Psychosocial outcomes of telemedicine case management for elderly patients with diabetes: IDEATel, a randomized trial

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Running title: Telemedicine case management and psychosocial outcomes

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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, and none for lipids, 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 vs. 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 vs. usual care for elderly diabetes patients (15). The intervention resulted in significant improvements in glycemic control, blood pressure and total/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 diabetes 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 IDEATel study design has been reported previously (15, 16). Medicare recipients were recruited if ≥ 55 years, diagnosed with diabetes, without moderate/severe impairments or comorbidities. Research nurses blinded to group 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 (BG) and blood pressure (BP) readings, videoconference with a nurse case manager (NCM) and dietitian, and access educational materials. Videoconferences routinely occurred every 4-6 weeks (with significant need, every 2 weeks) to educate, facilitate goal-setting/self management, and discuss concerns. Supportive interactions provided contact tailored to individual needs. Under endocrinologist supervision, NCMs 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), BP. Covariates were age, gender, race/ethnicity, education, marital status, smoking, comorbidity (20), years of diabetes, symptom severity (21), insulin use.

**Analyses**: Intent-to-treat analyses of the relationship between group (intervention vs. usual care) and change in psychosocial outcomes (1-year value controlling for baseline value) was 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, BP, cholesterol) reported (16). Subjects lost-to-follow-up did not differ from subjects who remained. Intervention and control groups did not differ in age, gender, race/ethnicity, or medical/psychosocial measures. There were anticipated differences between New York City (NYC) and Upstate samples described previously (16). In terms of psychosocial variables of interest, the NYC 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 (vs. controls) 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% C.I.= 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 NYC and Upstate found a significant difference upstate on change in self-efficacy (p<0.001), with a similar trend in NYC (p=.103). While NYC group had higher baseline self-efficacy, improvement Upstate 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 diabetes 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 NYC 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, BP and lipids, 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 that achieved improved depression outcomes had no impact on A1c (26).

Limitations are: (1) a possible “spillover effect”, i.e., with education and consultation, physicians may have altered interactions with control patients; (2) generalizability- sample was poor and elderly, intervention was unique telemedicine intervention, PCP pre-screening 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 target psychosocial domains directly to achieve significant gains. Future research that examines the benefits of case management should include measurement of psychosocial outcomes.

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References
Table 1: Predicting psychosocial outcomes using baseline values and other covariates including treatment group.\textsuperscript{a}

<table>
<thead>
<tr>
<th>VARIABLES:</th>
<th>CARE Depression\textsuperscript{b} (N=1358)</th>
<th>DDS Emotional Subscale (N=1356)</th>
<th>Burden\textsuperscript{b} (N=1355)</th>
<th>DDS Interpersonal Subscale\textsuperscript{b} (N=1355)</th>
<th>Diabetes Self Efficacy Scale\textsuperscript{b} (N=1355)</th>
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<tr>
<td>Intercept</td>
<td>-1.16</td>
<td>1.29</td>
<td>0.37</td>
<td>0.41</td>
<td>1.59</td>
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<td>Baseline Values</td>
<td>0.58</td>
<td>0.02</td>
<td>&lt;0.001</td>
<td>0.56</td>
<td>0.02</td>
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<td>Group</td>
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<td>0.18</td>
<td>0.30</td>
<td>0.06</td>
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<tr>
<td>Race/Ethnicity</td>
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<td>0.24</td>
<td>0.36</td>
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</tr>
<tr>
<td>Age</td>
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<td>0.01</td>
<td>0.20</td>
<td>-0.00</td>
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<tr>
<td>Gender</td>
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<td>0.21</td>
<td>0.00</td>
<td>0.43</td>
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<tr>
<td>Years education</td>
<td>-0.03</td>
<td>0.03</td>
<td>0.26</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>Years diabetes</td>
<td>0.02</td>
<td>0.01</td>
<td>0.07</td>
<td>0.01</td>
<td>0.01</td>
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<tr>
<td>Marital status</td>
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<td>0.21</td>
<td>0.78</td>
<td>0.02</td>
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<tr>
<td>BMI</td>
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<td>0.01</td>
<td>0.17</td>
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<td>Comorbidity</td>
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<td>Smoking-pack yrs.</td>
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<td>0.27</td>
<td>-0.00</td>
<td>0.00</td>
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<tr>
<td>Insulin – yes/no</td>
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<td>0.23</td>
<td>0.04</td>
<td>0.19</td>
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<tr>
<td>Diabetes symptom severity</td>
<td>0.32</td>
<td>0.06</td>
<td>&lt;0.001</td>
<td>0.31</td>
<td>0.07</td>
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</table>

\textsuperscript{a} All analyses are adjusted for clustering within PCP.

\textsuperscript{b} Adjusted for group heterogeneity in cluster and residual variances.