# Psychosocial Outcomes of Telemedicine Case Management for Elderly Patients With Diabetes

## The randomized IDEATel trial

PAULA M. TRIEF, PHD[1]
JEANNE A. TERESI, EDD, PHD[2]
ROBERTO IZQUIERDO, MD[3,4]
PHILIP C. MORIN, MS[3]
ROBIN GOLAND, MD[5]
LESLIE FIELD, RN, MSN[5]
JOSEPH P. EIMICKE, MS[2]
REBECCA BRITTAIN, BS[1]
JUSTIN STARREN, MD, PHD,[6]
STEVEN SHEA, MD[7]
RUTH S. WEINSTOCK, MD, PHD[3,4,8]

Diabetes case management (DCM) may improve medical outcomes (1,2). Case managers coordinate care and often provide a mix of interventions, e.g., telephone outreach, education, reminders. However, the efficacy of DCM is unclear. Three systematic reviews lend only limited support for the efficacy of DCM for improving glycemic control but none for lipid, weight, or blood pressure benefits (3–5).

DCM studies typically target biomedical outcomes and ignore potential psychosocial effects. Yet, psychosocial variables (e.g., depression, anxiety, social support) relate to hyperglycemia, complications, adherence, and quality of life (6–11). Thus, a positive impact of DCM on these factors is important. Two studies did assess psychosocial outcomes of DCM and found improved self-efficacy and satisfaction (cluster visit) (12) and quality of life (dietitian-led DCM group) (13).

Because barriers (e.g., distance, weather) limit DCM access, telemedicine can be used. A review of telemedicine versus face-to-face trials concluded that, while feasible and acceptable, there is little evidence that telemedicine has clinical benefits (14). Our team published results of a trial of telemedicine DCM versus usual care for elderly diabetic patients (15). The intervention resulted in significant improvements in glycemic control, blood pressure, and total and LDL cholesterol (16).

The purpose of the Informatics for Diabetes Education and Telemedicine (IDEATel) project, funded by the Centers for Medicare and Medicaid Services, is to evaluate the feasibility and effectiveness of telemedicine with a diverse, medically underserved, elderly diabetic sample. The purpose of this study is to assess the impact of the IDEATel intervention on secondary psychosocial outcomes.

## RESEARCH DESIGN AND METHODS

— A detailed description of the IDEATel study design has been previously reported (15,16). Medicare recipients were recruited if they were aged ≥55 years, diagnosed with diabetes, and without moderate/severe impairments or comorbidities. Research nurses blinded to the groups conducted baseline and 1-year medical and psychosocial assessments. The study was approved by appropriate institutional review boards.

### Intervention

Subjects received a home telemedicine unit to upload blood glucose and blood pressure readings, videoconference with a nurse case manager and dietitian, and access educational materials. Videoconferences routinely occurred every 4–6 weeks (with significant need, every 2 weeks) to educate patients, facilitate goal-setting/self-management, and discuss concerns. Supportive interactions provided contact tailored to individual needs. Under endocrinologist supervision, nurse case managers consulted with primary care providers who made treatment decisions.

### Data

Psychosocial measures were depression (17), diabetes distress (18), and self-efficacy (19), all with excellent reliability and validity estimates. Medical measures were glycemic control (A1C) and blood pressure. Covariates were age, sex, race/ethnicity, education, marital status, smoking, comorbidity (20), years of diabetes duration, symptom severity (21), and insulin use.

### Analyses

Intent-to-treat analysis of the relationship between groups (intervention versus usual care) and change in psychosocial outcomes (1-year value controlling for baseline value) were performed. A mixed-effects regression model was used to adjust for clustering due to randomization of subjects within physician practices, using Proc Mixed (SAS 9.0). A variance components covariance structure was used that controlled for baseline value and subject variables.

## RESULTS

— Recruitment and retention have been described, and the intervention effect on medical outcomes (A1C,

From the [1]Departments of Psychiatry and Medicine, SUNY Upstate Medical University, Syracuse, New York; the [2]Research Division, Hebrew Home for the Aged at Riverdale, Riverdale, New York; the [3]Department of Medicine, SUNY Upstate Medical University, Syracuse, New York; the [4]Joslin Diabetes Center, Syracuse, New York; the [5]Naomi Berrie Diabetes Center, Columbia University, New York, New York; the [6]Biomedical Informatics Department, Columbia University, New York, New York; the [7]Department of Epidemiology and Biomedical Informatics, Joseph Mailman School of Public Health, Columbia University, New York, New York; and the [8]Department of Medicine, VA Medical Center, Syracuse, New York.

Address correspondence and reprint requests to Paula M. Trief, PhD, Department of Psychiatry, SUNY Upstate Medical University, 750 E. Adams St., Syracuse, NY 13210. E-mail: triefp@upstate.edu.

Received for publication 5 December 2006 and accepted in revised form 7 February 2007.

Published ahead of print at http://care.diabetesjournals.org on 26 February 2007. DOI: 10.2337/dc06-2476. Clinical trial reg. no. NCT00271739, clincialtrials.gov.

**Abbreviations:** DCM, diabetes case management; IDEATel, Informatics for Diabetes Education and Telemedicine.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

**Table 1—*Predicting psychosocial outcomes using baseline values and other covariates including treatment group***

| | CARE depression ($n$ = 1,358)* | | | DDS emotional burden subscale ($n$ = 1,356)* | | | DDS interpersonal subscale ($n$ = 1,355)* | | | Diabetes self-efficacy scale ($n$ = 1,355)* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Estimate | SE | *P* | Estimate | SE | *P* | Estimate | SE | *P* | Estimate | SE | *P* |
| Intercept | −1.16 | 1.29 | 0.37 | 0.41 | 1.59 | 0.80 | 0.86 | 0.97 | 0.37 | −1.28 | 3.50 | 0.71 |
| Baseline values | 0.58 | 0.02 | <0.001 | 0.56 | 0.02 | <0.001 | 0.35 | 0.02 | <0.001 | 0.48 | 0.02 | <0.001 |
| Group | 0.19 | 0.18 | 0.30 | 0.06 | 0.22 | 0.77 | 0.00 | 0.14 | 0.98 | 2.38 | 0.50 | <0.001 |
| Race/ethnicity | 0.22 | 0.24 | 0.36 | −0.43 | 0.29 | 0.14 | −0.18 | 0.18 | 0.31 | −0.80 | 0.64 | 0.21 |
| Age | 0.02 | 0.01 | 0.20 | −0.00 | 0.02 | 0.85 | −0.01 | 0.01 | 0.24 | 0.05 | 0.04 | 0.25 |
| Sex | 0.75 | 0.21 | 0.00 | 0.43 | 0.26 | 0.11 | 0.15 | 0.16 | 0.35 | 0.05 | 0.59 | 0.94 |
| Years of education | −0.03 | 0.03 | 0.26 | 0.03 | 0.03 | 0.30 | 0.04 | 0.02 | 0.04 | 0.00 | 0.07 | 0.10 |
| Years of diabetes | 0.02 | 0.01 | 0.07 | 0.01 | 0.01 | 0.64 | −0.00 | 0.01 | 0.70 | 0.01 | 0.03 | 0.68 |
| Marital status | 0.06 | 0.21 | 0.78 | 0.02 | 0.26 | 0.95 | −0.26 | 0.16 | 0.11 | −0.24 | 0.57 | 0.67 |
| BMI | −0.02 | 0.01 | 0.17 | −0.03 | 0.02 | 0.06 | −0.01 | 0.01 | 0.34 | 0.03 | 0.04 | 0.47 |
| Comorbidity | −0.01 | 0.05 | 0.83 | 0.12 | 0.07 | 0.07 | 0.02 | 0.04 | 0.54 | 0.33 | 0.14 | 0.02 |
| Smoking (pack-years) | 0.00 | 0.00 | 0.27 | −0.00 | 0.00 | 0.29 | 0.00 | 0.00 | 0.31 | 0.02 | 0.01 | 0.03 |
| Insulin (yes/no) | −0.48 | 0.23 | 0.04 | 0.19 | 0.28 | 0.50 | 0.06 | 0.17 | 0.73 | −0.49 | 0.63 | 0.44 |
| Diabetes symptom severity | 0.32 | 0.06 | <0.001 | 0.31 | 0.07 | <0.001 | 0.17 | 0.04 | 0.00 | 0.62 | 0.15 | <0.001 |

All analyses are adjusted for clustering within primary care practices. *Adjusted for group heterogeneity in cluster and residual variances. Variables: group: treatment group (0, control; 1, experimental); race: participant Caucasian (0, no; 1, yes); age: computed at time of baseline annual assessment; sex: 1, male; 2, female; marital status: participant married (0, no; 1, yes); and insulin: 0, no; 1 yes. CARE, Comprehensive Assessment and Referral Evaluation; DDS, Diabetes Distress Scale.

blood pressure, and cholesterol) was reported (16).

Subjects lost to follow-up did not differ from subjects who remained. Intervention and control groups did not differ in age, sex, race/ethnicity, or medical/psychosocial measures. There were anticipated differences between New York City and Upstate samples as previously described (16). In terms of psychosocial variables of interest, the New York City group reported greater depression ($P = 0.001$) and diabetes distress ($P < 0.001$) but greater diabetes self-efficacy ($P < 0.003$) at baseline. Table 1 presents analyses of prediction of 1-year psychosocial outcomes controlling for baseline values.

Intervention subjects improved significantly (versus control subjects) in diabetes self-efficacy ($P < 0.0001$). The effect size (estimated using adjusted for covariate difference scores, expressed in the original units of the scale) of the intervention on self-efficacy was 2.377 (95% CI 1.40–3.36). (No established minimally important differences could be located for this measure.) There were no significant differences between groups on change in depression ($P = 0.30$) or diabetes distress ($P = 0.77$, $P = 0.98$). Separate analyses for New York City and Upstate found a significant difference Upstate on change in self-efficacy ($P < 0.001$), with a similar trend in New York City ($P = 0.103$). While the New York City group had higher baseline self-efficacy, improvement in the Upstate group led to no 1-year group differences. Other predictors of lower 1-year self-efficacy were greater comorbidity ($P = 0.02$), more smoking ($P = 0.03$), and greater symptom severity ($P < 0.001$). Predictors of more depressive symptoms at 1 year were being female ($P = 0.001$), not using insulin ($P = 0.04$), and greater symptom severity ($P < 0.001$). Greater symptom severity predicted greater diabetes distress ($P < 0.001$).

**CONCLUSIONS** — Diabetes case management, including support, goal-setting, and education, delivered using telemedicine resulted in significantly improved diabetes self-efficacy for elderly diabetic patients but not improved depression or diabetes distress.

Self-efficacy is important as it relates to better diabetes self-care (22,23), lower health risk, and better overall health (24) and may mediate the positive link between physical activity and quality of life (25).

The finding that the effect on self-efficacy was stronger in the Upstate sample may relate to group differences. The New York City group was mostly urban Hispanic with less education than the mostly rural Caucasian Upstate group. It may also reflect unintended differences in intervention delivery.

This intervention was designed to (and did) improve A1C, blood pressure, and lipids but not depression, distress, or self-efficacy. While there is often the expectation that a supportive relationship with a knowledgeable provider will benefit emotional well-being, this has not been studied and was not demonstrated in this study.

Some have argued for the converse, i.e., treat depression and expect a positive effect on glycemic control. However, a depression treatment for patients with comorbid diabetes and depression who achieved improved depression outcomes had no impact on A1C (26).

There are limitations to our study, including *1*) a possible "spillover effect," i.e., with education and consultation, physicians may have altered interactions with control patients; and 2) generalizability, i.e., sample was poor and elderly, intervention was a unique telemedicine intervention, and primary care physician prescreening may affect representativeness.

Diabetes case management and telemedicine are developed to improve medical outcomes and may also have a beneficial effect on diabetes self-efficacy. Future interventions may have to directly target psychosocial domains to achieve significant gains. Future research that examines the benefits of case management should include measurement of psychosocial outcomes.

**Acknowledgments**— This study was supported by a cooperative agreement (95-C-90998) from the Centers for Medicare and Medicaid Services.

Parts of this study were published in abstract form *Diabetes* 55 (Suppl. 1):A432, 2006.

**APPENDIX** — The following warrant IDEATel Upstate Consortium publication credit. SUNY Upstate Medical University (Syracuse, NY): Ruth S. Weinstock, MD, PhD*; Roberto Izquierdo, MD; L. Thomas Wolff, MD; Philip C. Morin, MS; Suzanne Meyer, RN, CDE; Suzan M. Carusone, RN, CCRC; Fraser G. Tudiver, MD†; Teresa J. Wagner, MS; Carina Lagua, MA, RD, CDE; Susan West, RN, MSN, CDE; JoAnn Shupe, AOS; Donald R. Roller, BS; Joseph Ziemba, MBA; David P. Thomson, MD; Kelly Duncan, BSW, CCRC; Wendy VanRiper; Sarah Doolittle, BS, CCRC; Joanne Kearns, MA, RD, CDE; and Deborah Bowerman, RN, CDE. A.L. Lee Memorial Hospital, Inc. (Fulton, NY): Shirley Seabury, MHA. Arnot-Ogden Medical Center (Elmira, NY): John F. Carroll, MD, MBA; Frederic P. Skinner, MD, PhD; and Terri L. Ennis, RN. Bassett Healthcare (Cooperstown, NY): Kathleen Sellers, RN, PhD, and Elsie Haus, MEd, FNP. Delaware Valley Hospital (Walton, NY): Michael J. Freeman, DO, MPH. Family Health Network of Central New York, Inc. (Cortland, NY): Susan Ulrich, MS, RN, CPNP. Guthrie Healthcare System (Sayre, PA): Brian D. Cassetta, MD. Hudson Headwaters Health Network (Glens Falls, NY): Patricia Auer, MSN, FNP; W. Emily Hammond, AAS, RN; Cairenn L. Young, MSW; and Mary M. Beadnell, LPN. Lourdes Hospital (Binghamton, NY): Timothy C. Howland, MD. Olean General Hospital (Olean, NY): Robert Catalano, MD; Galvin Anderson, MD; and Terri N. Kolasinski, RN. Samaritan Medical Center (Watertown, NY): Anil Shah, MD; Kate R. Fraczek, RN; and Terry Flynt, BSN, RN. State University of New York at Buffalo (Buffalo, NY): John Taylor, MBA; Lurene R. Tumiel, PhD; Marc Shilling, MA, MPA; and Chester Fox, MD. United Health Services (Binghamton, NY): David Kwiatkowski, MD. *Department of Veterans Affairs, Syracuse, New York. †Current address: Department of Family Practice, East Tennessee State University, Johnson City, Tennessee.

**References**


1. Krein SL, Klamerus ML, Vijan S, Lee JL, Fitzgerald JT, Pawlow A, Reeves P, Hayward RA: Case management for patients with poorly controlled diabetes: a randomized trial. *Am J Med* 116:732–739, 2004
2. Westley C: Diabetes care project at University Medical Associates. *Lippincotts Case Manag* 10:51–53, 2005
3. Norris SL, Nichols PJ, Caspersen CJ, Glasgow RE, Engelgau MM, Jack L Jr, Isham G, Snyder SR, Carande-Kulis VG, Garfield S, Briss P, McCulloch D: Task Force on Community Preventive Services: the effectiveness of disease and case management for people with diabetes: a systematic review. *Am J Prev Med* 22 (Suppl. 4):15–38, 2002
4. Ingersoll S, Valente SM, Roper J: Nurse care coordination for diabetes: a literature review and synthesis. *J Nurs Care Qual* 20: 208–214, 2005
5. Loveman E, Royle P, Waugh N: *Specialist Nurses in Diabetes Mellitus: The Cochrane Collaboration*. 4th ed. New York, John Wiley & Sons, 2005
6. Wilson W, Ary DV, Biglan A, Glasgow RE, Toobert DJ, Campbell DR: Psychosocial predictors of self-care behaviors (compliance) and glycemic control in non–insulin-dependent diabetes mellitus. *Diabetes Care* 9:614–622, 1986
7. Lin EHB, Katon W, von Korff M, Rutter C, Simon GE, Oliver M Ciechanowski P, Ludman EJ, Bush T, Young B: Relationship of depression and diabetes self-care, medication adherence and preventive care. *Diabetes Care* 27:2154–2160, 2004
8. de Groot M, Anderson RJ, Freedland KE, Clouse RE, Lustman PJ: Association of depression and diabetes complications: a meta-analysis. *Psychosom Med* 63:619–630, 2001
9. Lustman PJ, Anderson RJ, Freedland KE, de Groot MK, Carney RM, Clouse RE: Depression and poor glycemic control: a meta-analytic review of the literature. *Diabetes Care* 23:934–942, 2000
10. Katon W, von Korff M, Ciechanowski P, Russo J, Lin E, Simon G, Ludman E, Walker E, Bush T, Young B: Behavioral and clinical factors associated with depression among individuals with diabetes. *Diabetes Care* 27:914–920, 2004
11. Trief PM, Wade MJ, Pine D, Weinstock RS: A comparison of health-related quality of life of elderly and younger insulin-treated adults with diabetes. *Age Ageing* 32:613–618, 2003
12. Sadur CN, Moline N, Costa M, Michalik D, Mendlowitz D, Roller S, Watson R, Swain BE, Selby JV, Javorski WC: Diabetes management in a health maintenance organization: efficacy of care management using cluster visits. *Diabetes Care* 22:2011–2017, 1999
13. Wolf AM, Conaway MR, Crowther JQ, Hazen KY, Nadler JL, Oneida B, Bovbjerg VE: Translating lifestyle intervention to practice in obese patients with type 2 diabetes. *Diabetes Care* 27:1570–1576, 2004
14. Currell R, Urquhart C, Wainwright, P, Lewis R: *Telemedicine Versus Face to Face Patient Care: Effects on Professional Practice and Health Care Outcomes (Cochrane Review)*. 2nd ed. New York, John Wiley & Sons, 2005
15. Shea S, Starren J, Weinstock RS, Knudson PE, Teresi J, Holmes D, Palmas W, Field L, Goland R, Tuck C, Hripcsak G, Capps L, Liss D: Columbia University's Informatics for Diabetes Education and Telemedicine (IDEATel) Project: Rationale and design. *J Am Med Inform Assoc* 9:49–62, 2002
16. Shea S, Weinstock RS, Starren J, Teresi J, Palmas W, Field L, Morin P, Golan R, Izquierdo RE, Wolff LT, Ashraf M, Hilliman C, Silver S, Meyer S, Holmes D, Petkova E, Capps L, Lantigua RA: A randomized trial comparing telemedicine case management with usual care in older patients with diabetes mellitus. *J Am Med Inform Assoc* 13:40–51, 2006
17. Gurland N, Golden R, Teresi J, Challop J: The SHORT-CARE: an efficient instrument for the assessment of depression, dementia, and disability. *J Gerontol* 6:439–449, 1984
18. Polonsky WH, Fisher L, Earles J, Dudl RJ, Lees J, Mullan J, Jackson RA: Assessing psychosocial distress in diabetes: development of the diabetes distress scale. *Diabetes Care* 28:626–631, 2005
19. Shortridge-Baggett LM, van der Bijl JJ: International collaborative research on management self-efficacy in diabetes mellitus. *J N Y State Nurses Assoc* 27:9–14, 1996
20. Charlson ME, Pompei P, Ales KL, MacKenzie CR: A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chron Dis* 40:373–383, 1987
21. Grootenhuis PA, Snoek FJ, Heine RJ, Bouter LM: Development of a type 2 diabetes symptom checklist: a measure of symptom severity. *Diabet Med* 11:253–261, 1994
22. Sousa VD, Zauszniewski JA, Musil CM, Price Lea PJ, Davis SA: Relationships among self-care agency, self-efficacy, self-care, and glycemic control. *Res Theory Nurs Pract* 19:217–230, 2005
23. Sousa VD, Zauszniewski JA, Musil CM, McDonald PE, Milligan SE: Testing a conceptual framework for diabetes self-care management. *Res Theory Nurs Pract* 18: 293–316, 2004
24. McAuley E, Konopack JF, Motl RW, Morris KS, Doerksen SE, Rosengren KR: Physical activity and quality of life in older adults: influence of health status and self-efficacy. *Ann Behav Med* 31:99–103, 2006
25. Grembowski D, Patrick D, Diehr P, Durham M, Beresford S, Kay E, Hecht J: Self-efficacy and health behavior among older adults. *J Health Soc Behav* 34:89–104, 1993
26. Williams JW Jr, Katon W, Lin EH, Noel PH, Worchel J, Cornell J, Harpole L, Fultz BA, Hunkeler E, Mika VS, Unutzer J: IMPACT Investigators: the effectiveness of depression care management on diabetes-related outcomes in older patients. *Ann Int Med* 140:1015–1024, 2004