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COMMENTS AND RESPONSES

Multicentric, Randomized, Controlled Trial to Evaluate Blood Glucose Control by the Model Predictive Control Algorithm Versus Routine Glucose Management Protocols in Intensive Care Unit Patients

Response to Plank et al.

In the February issue of *Diabetes Care*, Plank et al. (1) reported the results of their computer-assisted model predictive control (MPC) algorithm versus routine glucose management in 60 postoperative thoracosurgical patients in three different hospitals. We agree that better glycemic control is worth aiming for, but we have some doubts concerning the design of the study and, consequently, the conclusion.

When comparing two protocols, both have to be "state-of-the-art." In the control group, however, the glucose algorithm protocol in the different ICUs was not standardized, the target blood glucose values were not identical, the insulin was given continuously or as bolus injection, and the frequency of glucose measurements was lower than in the MPC algorithm (once every 3 h versus hourly). It is known from the literature that glycemic control can best be achieved with a protocol using continuous insulin infusion combined with frequent blood glucose measurements and that the last two blood glucose values are used to determine the rate of insulin infusion (2).

In our opinion, before one may conclude that "computer can beat man," this promising MPC algorithm should *1*) be compared with the best available nurse-driven protocol, *2*) be tested in a more critically ill patient population, i.e., medical ICU patients, and *3*) be studied after an adequate power analysis has been performed.

JACK J.M. LIGTENBERG, MD, PHD
JOHN H. MEERTENS, MD
WILMA E. MONTEBAN-KOOISTRA, MD
JAAP E. TULLEKEN, MD, PHD
JAN G. ZIJLSTRA, MD, PHD

From the Intensive and Respiratory Care Unit, Department of Intensive Care, University Medical Center Groningen, Groningen, the Netherlands.

Address correspondence to Jack J.M. Ligtenberg, MD, PhD, Intensive and Respiratory Care Unit, Department of Intensive Care, University Medical Center Groningen, P.O. Box 30.001, NL-9700 RB, Groningen, the Netherlands. E-mail: j.j.m.ligtenberg@int.umcg.nl.

DOI: 10.2337/dc06-0732

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Multicentric, Randomized, Controlled Trial to Evaluate Blood Glucose Control by the Model Predictive Control Algorithm Versus Routine Glucose Management Protocols in Intensive Care Unit Patients

Response to Ligtenberg et al.

We thank Ligtenberg et al. (1) for drawing attention to our study, which demonstrated the efficacy and safety of the model predictive control (MPC) algorithm in controlling glycemia in critically ill postsurgery patients (2). We agree that properly designed studies evaluating different treatment approaches are needed. Our contribution was to execute the first prospective multicenter comparison of insulin titration protocols aiming to achieve tight glucose control. We agree that the best feasible approach for a nurse-led algorithm is to include the last two glucose measurements, the so-called dynamic scale protocol (3), and infuse insulin continuously, but this alone does not constitute "state-of-the-art glucose management protocol." Extensive variations on the theme exist. Additionally, intensity of educational support for nurses and (dis-) continuous nutritional feeding impact the outcome. While the "gold standard" is formed, our study evaluated existing protocols that have been designed for tight glucose control, that have been operational, and that have received institutional support in their respective intensive care units (ICUs). In agreement with the conclusion of a comprehensive review of the literature by Meijering et al. (3), a dynamic scale protocol (Prague) demonstrated comparable glycemic control, and a sliding-scale protocol (Graz) demonstrated inferior glycemic control compared with the MPC

algorithm. However, in terms of glucose levels in the target range, the rather complex dynamic scale protocol (as used in London, U.K.) tended to be inferior when compared with the MPC algorithm; this supports our views that tight glucose control in the ICU is not exclusively dependent on the protocol but also on clinical features such as different methods of nutritional provision and intuitive decision making of the ICU staff. A clear advantage of an automated algorithm is the avoidance of the intuitive decision making, integration of nutritional information, and the continuity of the day-and-night operation. An extension of our work for different study populations and the reduction of the sampling frequency are clearly required. An enhanced version of the MPC algorithm using extended blood sampling is currently being tested in a multicenter trial at medical ICUs. We regret that our conclusion that "the MPC algorithm is safe and effective in controlling glycemia in critically ill postsurgery patients" was interpreted as "computer can beat man." What we meant was that "computer can help man" to implement tight glycemic control and save numerous lives in intensive care medicine.

JOHANNES PLANK, MD[1]
JAN BLAHA, MD[2]
JEREMY CORDINGLEY, MBBS[3]
MALGORZATA E. WILINSKA, PHD[4]
LUDOVIC J. CHASSIN, PHD[4]
CLIFF MORGAN, PHD[3]
STEPHEN SQUIRE, BSC[3]
MARTIN HALUZIK, PHD[2]
JAROMIR KREMEN, MD[2]
STEPAN SVACINA, PHD[2]
WOLFGANG TOLLER, MD[1]
ANDREAS PLASNIK, MD[1]
MARTIN ELLMERER, PHD[1]
ROMAN HOVORKA, PHD[4]
THOMAS R. PIEBER, MD[1]

From the [1]Department of Internal Medicine, Medical University Hospital, Graz, Austria; the [2]1 Faculty of Medicine, Charles University, Prague, Czech Republic; the [3]Royal Brompton Hospital, London, U.K.; and [4]Cambridge University, Cambridge, U.K.

Address correspondence to Johannes Plank, Department of Internal Medicine, Medical University Graz, Auenbruggerplatz 15, 8036 Graz, Austria. E-mail: johannes.plank@klinikum-graz.at.

DOI: 10.2337/dc06-0838

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Incidence of Type 2 Diabetes in Individuals With Central Obesity in a Rural Japanese Population: The Tanno and Sobetsu Study

Response to Ohnishi et al.

Ohnishi et al. (1) applied International Diabetes Federation criteria of central obesity for Japanese patients (waist circumference ≥85 cm in men and ≥90 cm in women) in their study evaluating the relative importance of central and general obesity for incidence of type 2 diabetes in Japan. These International Diabetes Federation criteria of abdominal obesity were proposed by the Examination Committee of Criteria for "Obesity Disease" in Japan set up by the Japanese Society for the Study of Obesity (2) and are a result of the inappropriate presupposition that there are no sex differences in cut points of visceral fat area and that visceral fat area is linearly proportional to waist circumference, as mentioned previously (3). If they had determined the cut points of waist circumference by receiver-operating characteristic curves as they did to determine the cut points of BMI and visceral fat area and those of visceral fat area separately by sex, the cut points of waist circumference might have been different values. For example, Shiwaku et al. (4) reported that optimal cut points of waist circumference were 82 cm for men and 73 cm for women in Japanese, and Hara et al. (5) recently proposed 83–85 cm for men and 73–78 cm for women as optimal cut points of waist circumference for the diagnosis of metabolic syndrome in Japan. Sone et al. (6) recalculated the risk of metabolic syndrome for cardiovascular events in Japanese diabetic patients, applying Asian cut points for waist circumference (90 cm for men and 80 cm for women) instead of Japanese criteria (85 cm for men and 90 cm for women) and reached different results from their previous reports (7,8). Therefore, Ohnishi et al. should also reanalyze their data applying these proposed cut points by Hara et al. and Asian criteria of central obesity (≥90 cm in men and ≥80 cm in women) separately by sex before reaching conclusions on the relative prognostic importance of central and general obesity in Japan.

EIJI ODA, MD

From the Department of Internal Medicine, Niigata Prefectural Yoshida Hospital, Yoshida, Tsubame, Niigata, Japan.

Address correspondence to Eiji Oda, MD, Department of Internal Medicine, Niigata Prefectural Yoshida Hospital, Yoshida, Tsubame, Niigata, 959-0242, Japan. E-mail: ijie@venus.sannet.ne.jp.

DOI: 10.2337/dc06-0888

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