Remedial Actions for the Physical Inactivity of Hospitalized Patients With Type 2 Diabetes

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OBJECTIVE — Physical inactivity is often suspected in hospitalized patients with type 2 diabetes but has yet to be quantified.

RESEARCH DESIGN AND METHODS — We measured the level of physical activity of 36 hospitalized (H) and 36 free-living nonhospitalized (NH) type 2 diabetic subjects with actimeters (SenseWear Arm-Band).

RESULTS — The number of steps (H: 4,381 ± 3,742 steps/24 h, NH: 7,220 ± 4,763 steps/24 h; $P < 0.01$), duration of physical activity (H: 45 ± 57 min/24 h, NH: 148 ± 116 min/24 h; $P < 0.005$), and physical activity expenditure (H: 287 ± 390 kcal/24 h, NH: 1,035 ± 1,006 kcal/24 h; $P < 0.005$) were two- to threefold lower in the hospitalized patients. Simple advice enabled us to increase their recorded levels of physical activity by ~50% ($P < 0.005$), and a further 50% ($P < 0.05$) was obtained by the use of a pedometer.

CONCLUSIONS — The physical inactivity of hospitalized patients with type 2 diabetes is significant and remediable, although the advice given must take into account the existence of sensory neuropathy and silent myocardial ischemia.

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The potential benefits of physical activity for patients with type 2 diabetes are widely recognized (1), but their application to daily clinical practice remains to be determined (2). Physical inactivity is often suspected in hospitalized type 2 diabetic patients, but to our knowledge, this has not been quantified: traditional physical activity questionnaires are not an ideal tool for such an evaluation. Using actimeters (3), we compared the physical activity of 36 hospitalized (H) versus 36 ambulatory, free-living, nonhospitalized (NH) patients with type 2 diabetes. The physical activity of the hospitalized patients was further recorded during a two-stage remedial procedure: physical activity counseling followed by the use of a pedometer.

RESEARCH DESIGN AND METHODS

— The hospital admissions were indicated for poor glucose control (A1C for H: 8.8 ± 1.8%; NH: 7.0 ± 1.0%; $P < 0.001$) and paraclinical investigations; patients with acute diseases requiring rest were excluded. Sex (H: 24/36 men, NH: 22/36 men), age (H: 55 ± 10 years, NH: 60 ± 10 years), and BMI (H: 34 ± 6 kg/m^2; NH: 31 ± 5 kg/m^2) did not differ between the two groups.

The physical activity levels were recorded with actimeters (SenseWear Arm-Band, Body Media, Stanford, CA), which have been validated versus doubly labeled water for the assessment of total energy expenditure in patients with type 2 diabetes (4). Both groups carried the actimeters for 1 week. The ambulatory patients were not advised about physical activity but were informed that it was recorded.

The hospitalized group underwent a two-stage remedial procedure with physical activity measurement before (T1) and after advice on physical activity (T2) according to French recommendations (5) and finally wore a pedometer (T3). Each period lasted at least 24 h. The French recommendations for physical activity for patients with type 2 diabetes include a medical examination to detect contraindications, awareness of the favorable role of exercise in the management of diabetes, and tailored counseling suggestions to change lifestyle, owing to daily exercise sessions (>30 min) (5). In practice, the advice was simple ("take a walk instead of staying seated"), but it was customized as a function of the antidiabetic treatment (risk of hypoglycemia) and complications (peripheral neuropathy). The results are expressed as means ± SD and compared by ANOVA and *t* tests.

RESULTS

— The actimeters were carried during 97 ± 2% of the study. As shown in Table 1, the levels of physical activity were particularly low for the hospitalized patients two- to threefold lower than for the ambulatory group. The counseling led to a 50% increase, followed by a further 50% with the use of the pedometer; both were significant increases. Although they did not reach the ambulatory results (except for the number of steps), the levels of physical activity were doubled after the intervention.

CONCLUSIONS

— Our study shows and quantifies the marked sedentariness of hospitalized patients with type 2 diabetes, as suspected by clinicians. This phenomenon probably concerns other patients, with other type of diabetes or without diabetes, but its practical implications are of specific importance in the case of type 2 diabetes, since physical activity can be considered a part of the treatment. The deleterious effect of physical inactivity on glucose control are probably hidden by the controlled diet during hospitalization.

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Table 1—*Levels of physical activity in 72 patients with type 2 diabetes: 36 hospitalized versus 36 nonhospitalized*

	Hospitalized type 2 diabetic patients (n = 36)			Nonhospitalized patients (n = 36)
	Before counseling	After counseling	With pedometer	
Physical activity energy expenditure (kcal/24 h)	287 ± 390‡	449 ± 400‡#	626 ± 422*#	1,035 ± 1,006
Total energy expenditure (kcal/24 h)	2,136 ± 706‡	2,452 ± 530†#	2,584 ± 589*§	2,968 ± 932
Duration of physical activity (min/24 h)	45 ± 57‡	65 ± 59‡#	95 ± 62*#	148 ± 116
Number of steps/24 h	4,381 ± 3,742†	6,567 ± 3,943# (NS)	8,682 ± 5,136# (NS)	7,220 ± 4,763

*$P < 0.05$, †$P < 0.01$, ‡$P < 0.005$ between the two groups. §$P < 0.05$, #$P < 0.005$ vs. preceding measurement in the hospitalized group.

The ability to remedy this inactivity by a simple intervention is encouraging. However, physical activity counseling must take into account the clinical picture as mentioned by others (5). This is especially true for hospitalized patients, who usually have a long history of diabetes with long-term complications: we checked the sensitivity of the feet and the absence of proliferative retinopathy and envisaged the existence of silent ischemic heart disease before advising our patients to walk. No significant adverse event occurred during our study, but one of our patients had to stop walking for a short time because of a cutaneous lesion of the foot. Further work will be required to find out whether the doubling in level of physical activity we obtained could be safely maintained in the long term. For outpatients with type 2 diabetes, durable (1- to 2-year) increases in physical activity have been reported after counseling, based on questionnaires (6) or accelerometer records (7), with approximately −0.5% A1C reductions, and benefits on blood pressure and serum lipids.

The increased number of steps while wearing the pedometer (+2,115 steps/day at T3, $P < 0.001$ vs. T2) is in line with the improvement observed when a pedometer is used for a longer period: +2,491 steps/day after 18 weeks (8). A walking-based simple and low-cost intervention can lead to significant improvements (A1C, BMI) at 1 year (9), although more sophisticated interventions may be preferred for some patients. The fact that simple well-accepted actimeters, as we used, can readily detect the effect of an intervention is also encouraging for future studies.

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S.P. collected data and wrote the manuscript. S.F., C.F., and H.G. collected data and participated in the study design. V.R. conceived the study and participated in its design and coordination and wrote the manuscript. All authors read and approved the final manuscript.

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References

1. Sigal RJ, Kenny GP, Wasserman DH, Castaneda-Sceppa C, White RD. Physical activity/exercise and type 2 diabetes: a consensus statement from the American Diabetes Association. Diabetes Care 2006;29:1433–1438
2. Praet SF, van Loon LJ. Exercise: the brittle cornerstone of type 2 diabetes treatment. Diabetologia 2008;51:398–401
3. St-Onge M, Mignault D, Allison DB, Rabasa-Lhoret R. Evaluation of a portable device to measure daily energy expenditure in free-living adults. Am J Clin Nutr 2007;85:742–749
4. Mignault D, St-Onge M, Karelis AD, Allison DB, Rabasa-Lhoret R. Evaluation of the Portable HealthWear Armband: a device to measure total daily energy expenditure in free-living type 2 diabetic individuals. Diabetes Care 2005;28:225–227
5. Gautier JF, Berne C, Grimm JJ, Lobel B, Coliche V, Mollet E. [Physical activity and diabetes]. Diabete Metab 1998;24:281–290
6. Di Loreto C, Fanelli C, Lucidi P, Murdolo G, De Cicco A, Parlanti N, Ranchelli A, Fatone C, Taglioni C, Santeusanio F, De Feo P. Make your diabetic patients walk: long-term impact of different amount of physical activity on type 2 diabetics. Diabetes Care 2005;28:1295–1302
7. Kirk A, Mutrie N, MacIntyre P, Fisher M. Effects of a 12-months physical activity counselling intervention on glycemic control and on the status of cardiovascular risk factors in people with type 2 diabetes. Diabetologia; 2004;47:821–832
8. Bravata DM, Smith-Spangler C, Sundaram V, Gienger AL, Lin N, Lewis R, Stave CD, Olkin I, Sirard JR. L, Lin N, Lewis R, Stave CD, Olkin I, Sirard JR. Using pedometer to increase physical activity and improve health: a systematic review. JAMA 2007; 298:2296–2304
9. Praet SF, van Rooij ES, Wijtvliet A, Boonman-de Winter LJ, Enneking T, Kuipers H, Stehouwer CD, van Loon LJ. Brisk walking compared with an individualised medical fitness programme for patients with type 2 diabetes: a randomised controlled trial. Diabetologia 2008;51:736–746