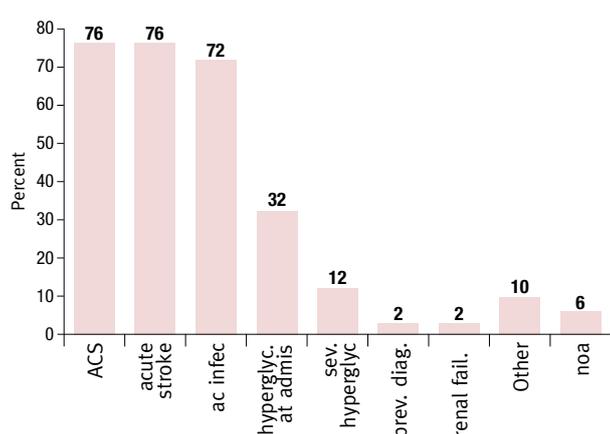
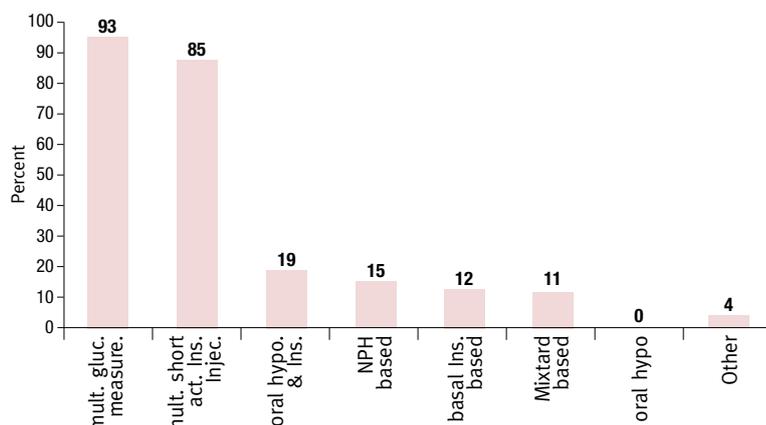


Figure 2. Measurements that are used for tight glucose control in acutely ill patients. n=50, more than one answer was allowed. mult. gluc. measure. = multiple glucose levels measurements, mult. short act. Ins injec. = multiple short-acting insulin injections, Oral hypo. & Ins. = oral hypoglycemic & insulin injections, NPH based = insulin NPH-based protocol, basal Ins. based = basal insulin [LANTUS/LEVEMIR]-based protocol, Mixtard based = insulin mixture-based protocol, oral hypo. = oral hypoglycemic-based protocol.



only 33 (66%) had defined it as a treatment goal in their own department. Furthermore, only 27 of the 50 departments that responded (54%) had a defined protocol for intensive glucose control in acutely ill patients.

A consistent number of physicians considered patients with acute coronary syndrome (38 physicians, 76%), acute stroke (38 physicians, 76%), and acute infectious disease (36 physicians, 72%) to be candidates for an intensive glucose control protocol. Sixteen physicians (32%) argued that all hospitalized patients with hyperglycemia on admission should have tight glucose control during their hospital stay [Figure 1].

Among the 27 departments that had a defined protocol, the most frequently used modalities to achieve tight glucose control were multiple glucose measurements in 25 (93%) and repeated short-acting subcutaneous insulin injections in 23 (85%). Long-acting or basal insulin-based protocols were rarely used in these departments [Figure 2].

A glucose level of 120–140 mg/dl was the target level in most departments (12/27, 44%), and 16 of 27 (59%) estimated that 45–60% of patients achieve this level of control. Notwithstanding, hypoglycemia was not considered to be a clinical problem by 19 department heads (70%).

Table 2. Survey results: reasons for not having a defined protocol (n=23)*

There are no guidelines	52% (n=12)
Shortage of medical and/or nursing staff	26% (n=6)
There is no clear benefit	26% (n=6)
Complications may outweigh the benefits	13% (n=3)
Each physician has his/her own protocol	9% (n=2)
Other	30% (n=7)

*More than one answer was allowed

Twenty-three departments did not have a defined protocol to maintain tight glucose control in acutely ill patients. The main reason, cited by 12/23 (52%), was the lack of guidelines. Lack of evidence of a clear benefit from tight glucose control during hospitalization and shortage of medical and/or nursing staff were mentioned equally by 6/23 (26%) [Table 2]. Almost all of these physicians (22/23, 96%) stated they would be interested in using a protocol based on repeated glucose measures, along with basal long-acting insulin.

DISCUSSION

The study results highlight the varying and ambivalent attitudes toward tight glucose control in acutely ill patients hospitalized in medical wards. The heads of most internal medicine departments considered tight glucose control as a major target of treatment for acutely ill hospitalized patients, but only two-thirds defined it as a goal of treatment in their own department. Furthermore, only half had a defined protocol for such intervention. Our explanation for these divergent ideals is the lack of well-designed studies, clear guidelines, and protocols for maintaining tight glucose control in acutely ill hospitalized patients.

The approach toward the importance of tight glucose control in acutely ill patients is derived from prospective controlled studies on ICU patients who were managed with i.v. insulin protocols. These studies found various short-term benefits, such as a reduction in hospital mortality and length of ICU stay, and a significant decrease in the development of renal failure [1,4]. The patients who were included in these studies were those with acute coronary syndrome, acute cerebral stroke and sepsis, most of whom are frequently admitted to medical departments. Indeed, most heads of Israeli internal medicine departments acknowledge that intensive glucose control in these patients should be a major treatment goal. Nevertheless, it is often impractical to mandate intravenous insulin-based protocols in internal medicine wards because they are usually understaffed and lack the expertise to imple-

ment intravenous-based protocols. Our survey found that the most frequently used modality for tight glucose control was multiple glucose measurements with multiple short-acting insulin injections. However, this therapeutic approach also needs a well-defined protocol of insulin dosage related to glucose levels.

Another area of inconsistency among the department heads related to the target glucose levels. Most departments with a predefined protocol for tight glucose control considered 120–140 mg/dl to be a reasonable target and estimated that 45–60% of the measurements reached this level. Based on our experience, it seems that these figures are overly optimistic. The control of glucose levels in a medical department is complex and is less satisfactory than the controls observed in ICUs [1-4]. Furthermore, we have recently shown that with a protocol based on repeated glucose measurements and multiple subcutaneous NPH and short-acting insulin injections, only 43% of the glucose level measurements were within the desired target range of < 140 mg/dl during the day and < 170 mg/dl during the night [submitted for publication].

This study had several limitations. It was a subjective, recall-based study that included only 50 physicians. Nevertheless, these 50 have a major impact on the treatment policies in the internal medicine departments in our country.

We conclude that only a well-designed, controlled, prospective study will be able to consolidate the attitudes of internal medicine physicians regarding the feasibility, effectiveness, benefits and side effects of tight glucose control in severely ill patients who are treated in the medical wards. Meanwhile, it is recommended that physicians maintain optimal blood glucose levels by frequent measurements and corresponding insulin dosage adjustments [5].

Correspondence:

Dr. A. Elis

Dept. of Medicine A, Meir Medical Center, Kfar Saba 44281, Israel

Phone: (972-9) 747-2185

Fax: (972-9) 746-0781

email: avishayel@clalit.org.il

References

1. Krinsley JS. Effect of an intensive glucose management protocol on the mortality of critically ill adult patients. *Mayo Clin Proc* 2004; 79: 992-1000.
2. Van den Berghe G, Wilmer A, Hermans G, et al. Intensive insulin therapy in the medical ICU. *N Engl J Med* 2006; 354: 449-61.
3. van den Berghe G, Wouters P, Weekers F, Verwaest C. Intensive insulin therapy in the critically ill patients. *N Engl J Med* 2001; 345: 1359-67.
4. Malmberg K, Ryden L, Efendic C. Randomized trial of insulin-glucose infusion followed by subcutaneous insulin treatment in diabetic patients with acute myocardial infarction (DIGAMI study): effects on mortality at 1 year. *J Am Coll Cardiol* 1995; 26: 57-65.
5. Inzucchi SE. Management of hyperglycemia in the hospital setting. *N Engl J Med* 2006; 355: 1903-11.
6. Malhotra A. Intensive insulin in intensive care. *N Engl J Med* 2006; 354: 516-18.

ICU = intensive care unit