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Home-based diabetes self-management coaching delivered by paraprofessionals: A randomized controlled trial

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ABSTRACT

This study evaluated paraprofessional-led diabetes self-management coaching (DSMC) among 94 clients with type 2 diabetes recruited from a Community Care Access Centre in Ontario, Canada. Subjects were randomized to standard care or standard care plus coaching. Measures included the Diabetes Self-Efficacy Scale (DSES), Insulin Management Diabetes Self-Efficacy Scale (IMDSES), and Hospital Anxiety and Depression Scale (HADS). Both groups showed improvement in DSES (6.6 + 1.5 vs. 7.2 + 1.5, $p < .001$) and IMDSES (113.5 + 20.6 vs. 125.7 + 22.3, $p < .001$); there were no between-groups differences. There were no between-groups differences in anxiety ($p > .05$ for all) or depression scores ($p > .05$ for all), or anxiety ($p > .05$ for all) or depression ($p > .05$ for all) categories at baseline, postintervention, or follow-up. While all subjects demonstrated significant improvements in self-efficacy measures, there is no evidence to support paraprofessional-led DSMC as an intervention which conveys additional benefits over standard care.

Introduction

The World Health Organization estimated that 422 million adults worldwide were living with diabetes (Global Report on Diabetes, WHO, 2016). In Canada, a 70% increase was observed in the prevalence of diagnosed diabetes between 1998–1999 and 2008–2009 with almost 2.4 million Canadians (6.8%) living with diabetes, though it is estimated that about 20% of diabetes cases remain undiagnosed (Pelletier et al., 2012). In the province of Ontario, Canada, a 69% increase in diabetes prevalence was recorded between 1994–1995 and 2004–2005 (Creatore, Gozdyra, Booth, & Glazier, 2007) with Toronto contributing 20% more cases of diabetes than the provincial average (Booth, Creatore, Gozdyra, & Glazier, 2007).

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The chronic nature of diabetes often requires patients to engage in a significant shift in health maintenance behaviors such as blood glucose monitoring, medication compliance, healthy eating, and regular exercise if clients expect to improve health status and reduce complications (Michie, Miles, & Weinman, 2003). Without a proper approach to establish essential self-management behaviors in these clients, many will require ongoing and expensive support from health care services. Indeed, the combined direct ($2.18 billion) and indirect ($1.45 million) cost of managing diabetes amounted to $2.23 billion in 2008, while the value of lost productivity due to morbidity was $1.59 million (Public Health Agency of Canada, 2009). The annual per capita health care costs of managing a population with diabetes is estimated to be three to four times greater than for those without diabetes (Public Health Agency of Canada, 2009), while the former are more than three times as likely to be hospitalized in the last year than those without diabetes (Pelletier et al., 2012).

Client-directed goal setting and self-management are essential components of client-centered care (Sevick et al., 2007), improving goal attainment when it is personally relevant to the client (Huisman et al., 2009). Client-directed goal setting and self-management education have been found to complement traditional patient education in supporting patients who have chronic conditions. A central concept in self-management is self-efficacy which is enhanced when patients succeed in solving patient-identified problems (Bodenheimer, Lorig, Holman, & Grumbach, 2002). Evidence suggests that programs teaching self-management tasks are more effective than information only patient education in improving clinical outcomes.

The Stanford Self-Management program has developed self-management programs for individuals with chronic diseases. The program incorporates the use of lay people as trained facilitators of group sessions and has been successfully implemented among clients with diabetes in the community setting (Chodosh et al., 2005; Deakin, McShane, Cade, & Williams, 2005; Lorig et al., 2001, 1999). However, there are a significant number of clients unable to access community education programs due to barriers such as the lack of transportation or poor fit of peer-group programs. These individuals may benefit from a self-management education program delivered in the home. The Flinders program, developed in Australia, was created as an individual delivery self-management program and appeared to be promising as an in-home alternative to the peer-based Stanford Model (Battersby et al., 2015). However, after appearing to be highly suitable for implementation in the home care environment, some have found it to be operationally unsustainable (J. Britten, Director of Self-Management Education, Rural and Community Health and Chronic Disease Management, Capital Health Authority, Alberta Health Service, personal communication, 2010).

Although diabetes self-management education already forms an element of the care provided within the home by community-based providers, there is generally no structured, systematic approach in use. Therefore, the purpose of

the study was to implement and evaluate a patient-centered model of home-based diabetes self-management coaching (DSMC) for clients with type 2 diabetes on insulin. The proposed program was intended to supplement traditional diabetes education typically provided by their in-home nurse by providing coaching support delivered by a personal support worker (PSW). To this end, the following hypothesis was tested: Home-care clients randomly assigned to receive a one-to-one home-based DSMC program will demonstrate improvement in diabetes management self-efficacy and anxiety/depression relative to a goal-setting only control group.

Methods

Design and primary and secondary outcome measures

This study utilized a randomized controlled trial design. The Stanford Diabetes Self-Efficacy Scale (DSES) (Stanford Patient Education Center, 2015) and Insulin Management Diabetes Self-Efficacy Scale (IMDSES) (Hurley, 1990) were selected as the primary outcome measures; the Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983) was selected as the secondary outcome measure.

Intervention team

The intervention team consisted of three nurses and nine PSWs recruited from two home care service providers. In Ontario PSWs are not regulated under the Regulated Health Professions Act. In accordance with the Long Term Care Homes Act (2007), PSWs must attend a training program a minimum of 600 hours which meets vocational standards of the Ministry of Training, Colleges and Universities, National Association of Career Colleges, or the Ontario Community Support Association (Government of Ontario, 2007). Study PSWs were selected based on the following: five or more years' experience in the community, experience in provision of care for clients living with chronic diseases, experience with preceptorship and mentoring, positive performance reviews, and previous acknowledgment for excellent client experience. PSWs were the principal delivery agent for the coaching intervention for the experimental (EXP) subjects, while nurses assured a standardized approach to diabetes-related goal setting for both EXP and control (CONT) subjects. A goal-setting template was provided to ensure consistency across nurses and subjects.

DSMC curriculum development and delivery

A working group composed of a Community Care Access Centre (CCAC; 1 of 14 CCACs that provide case management and coordinate home care

across the province of Ontario) service manager, Nurse/PSW supervisor, and a Certified Diabetes Educator (CDE) was formed to develop the 2-day DSMC curriculum for preparing the PSWs. The DSMC curriculum consisted of four components: (a) orientation to the study, (b) diabetes management, (c) *Choices & Changes: Motivating Healthy Behaviors* (C&C) (Institute for Healthcare Communication, 2016), and (d) goal-setting principles.

Day 1 of the training program included a 1-hour orientation to the study and explanation of roles of nurses and PSWs involved in the project, after which nurses were excused. The remainder of Day 1 involved PSWs only and included a half-day of training on diabetes management provided by the CDE based on the *@YourSideColleague* online training resource (Saint Elizabeth Health Care, 2011) and 2 hours of C&C training that followed a structured curriculum provided by the Institute of Healthcare Communication. The C&C component was delivered by the CCAC service manager (HC) who attended a 5-day C&C Faculty Development program provided by the Institute for Healthcare Communication. C&C was selected as the conceptual framework for collaborative goal attainment strategy development. The C&C component of the DSMC curriculum included a brief introduction to research regarding: (a) health behavior change showing that clinicians can have a positive impact on patients' health behaviors including self-management strategies; (b) adherence to specific treatment recommendations; (c) avoidance, reduction, or cessation of unhealthy behaviors; and (d) adoption of healthy behaviors.

C&C incorporates elements of motivational interviewing, social cognitive theory, self-determination theory, and the transtheoretical model of health behavior change (Prochaska & DiClemente, 1983) to guide clinicians and patients in a collaborative approach to motivating and sustaining behavior changes specific to clinical need or disease state. Core elements of C&C include assessment of preparedness for change (Prochaska & DiClemente, 1983) and a Conviction/Confidence Model matrix (Keller & White, 1997). Depending on an individual's current state of preparedness, the appropriate strategy is selected to move him/her to the subsequent stage. In addition, the subject rates his/her conviction and confidence on a 10-point scale (0 = *low conviction/ confidence*; 10 = *high conviction/confidence*). The ratings are then plotted on a conviction (y-axis) and confidence (x-axis) matrix in one of four quadrants: "Moving" (high conviction, high confidence); "Sceptical" (low conviction, high confidence); "Cynical" (low conviction, low confidence); or "Frustrated" (high conviction, low confidence). The quadrant within which the ratings intersect is used to facilitate a collaborative discussion to identify the intervention strategies employed to promote goal achievement.

The initial 6 hours of Day 2 were dedicated to completion of C&C training. To ensure understanding and application of the C&C program, the trainer incorporated a number of comprehension assessments into the

2-day workshop including teach-backs, role playing, and critical review. The remainder of Day 2 involved an overview of the principles of SMART (i.e., Specific, Measurable, Achievable, Realistic, Timely) goal setting (Doran, 1981) and Goal Attainment Scaling (Kiresuk, Smith, & Cardillo, 1993). A 1-day booster was provided to all PSWs 8 months after the initial training.

Apparatus

Subject manuals

EXP and CONT subject manuals consisted of a goal template to be completed by the nurse and a client goal worksheet to be completed with the client by the research associate (RA). In addition, the EXP subject manual included a series of three worksheets for each of the six coaching sessions. Worksheet 1 was a checklist of objectives for the visit; Worksheet 2 was a goal action plan; Worksheet 3 was a Conviction/Confidence Model matrix (Keller & White, 1997). Manuals were provided by the RA at the baseline data collection visit prior to the baseline nurse visit and retained by clients throughout the intervention period. The EXP subjects' worksheets were not included in the manual until after the baseline nurse visit to limit the possibility that care plan goal(s) identified by the nurse would be influenced by knowledge of group assignment. These worksheets were provided by the PSW at the first intervention visit.

Intervention team manuals

Five Intervention Team manuals were developed; one each for PSWs, the CCAC service manager, CCs, nurses, and nurse/PSW supervisor. Each manual included the following components: (a) study process flow; (b) customized checklists; (c) a nurse template for care plan goal setting; (d) baseline, postintervention, and 1-month follow-up checklists for the RA; and (d) PSW checklists for each of the six coaching sessions.

Procedures

Recruitment

Potential subjects were identified by a review of weekly admissions at the CCAC. Lists were segmented by caseload and provided to individual Care Coordinators (CC) to which a given client had been assigned. CCs reviewed each list to determine appropriateness for recruitment. Eligibility criteria included type 2 diabetes, English-speaking, age greater than 18 years, prescribed insulin, and inability to attend a self-management session outside the home. Exclusion criteria included cognitive impairment, pregnancy, and prior exposure to self-management programs.

Clients fitting the inclusion/exclusion criteria were informed of the study by their CC during their next face-to-face visit or by telephone. This process ensured that there was no direct contact made by any member of the study team and the clients, thus ensuring an unbiased application of the study inclusion/exclusion criteria. Interested clients provided verbal consent to be contacted by research staff who contacted potential study subjects within one week to provide a detailed description of the study, confirm eligibility and, where appropriate, schedule a baseline data collection visit. Subjects consenting to an in-home baseline assessment visit were randomly allocated to the EXP or CONT group using a random numbers generator. This study was approved by the CCAC Research Ethics Board.

DSMC intervention

Throughout the intervention phase, EXP and CONT subjects received standard diabetes care by a nurse based on the CCAC's "Diabetic Teaching for Clients on Insulin Service Pathway" which includes treatment (e.g., testing blood sugars, insulin administration) and education (e.g., client familiar with signs of hyper/hypoglycemia, skin care, independently performing insulin injections, glycemia monitoring, etc.). In addition, subjects randomized to the EXP group received six 1-hour one-to-one in-home coaching sessions delivered by a PSW. Sessions were conducted at roughly 1-week intervals depending on subjects' availability. The focus of the intervention was on achieving the goals that the subjects identified as the focus for the 6-week period after baseline data collection. Though nurses continued to provide clinical care for all subjects throughout the intervention phase, as described above, coaching intervention visits by the PSWs were not concurrent with nurses' visits.

During each DSMC visit the PSW and EXP subject worked through the structured, session-specific worksheets for that particular session. The emphasis of Session 1 was largely on rapport building. During this session the PSW and subject reviewed the subject's self-identified goal(s) recorded by the RA at the baseline data collection, and began the discussion to establish the individual subject's challenges and strengths that would guide subsequent motivational interviewing sessions. During Session 2 the PSW and subject worked together to establish the subject's commitment and confidence in achieving goal(s), frame the goal(s) in the context of C&C, and began evaluating the subject's preparedness for change. Sessions 3 through 5 focused on actively implementing strategies for enhancing confidence and commitment and documenting progress on the Conviction/Confidence matrix. The sixth and final session included a review of the subject's progress and success to date, reaffirmation of the subject's goal(s) for the future, review of the subject's confidence and commitment to independent diabetes management, and documentation of progress on the Conviction/Confidence matrix. Following Session 6, the PSW contacted the RA, so the postintervention data collection visit could be scheduled.

Data collection

All subjects received a face-to-face visit by the RA to obtain written consent and to complete the baseline data collection instruments (DSES, IMDSES, and HADS). The self-identified goal(s) of all subjects were recorded in the individual client manuals by the RA. It should be noted that the discussion with the RA regarding self-identified goal(s) occurred without reference to the care plan goal(s) developed by the nurse; this was a separate process. Maintaining separate processes for nurse care plan goal setting and subject self-identified goal setting assured that nurses used a standardized process for goal setting and were not influenced by the study protocol, while allowing subjects the flexibility to self-identify for the study any goal related to their health that they wished to work on over the next 6 weeks.

For the EXP subjects, the RA made another face-to-face visit after the completion of the intervention to complete the post-intervention data collection instruments. For the CONT subjects the postintervention data collection visit was scheduled 6 weeks after the baseline visit to match the intervention duration for the EXP subjects. At the postintervention data collection visit all subjects were asked to review their progress on the goal(s) that they had self-identified at the baseline data collection visit. One-month following postintervention data collection, the RA conducted a telephone follow up to complete the HADS.

Analysis

Descriptive statistics were utilized to summarize and present the study data. Repeated measures (RM) ANOVA was used to test for between- and within-groups differences over the course of the study intervention at baseline, postintervention, and 1-month follow-up for continuous variables. The Mann-Whitney U statistic was used to test for between-groups differences for categorical variables. The HADS instrument is designed to provide aggregate scores for anxiety and depression separately. In addition, the HADS provides a categorical scale for each construct: $0–7 =$ Normal, $8–10 =$ Borderline, $11–21 =$ Abnormal. Thus, the outcome of the HADS was analyzed using both parametric and nonparametric statistics, respectively, for purposes of comparing the aggregate scores and proportions of subjects within each HADS category.

Fidelity check to confirm accuracy of DSMC intervention delivery

Using an a prior checklist, two of the authors (JG and TP) independently reviewed the completed intervention worksheet booklets for two randomly selected subjects for each PSW to determine alignment between the coaching intervention and the C&C conceptual framework and consistency of focus on

the same goal(s) across the six sessions. The checklist was created to ensure that the goal(s) and the action plan are reflective of the theoretical underpinnings of the training.

Results

Subjects

Of the 112 community-dwelling CCAC clients who agreed to be contacted by the RA, 94 (84%) were recruited into the study. Subject demographics and clinical data are presented in Table 1. While the EXP and CONT groups had similar baseline characteristics, EXP subjects were three times as likely to present with a history of musculoskeletal complications, $\chi^2(1, n = 94) = 3.89$, $p = .05$. In addition, there was a trend toward a longer period of time on insulin among CONT subjects, 9.8 ± 13.2 versus 5.6 ± 7.9, $t(89) = 1.87$, $p = .07$.

After baseline data collection, 13 individuals (14%) dropped out prior to the follow-up data collection; 7 from the EXP group and 6 from the CONT group. Of the EXP group dropouts, three (43%) dropped out prior to the first intervention session, one (14%) after completing a single intervention session, and three (43%) after completing two sessions. Of the remaining 40 EXP subjects, only one person did not complete all 6 sessions of the intervention, representing 98% compliance with the full intervention. The mean intervention duration was 5.8 ± 1.4 weeks

Accuracy of DSMC intervention delivery

With the exception of a single PSW, the raters achieved consensus on completion and adherence to the C&C conceptual framework demonstrated by the PSWs. One PSW struggled with delivering the intervention consistent with the training and it was determined that she should be replaced after having completed two subjects. Consistent with an intention-to-treat approach, these subjects were included in the analysis.

Diabetes self-efficacy (DSES)

Primary and secondary outcome measure means for each group at baseline, postintervention, and 1-month follow-up are provided in Table 2. The 2 (time; baseline vs. postintervention) × 2 (group) RM ANOVA for DSES revealed a significant main effect for time, $F(1, 79) = 13.51$, $p < .001$, indicating that both groups demonstrated an improvement in diabetes self-efficacy from baseline to postintervention (6.6 ± 1.5 vs. 7.2 ± 1.5, respectively). There was no significant main effect detected for group, $F(1, 79) = 0.16$, $p = .69$, indicating the EXP and CONT groups did not differ in terms of self-efficacy

Table 1. Study subject demographics.

	Control (n = 47)	Experimental (n = 47)	Sig.
Male	22 (46.8%)	24 (51.1%)	.68
Age	66.9 ± 11.7	65.1 ± 13.2	.48
Years since diabetes diagnosis	20.3 ± 15.6	15.6 ± 12.5	.11
Years on insulin	9.8 ± 13.2	5.6 ± 7.9	.07
Comorbidities	3.2 ± 1.7	3.3 ± 1.5	.70
Marital status			.71
Separated/divorced	18 (38.3%)	13 (27.7%)	
Married	12 (25.5%)	14 (29.8%)	
Single	9 (19.1%)	12 (25.5%)	
Widowed	8 (17.0%)	8 (17.0%)	
Education			.68
Grade school	9 (19.1%)	11 (23.4%)	
Some high school	9 (19.1%)	7 (14.9%)	
High school	13 (27.7%)	11 (23.4%)	
Some postsecondary	5 (10.6%)	3 (6.4%)	
Postsecondary	10 (21.3%)	15 (31.9%)	
Graduate degree	1 (2.1%)	0	
Culture			.64
North American	15 (31.9%)	16 (34.0%)	
Mediterranean	9 (19.1%)	8 (17.0%)	
European	7 (14.9%)	10 (21.3%)	
Caribbean	6 (12.8%)	7 (14.9%)	
Southeast Asian	4 (8.5%)	3 (6.4%)	
Aboriginal	3 (6.4%)	0	
Asian	1 (2.1%)	1 (2.1%)	
Somalian	1 (2.1%)	0	
Oceanian	1 (2.1%)	0	
South American	0	1 (2.1%)	
Middle Eastern	0	1 (2.1%)	
Comorbidities			
Hypertension	27 (57.4%)	28 (59.6%)	.83
Myocardial infarction	17 (36.2%)	20 (42.6%)	.53
High cholesterol	15 (31.9%)	11 (23.4%)	.36
Blood disease	10 (21.3%)	7 (14.9%)	.42
Vision impairment	9 (19.1%)	11 (23.4%)	.61
Kidney disease	9 (19.1%)	8 (17.0%)	.79
Arthritis	9 (19.1%)	7 (14.9%)	.58
Neuropathy	8 (17.0%)	8 (17.0%)	—
Musculoskeletal	4 (8.5%)	11 (23.4%)	.05
Amputation	4 (8.5%)	1 (2.1%)	.17
Thyroid disease	4 (8.5%)	1 (2.1%)	.17
Mood disorder	3 (6.4%)	6 (12.8%)	.29
Acquired brain injury	3 (6.4%)	4 (8.5%)	.69
Wound	3 (6.4%)	4 (8.5%)	.69
Benign tumor	2 (4.3%)	2 (4.3%)	—
Liver disease	2 (4.3%)	1 (2.1%)	.56
Pulmonary disease	2 (4.3%)	2 (4.3%)	—
Addiction disorder	2 (4.3%)	2 (4.3%)	—
Cancer	1 (2.1%)	4 (8.5%)	.17
Other	16 (34.0%)	18 (38.3%)	.67

(6.8 ± 1.5 vs. 6.9 ± 1.5, respectively). Though the EXP and CONT groups were essentially equal in terms of self-efficacy at baseline (6.6 ± 1.6 vs. 6.6 ± 1.5) and the EXP group demonstrated a trend toward greater self-

Table 2. Mean Diabetes Self-Efficacy Scale (DSES) and Total Insulin Management Diabetes Self-Efficacy Scale (IMDSES) scores at baseline and postintervention; Hospital Anxiety and Depression Scale (HADS) scores at baseline, postintervention, and 1-month follow-up.

	Baseline		Postintervention		1-month follow-up		
	Control	Experimental	Control	Experimental	Control	Experimental	Sig.
DSES	6.6 ± 1.5	6.6 ± 1.6	7.0 ± 1.5	7.3 ± 1.5	—	—	*
IMDSES	114.1 ± 22.1	112.9 ± 19.3	127.0 ± 24.3	124.4 ± 20.2	—	—	*
HADS: Anxiety	7.8 ± 4.6	8.2 ± 5.2	7.5 ± 5.1	7.8 ± 4.7	7.9 ± 5.4	7.6 ± 4.9	NS
HADS: Depression	7.5 ± 4.1	8.3 ± 4.8	7.2 ± 4.4	7.8 ± 4.6	7.5 ± 4.6	7.8 ± 5.3	NS

*Significant main effect for time ($p < .001$).

efficacy at postintervention (7.3 ± 1.5 vs. 7.0 ± 1.5, respectively), there was no significant interaction detected, $F(1, 79) = 1.52$, $p = .22$.

Insulin management diabetes self-efficacy (IMDSES)

The results for the 2 (time; baseline vs. postintervention) × 2 (group) RM ANOVA for IMDSES revealed a significant main effect for time, $F(1, 79) = 33.60$, $p < .001$, indicating that both groups demonstrated an improvement in diabetes self-efficacy from baseline to postintervention (113.5 ± 20.6 vs. 125.72 ± 22.3, respectively). There was no significant main effect detected for group, $F(1, 79) = 0.21$, $p = .65$, indicating the EXP and CONT groups did not differ in terms of self-efficacy (118.6 ± 19.7 vs. 120.6 ± 23.2, respectively). There was no significant interaction detected, $F(1, 79) = 0.12$, $p = .74$.

Anxiety and depression

The 3 (time; baseline vs. postintervention vs. 1-month follow-up) × 2 (group) RM ANOVA for the anxiety subscale revealed no significant main effects for time, $F(2, 150) = 0.29$, $p = .75$; or group, $F(1, 75) = 0.01$, $p = .91$; nor did it identify a significant interaction, $F(2, 150) = 0.35$, $p = .71$. Likewise, the 3 (time) × 2 (group) RM ANOVA for the depression subscale revealed no significant main effects for time, $F(2, 150) = 0.57$, $p = .57$; or group, $F(1, 75) = 0.42$, $p = .52$; nor did it identify a significant interaction, $F(2, 150) = 0.84$, $p = .18$.

HADS categorical distributions for subjects in each group are provided in Table 3. There were no differences between EXP and CONT groups in terms of the distribution of subjects in the Normal, Borderline, or Abnormal categories for anxiety at baseline (Mean rank 40.0 vs. 37.0, $U = 665.0$, p = .52), postintervention (38.3 vs. 38.7, $U = 714.0$, p = .93), or 1-month follow-up (36.5 vs. 40.5, $U = 645.0$, p = .38). Similarly, there were no differences between EXP and CONT groups in terms of the distribution of subjects in the Normal, Borderline, or Abnormal categories for depression at baseline (Mean rank 42.1 vs. 34.9, $U = 585.0$, p = .12), postintervention (39.0

Table 3. Hospital Anxiety and Depression Scale (HADS) categories at baseline, postintervention, and 1-month follow-up.

	Control (*n* = 38)	Experimental (*n* = 38)	*U*
Baseline			
Anxiety			
Normal	22 (57.9%)	16 (42.1%)	NS
Borderline normal	5 (13.2%)	14 (36.8%)	
Abnormal	11 (28.9%)	8 (21.1%)	
Depression			
Normal	24 (63.2%)	16 (42.1%)	NS
Borderline normal	5 (13.2%)	10 (26.3%)	
Abnormal	9 (23.7%)	12 (31.6%)	
Postintervention			
Anxiety			
Normal	22 (57.9%)	22 (57.9%)	NS
Borderline normal	6 (15.8%)	7 (18.4%)	
Abnormal	10 (26.3%)	9 (23.7%)	
Depression			
Normal	23 (60.5%)	21 (55.3%)	NS
Borderline normal	3 (7.9%)	6 (15.8%)	
Abnormal	12 (31.6%)	11 (28.9%)	
1-Month Follow-up			
Anxiety			
Normal	19 (50.0%)	22 (57.9%)	NS
Borderline normal	7 (18.4%)	8 (21.1%)	
Abnormal	12 (31.6%)	8 (21.1%)	
Depression			
Normal	22 (57.9%)	21 (55.3%)	NS
Borderline normal	6 (15.8%)	6 (15.8%)	
Abnormal	10 (26.3%)	11 (28.9%)	

vs. 38.0, U = 703.5, p = .83), or 1-month follow-up (39.1 vs. 37.9, U = 700.0, p = .80).

Discussion

Self-efficacy

Self-efficacy affects motivation, is crucial for promotion of self-management in diabetes (Mohebi, Azadbakht, Feizi, Sharifirad, & Kargar, 2013), and has been linked to specific self-management behaviors including healthy eating, physical activity (King et al., 2010), BG monitoring, foot care (Sarkar, Fisher, & Schillinger, 2006), and medication compliance (Hernandez-Tejada et al., 2012). Poor self-efficacy has been associated with higher resistance to treatment. Given that subjects in the current study experienced a significant improvement in diabetes and insulin management self-efficacy regardless of group assignment, suggests that the DSMC intervention alone is not an independent cause of enhanced self-efficacy. Rather, it is possible that participation in the research study acted as an intervention in and of itself. It is possible that participation in the study represented therapeutic visits and a person with whom to interact. In this context it appears that the inclusion of

a PSW as a change agent in an intervention to promote self-efficacy in diabetes self-management may not be necessary. Rather interaction with the RA, including such exercises as goal-setting, and answering questions regarding one's diabetes-related behaviors as well as diabetes and anxiety may have resulted in self-reflection and greater awareness of one's condition. It may simply be that formal, repeated engagement and reflection were sufficient to impart a sense of empowerment over the subjects' disease conditions.

Depression

That some subjects demonstrated depression is consistent with previous studies that have shown an increased burden of depression among patients with diabetes (Andreoulakis, Hyphantis, Kandylis, & Iacovides, 2012; Nouwen et al., 2010). Indeed, two of every five EXP and CONT subjects reported "Borderline Normal" or "Abnormal" levels of depression, while nearly one third reported "Abnormal" depression. Patients with depression and diabetes or other comorbidities have been shown to have poor compliance with self-management (deGroot, Anderson, Freedland, Clouse, & Lustman, 2001; DiMatteo, Lepper, & Croghan, 2000; Gonzalez et al., 2008, 2007). Further, the presence of both diabetes and depression has been linked to poorer quality of life (Das et al., 2013), glycemic control (Mathew, Dominic, Isaac, & Jacob, 2012), and an increased risk of mortality (Pan et al., 2011; van Dooren et al., 2013). Collaborative care composed of multi-professional patient care, a structured management plan, scheduled patient follow-up, and enhanced interprofessional communication has been shown to improve depression in patients with diabetes (Huang, Wei, Wu, Chen, & Guo, 2013). Though all of these collaborative care elements were present in the current study, we nonetheless failed to demonstrate a significant impact on depression in the EXP group, possibly due in part to the duration of the intervention which was 6 weeks on average, whereas the duration of the studies included in the meta-analysis by Huang et al. (2013) ranged from 13 to 30 months. This may be of particular relevance in the current study where the EXP and CONT subjects had been taking insulin for 5.6 and 9.8 years, respectively, and therefore possibly more resistant to change, especially over such a brief interval.

PSWs as delivery agents

We believe this study is unique in engaging PSWs as a self-management intervention delivery agent. The rationale for investigating PSWs in a coaching role relates to the unique relationship which exists between PSWs and the clients for whom they provide care as well as the cost of providing in-home

care; PSWs are roughly half the cost of providing in-home nursing. Among in-home care providers, PSWs tend to have the most routine and consistent interaction with their clients, often providing home visits on a daily basis. Thus an intervention based on the establishment of a "trust" relationship and delivered on a regular basis would presumably be facilitated by a delivery agent in the role of a PSW. Vogler, Davidson, Crane, Steiner, and Brown (2002) examined paraprofessional versus nurses for delivery of an early intervention for children with disabilities. Though the use of paraprofessionals was found to decrease the duration of time from assessment to commencement of service delivery, there were no definitive answers on the influence or efficacy of the service provider type. The model of case management was different between the two groups in addition to the service provider so it is not possible to determine what aspects were the most influential. Unfortunately, it was beyond the scope of the current study to test if there were would be differences related to who delivered the intervention (PSW or Nurses).

It is important that regardless of who delivers an intervention to promote self-management, it must address material needs, develop a meaningful understanding of each client's unique perspective, and consider and negotiate multiple possible service alternatives in a collaborative approach (Bailey, 2015). It is possible that the study training delivered to the PSWs was of insufficient duration to achieve the intervention shift required. Historically, PSW education and training has emphasized the role of "doing for" clients and less emphasis on "doing with" clients. Indeed, the Ontario Personal Support Worker Association (2015) identifies the PSW scope of practice as typically involving "personal care tasks and incidental activities of daily living, such as housekeeping, meal preparation, socialization and companionship" ("Introduction," para. 2). Given the skill set necessary for collaborative goal setting, it is possible that a 2-day training session and booster session were insufficient. Despite our efforts to assess whether the PSWs were effectively delivering the curriculum, it is possible the PSWs could have delivered the intervention more robustly had the training been longer and the PSWs observed in practice interventions for the development of this critical therapeutic skill (Bohman, Forsberg, Ghaderi, & Rasmussen, 2015; Miller & Mount, 2001; Moyers et al., 2015).

As health care costs and the burden of diabetes continue to grow, it is important to continue to investigate innovative methods for promoting self-managed care. In Schillinger et al. (2008), subjects with diabetes were randomized to one of two self-managed support interventions: an automated weekly telephone management interaction or a monthly group medical visit (physician, health educator, and pharmacist; Schillinger et al., 2008). Subjects indicating an out-of-range blood glucose measure received a call from a Nurse within a short period of time. In previous research it was found that

it was challenging for clinicians to engage in collaborative goal setting in routine visits (Handley et al., 2006; MacGregor et al., 2006) so the focus on this intervention was to improve collaborative goal-setting activities and action planning and to increase engagement. The automated telephone management was more effective than the group visit, suggesting direct interaction is less important in developing rapport as previously thought. There has been increased interest in Ontario in providing Telehomecare through a provincial health network to monitor somatic indices of diabetes. The findings from Schillinger et al. (2008) suggest that telephone interaction can be useful for more than just somatic monitoring and might be used for supporting self-managed care more broadly.

Limitations

While we set-out with the intention of blinding RNs of subject group assignment, in practice, we were not able to assure definitively that this was the case. However, in spite of taking steps to conceal group assignment to the RNs and instructing both RNs and subjects not to discuss group assignment, we cannot preclude that such conversations took place, thus potential confounding related to violation of blinding of RNs on the study outcome cannot be ruled-out. CONT and EXP subjects recruited into the study had been on insulin for 9.8 and 5.6 years, respectively. The lack of a significant self-efficacy main effect for group may have been related to greater behavioral entrenchment and, thus, greater resilience to change as a result of the DSMC intervention. While both groups demonstrated improvement on self-efficacy indicators, it is likely this was secondary to the social contact involved with data collection and a standard model of care that achieves improved outcome. Had the subjects spent less time using insulin, there may have been greater receptivity to the intervention that may have otherwise achieved greater self-efficacy improvement among the EXP group relative to CONT. Though randomization appeared largely successful in establishing baseline equivalency between groups, we are unable to explain the baseline difference in the proportion of EXP subjects demonstrating abnormal depression at baseline. Finally, the limited follow-up duration of 1 month is insufficient to suggest any long-term effects of the intervention.

Conclusions

This study sought to evaluate the efficacy of a PSW-led coaching intervention to improve diabetes self-efficacy, based on the rationale that PSWs are a relatively more cost-effective that traditional nurse-led self-management coaching interventions. The results, however, suggest that PSWs may not confer additional benefits for improving self-efficacy in the context of a self-management

intervention above and beyond the standard of care, which included a nurse-led pathway education program. This may be related to the primarily supportive role played by PSWs, rather than as a more active health promotion agent. However, the results do demonstrate that a collaborative intervention including PSW coaching may be sufficient to improve depression, particularly among those demonstrating an increased depression burden. Given the role of depression in adherence to maintenance regimens and mortality, further study of PSWs as an extension of a collaborative approach to diabetes self-management, particularly as a depression mitigation intervention, is warranted.

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