Published in final edited form as:

Clin Nurse Spec. 2013 ; 27(2): 88–95. doi:10.1097/NUR.0b013e3182819171.

Cost Template for Meaningful Activity Intervention for Mild Cognitive Impairment

Yvonne Yueh-Feng Lu, PhD, RN [Assistant Professor],

Department of Adult Health Institutional affiliation: Indiana University Work Phone: 317-278-2042

Work Fax: 317-274-2411 yuelu@iupui.edu

Tamilyn Bakas, PhD, RN, FAHA [FAAN Professor, PhD Program Coordinator], and

Department of Adult Health Indiana University 1111 Middle Drive, NU E421 Work Phone:

317-274-4695 Work Fax: 317-274-2411 tbakas@iupui.edu

Joan E. Haase, PhD, RN, FAAN [Holmquist Professor in Pediatric Oncology Nursing Co-director, Research in Palliative and End-of-Life Communication and Training (RESPECT) Center]

Depart of Family Health Nursing Office: 317-274-2989 jhaase@iupui.edu

Abstract

Purpose—To describe and compare cost estimates for a pilot study of the Daily Enhancement of Meaningful Activity (DEMA) intervention for persons with mild cognitive impairment (PwMCI)-caregiver dyads.

Background—The increasing complexity of the health care system and rising health care costs, have forced nurse scientists to find ways to effectively improve health care quality and control cost, but no studies have examined costs for new programs that target PwMCI-caregiver dyads.

Description of the project—Pilot study data were used to develop a cost template and calculate the cost of implementing the DEMA.

Outcomes—Mean cost per dyad was estimated to be \$1,327.97 in the clinical setting, compared with \$1,069.06 if a telephone delivery mode had been used for four of the six face-to-face sessions. This difference was largely due to transportation-related expenses and staff cost.

Implications—DEMA should be evaluated further with larger and more diverse samples as a technology-delivered health promotion program that could reduce costs.

Keywords

Cost; intervention studies; cognitive impairment

Introduction

The importance of estimating costs for a pilot intervention program

Cost analyses of behavioral interventions have received increasing attention in health care intervention research, even during the early phases of intervention development and pilot testing.^{1,2} The increasing complexity of the health care system, rising health care costs, and

provider shortages have forced nurse scientists to look for ways to effectively improve health care quality and control cost.³

Mild cognitive impairment (MCI) is a growing problem among the aging population, and health care is particularly costly for older and diverse populations with memory problems.³ MCI is defined as a transitional state between the cognitive changes of normal aging and the earliest symptoms of Alzheimer disease (AD). MCI involves functional decline that may include decrements in engagement in meaningful activities and sense of confidence and it is also associated with depressive symptoms, dissatisfaction with family communication, and declining physical function.

The Daily Enhancement Meaningful Activity (DEMA) intervention was developed directly from the patient/caregiver dyadic perspective to address priority needs in ways that are most meaningful and helpful to the dyad. It was also designed to incorporate a strengths-based, positive health approach with a family dyadic format to address two priority needs of MCI patients: prevention of premature disengagement and depressive symptoms. The program was also designed to improve MCI patients' abilities to adjust to life changes. Like most pilot behavioral intervention programs,⁴⁻⁶ the DEMA intervention for couples dealing with memory problems was undertaken to evaluate the feasibility of the program and the preliminary impact of an intervention that may, in the future, inform policy and implementation decisions.

Cost estimation is important when developing pilot programs and for program evaluation. Cost estimation: (a) provides estimates of program costs and benefits, before programs are implemented in large, diverse populations and real-world situations; (b) improves understanding of program operations; (c) specifies levels of intervention that are most costly; and (c) may uncover unexpected costs.^{1,7} A cost template provides an initial structure for future planning of program costs and benefits that can be modified and eventually translated into the real-world community.

Recent research has examined the cost-effectiveness of non-pharmacological programs for dementia patients and/or their family caregivers,⁷⁻⁹ but no studies have examined costs for new programs that target PwMCI-caregiver dyads. The purpose of this paper is to describe development and use of a cost template to estimate the program costs of the DEMA intervention for PwMCI-caregiver dyads in the clinical setting.

Strategies for developing a cost template

Estimating a cost template is a fundamental step in cost analysis for new program development and can be guided by the production process model.¹⁰ This model, used to develop the cost template for a nurse-led stroke caregiver intervention program,¹¹ was used to guide the development of the cost template for the DEMA intervention. The Production Process Model describes the process by which input resources are identified and quantified to produce output. Input may involve such things as training and supervision costs for personnel, materials, and costs to participants. The output for this study is the DEMA intervention. The total cost of the production includes the total of each input resource, calculated as the quantity of that resource multiplied by its unit value. The cost template for the DEMA intervention was calculated through three main steps: identifying, measuring, and valuing resource use.^{10,11}

Identifying input resource use—Development of the cost template first required identification of all DEMA intervention costs. Program costs consisted of personnel time and materials involved in intervention training, delivery, and preparation and wrap-up time for the DEMA sessions. Participant costs were also considered a program cost, including

transportation (travel time, mileage, and parking fees) and intervention activities' costs to the participants.^{1,3,10,12,13} Transportation costs were calculated based on mileage to the intervention session location (usually the healthcare setting) and time spent traveling to the location. Mileage and time spent traveling were determined using MapQuest. Parking fees were based on the posted parking charges at local clinical sites. To attend the DEMA intervention sessions, the PwMCI and their family caregivers spent valuable time that often could have been used for other activities such as employment. Therefore, participant time related to actual intervention activities was included as an input resource.

Measuring input resource use—After all appropriate input resources were identified, quantities of resources needed to be defined in terms of measurable units. For example, meaningful activity engagement consultation, living will and/or legal consultation, and nurse consultation by the intervener were quantified in terms of hours for both the intervener and the PwMCI-caregiver dyads. Number of visits, telephone calls, and materials were also quantified as part of the process.

Valuing input resource use—The process of valuing input resource use involves assigning a unit cost to each input resource. For example, an hourly wage needs to be specified for personnel involved in the study. The time cost to participants to receive our intervention was estimated based on what they might have earned if they were working instead of participating in the study. The current market value of materials was used in assigning value to resources. Assigning values to resources can be challenging since the true costs of health interventions often exceed market prices.^{1,11,14} The time costs for PwMCI were estimated based on the federal minimum wage worker.¹⁵ Usually, family caregivers provide support or care for those with memory problems, and the cost of informal care time is often higher than the cost of a home health aide compared to family caregivers' self-reported occupation hourly wages. Therefore, time costs for family caregivers were based on the federal minimum wage for a home health aide provided by Bureau of Labor Statistics data.¹⁶

Brief Description of the DEMA intervention

DEMA was developed directly from the patient/caregiver dyadic perspectives to address their priority needs in ways most meaningful and helpful to them. DEMA aims to help patients, with family support, increase their meaningful activity engagement by using the principles of problem-solving therapy (PST). Content validity of the DEMA intervention is described elsewhere.¹⁷ Following approval from an institutional review board for the protection of human subjects, we recruited PwMCI-caregiver dyads from the university hospital, Alzheimer Center, and Health Aging Brain Center. PwMCI were diagnosed by an interdisciplinary team based on Winblad et al's criteria.¹⁸ The program included six face-to-face, bi-weekly sessions with an intervener using the Self-management Toolkit. The toolkit was organized around six self-management needs and consisted of 40 subtopic handouts. For each session, depending on the needs identified by the dyads, between five and eight subtopic handouts from the toolkit were used to structure the face-to-face sessions. During Session 1, the dyads were introduced to the overall structure and format of the sessions and the concept of meaningful activity. The intervener and dyad then: 1) reviewed the PwMCI's history of meaningful activity; 2) began to establish a realistic and manageable meaningful activity plan that included priority goals; 3) discussed the six topics in the Self-Management Toolkit. Each of the five sessions had two parts: Part 1 focused on planning strategies for engagement in meaningful activity, and Part 2 focused on the six topic areas in the Self-management Toolkit. Between sessions, the PwMCI engaged in the planned self-selected activities with spousal support. The aims of the DEMA intervention are to help MCI patients enhance their coping skills and self-management capability to improve activity engagement

to achieve outcomes of reduced emotional distress and depressed mood, as well as improved physical functioning and quality of life. The program also aims to improve skills related to adjusting to life changes for caregivers and PwMCI.

Methods—Using data from our pilot, we developed a cost template of the DEMA intervention. Research-associated costs (i.e., recruitment, research outcome measures, data collection, data management, statistical analyses) were not included as DEMA intervention costs. The cost template was focused on estimated cost of implementing the DEMA intervention and the cost of PwMCI-caregiver dyads' time. Intervention costs included training time (intervention training, ongoing supervision, team meetings), intervention preparation and wrap-up time for the interveners, intervention delivery costs (sessions and materials), and dyad costs (transportation, parking, and time). The pilot DEMA intervention was performed at a clinic (two PwMCI-caregiver dyads lived less than 30 minutes driving distance from the clinic and preferred to receive sessions at home due to health concerns such as using portable oxygen for COPD or a walker). We also included travel costs for PwMCI-caregiver dyads to clinical settings: travel time, gas mileage, and parking fees. We recorded the number of hours spent in training the research assistant (RA). The intervener kept track of the number of hours spent on preparing, delivering, and making the reminder phone calls before face-to-face intervention. Other costs directly related to the intervention were for print materials that were mailed to the PwMCI-caregiver dyads. We also documented each PwMCI-caregiver dyad's time spent on the program, which was the same as intervention delivery time in the intervener's activity log. In addition, each PwMCI-caregiver dyad's travel time and parking cost were included.

RESULTS

The cost template for the DEMA intervention is presented in Table 1. The template details costs associated with training time, intervention preparation and wrap-up, intervention delivery, and dyad participation. We estimated the workers' unit costs per hour to be \$15 for the RA, \$25 for the nurse intervener, \$30 for the trainer, and \$40 for an assistant professor within an academic setting. The unit cost of print materials was \$60 per PwMCI-caregiver dyad. Similar to methods of Bakas et al.'s and Nichols et al.'s studies,^{11,12} the PwMCI's time was valued at the minimum wage of \$7.25 per hour.¹⁵ We also valued the caregiver's time at \$10.41 per hour, the mean of hourly wages for home-care aides for 2011.¹⁶ The average total cost per dyad for the DEMA intervention was \$1,327.97. Specific details on how these costs were computed are provided in Table 1.

Training time cost included the time that interveners and supervisors spent during training, ongoing supervision, and team meetings. We estimated the subtotal training costs to be \$631.94 per dyad, which was nearly half of the total DEMA cost per dyad. Each intervener received eight hours of training related to the DEMA intervention protocol. The supervisor, an assistant professor, was responsible for providing training and ongoing supervision to maintain intervention fidelity. The total of four training sessions (2 hours per session $\times$ 4 = 8 hours) included a brief orientation to the DEMA intervention, role playing, audio-taped review of sessions, and evaluation. Ongoing supervision consisted of approximately one hour for one of six sessions for each dyad to check the fidelity of the DEMA intervention. Each individual session was audiotaped. The audiotapes were randomly selected and rated for adherence more frequently at the beginning of the study and every three months thereafter. The tapes provided a basis for feedback to the intervener to ensure consistency with the established protocol. This involved listening to audiotapes and reading the written transcriptions separately. Team meetings involved 26 one-hour meetings over the course of one year. The purpose of the team meetings was to evaluate treatment fidelity related to

training, delivery, receipt, and enactment, as well as to assess any divergence in the intervention protocol and any adverse events or potential risk.

Preparation and wrap-up for the DEMA intervention included phone call reminders, intervention preparation, and wrap-up. Intervention preparation included gathering intervention supplies, reviewing the dyad's general information and, after session one, reviewing the previous intervention documents prior to each session. Wrap-up included developing a brief summary of sessions, making a written weekly activity follow-up list, and entering data of the activity log after each intervention. The average subtotal cost of preparation and wrap-up was \$94.20 (7.10% of the total cost) for each dyad enrolled.

Intervention delivery cost included one hour of intervener salary per session for a total of six sessions as well as intervention materials. The per-package intervention material included printing, binder, and postage. The subtotal cost of intervention delivery was \$210 per dyad (15.81% of total costs).

Costs to the dyad for their involvement in the DEMA intervention included gas, travel time, parking fee, and time spent receiving intervention sessions. We used the mean of all dyads' travel miles multiplied by six (number of the intervention sessions). Gas cost, travel time, and parking fee were considered transportation-related cost and, on average, totaled \$285.87 per dyad. We estimated \$105.96 for the dyad's time spent in intervention sessions when calculating the MCI patient's time at \$7.25 per hour and the caregiver's time at \$10.49 per hour. The average subtotal of dyad costs was \$391.83. The final average cost template estimate for the total DEMA intervention in the clinical setting (training, preparation and wrap up, delivery, and dyad costs) was \$1,327.97 per PwMCI-caregiver dyad.

Because of the high cost of staff salary and dyad transportation-related costs, we plan to revise the DEMA intervention to use more telephone sessions in place of some face-to-face sessions. We also plan to make our training more efficient. Table 2 provides an estimate of costs for the DEMA intervention if these proposed changes are made. To reduce training costs, we will hire an RN instead of a doctorally prepared assistant professor to train and supervise the DEMA interveners. The trainer salary costs will then be reduced by about \$80 per dyad, providing significant savings for the DEMA intervention. We also plan to reduce dyad transportation-related costs by converting four of our six face-to-face sessions to telephone sessions (see Table 2). With only two face-to-face sessions and four telephone sessions, transportation-related costs (gas mileage, travel time, and parking) would be reduced by \$190.58. Based on these modifications, our new estimated costs for the total DEMA intervention are \$1,069.06 per dyad, a saving of approximately \$258.91 per dyad.

DISCUSSION

The development of a cost template is an essential and fundamental step in conducting a preliminary cost-effectiveness analysis that allows researchers, clinicians, administrators, and decision makers to assess the potential value of a health intervention such as DEMA. Only a few published studies have explored program costs for interventions for dementia family caregivers.^{8,11,19,20} To our knowledge, this is the only study that has explored preliminary costs for an intervention designed to improve outcomes for PwMCI-caregiver dyads in the clinical setting. The aim of this paper was to estimate the pilot program costs of the Daily Enhancement of Meaningful Activity (DEMA) intervention for PwMCI-caregiver dyads in clinical settings.

Training time cost comprised the largest percent of costs (47.6%) for the DEMA intervention (see Table 1). These costs were considered fixed and were based on the small number of participants in the pilot study. When enrolling larger numbers of PwMCI-

caregiver dyads in a future randomized controlled trial, training time costs (intervention training and supervisor training time) will be reduced, because these costs are the same regardless of the number of dyads participating in the study. Further cost reduction is expected for the next study because of plans to use an RN, rather than the assistant professor supervisor, to train and monitor the nurse interveners. Additional strategies may be considered to further reduce costs, such as using more efficient technological methods for training. For example, training sessions could be videotaped or interactive training sessions could be designed using computers or iPads, which would cost less than one-on-one training. On the other hand, some training, supervision, and team meetings will be necessary to maintain treatment fidelity, which is an essential function in health behavior programs and research. Treatment fidelity is important to make sure each session for each dyad is implemented as planned and treatment is accurately delivered.²¹ Thus, there is need for developing effective ways to balance the cost of supervision time and treatment fidelity in future clinical trial studies. Developing a computer-based and standardized treatment fidelity assessment system related to training that will use an automatic reporting system will not only improve communication in a timely manner but also reduce the number of team meetings required.

The well justified preparation and wrap-up costs were a small percent of total study costs (7.10%). Reminder phone calls are important for study retention. Intervention preparation and wrap-up were integral components of the intervention process. These strategies are key to subject retention in behavioral intervention research.²²

Intervention delivery cost also represented only a small percent of total costs (15.81%) and were considered fixed in this study. However, we may consider replacing the RN interveners with volunteer or paid lay persons who could work with PwMCI-caregiver dyads individually or through support groups. Furthermore, to increase accessibility and eliminate the cost of using paper copies, the self-management kit could be downloaded to a computer.

Costs to the dyad for their involvement, representing the second highest percent of costs (29.50%) in the pilot study, included gas, travel time, parking fees, and time spent receiving intervention sessions (see Table 1). The cost of informal caregiving was calculated by varying the average hourly wages obtained from the US Department of Labor in order to minimize sensitivity analysis. To increase accessibility and reduce the dyad cost, we plan to revise the previous DEMA intervention delivery mode from six bi-weekly face-to-face sessions to two bi-weekly face-to-face sessions and four bi-weekly telephone sessions for future studies. The reason for keeping two face-to-face sessions in a new study is to establish a therapeutic alliance through the use of a meaningful activity values assessment for the PwMCI-caregiver dyads. For example, during this assessment, the dyad performs activities that require visual contact with each other and the intervener. The dyad also begins to establish a realistic and manageable meaningful activity plan and to practice problem-solving skills. Once the dyad is familiar with these techniques, the rest of the DEMA intervention can be delivered by telephone to reinforce and maintain the strategies learned in the first two sessions. Telephone interventions have advantages over face-to-face interventions in terms of reduced costs for transportation and parking, as well as convenience to participants. Delivered completely by telephone, Bakas and colleagues have shown preliminary efficacy and strong satisfaction ratings for the Telephone Assessment and Skill-building Kit (TASK) for stroke caregivers.^{23,24} Based on eight weekly calls from a nurse, the cost template for the TASK program showed that the average total program cost was only \$421 per caregiver. This included training, intervention preparation and wrap-up, intervention delivery, material costs, and caregiver time costs. Though the TASK program was not a “dyad” intervention, it is possible that the total program costs for the DEMA intervention could be significantly reduced by converting some of the face-to-face sessions

to telephone-delivered sessions. Further revision and pilot testing for the DEMA telephone intervention should lead to an efficacious and cost-effective program that may be more easily incorporated into practice as well as increase recruitment and retention.²²

Comparison with previous studies

This paper described the procedures of estimating the cost template for a pilot study. It provides unique contributions to the cost template for an activity-based dyadic intervention for PwMCI in three ways. First, the information in the cost template focused on the health intervention cost to the dyad, and not only to a single participant. Unlike previous cost analysis studies focused on either the family caregiver or the dementia patient by delivering education and fostering social support,^{19,20} our pilot study used a family dyadic approach to address the priority need for an efficacious intervention to prevent premature disengagement and depressive symptoms in PwMCI. The intervention also aimed at improving skills of adjusting to life changes for caregivers. Second, the cost template data were compared for two types of intervention delivery modes: six face-to-face sessions versus two face-to-face and four telephone sessions. The latter method was found to potentially reduce intervention cost by 20%. . Third, we included gas cost, travel time, and parking fee for PwMCI-caregiver dyads when conducting face-to-face interventions at a clinical site. All the foregoing information can be useful in identifying costs of different components of an intervention and which components could benefit from modification in future intervention programs.

DEMA compares favorably to the few other cost estimates of patient- and caregiver-targeted interventions designed for persons with dementia and their family caregivers. Graff et al.'s study found that a 10-session, community-based occupational therapy intervention, delivered over three weeks, cost on average \$1,790, per dementia patient and caregiver dyad. The costs to the dyad for their involvement in occupational therapy were not included. A physical activity study cost an average of \$1,134, and the REACH II study cost an average of \$1,214. Both costs were greater than the DEMA intervention.^{8,12,20} On the other hand, Gitlin et al.'s tailored activity intervention study cost an average of \$941.63, which was less than the DEMA intervention.⁷

Other lessons derived from the pilot study included: 1) A data-collection instrument for a time and cost categories study needs to be developed and approved by all of those working on the intervention; and 2) providing opportunity for the study staff to explore the challenges of intervention implementation and interpreting or coding the cost items could identify possible further revisions for future studies.

Limitations

Comparing our results with other studies is challenging because few cost analysis studies have focused on the dyad. Also, our pilot study findings were not representative of all PwMCI in our health region due to the small and homogeneous sample, the single-sample design, and the fact that participants were recruited primarily from one university hospital.

CONCLUSION

In summary, with increases in population size and life expectancy, Alzheimer's disease has become one of the main health problems and sources of medical cost. Health care resources (dollars for spending) are limited and there is a great need for more cost-effective new treatments, non-pharmacological interventions, and diagnostic procedures in that context. The use of cost templates may help to establish the value of health promotion interventions, preventive services, programs, and policies. Cost estimation for health interventions is an

ongoing process and assessing intervention cost and health-related outcomes is needed. Despite some limitations in cost template analysis, these analyses can provide valuable information for evaluating specific interventions and minimizing their cost.

Acknowledgments

The author gratefully acknowledges study funding received from the National Institutes of Health, National Institute of Nursing Research (NINR, 1k01 NR010854-01).

References

1. Foster EM, Porter MM, Ayers TS, Kaplan DL, Sandler I. Estimating the costs of preventive interventions. *Evaluation Review*. 2007; 31:261–86.
2. Findorff MJ, Wyman JF, Croghan CF, Nyman JA. Use of time studies for determining intervention costs. *Nursing Research*. 2005; 54:280–4. [PubMed: 16027571]
3. Grosse SD, Teutsch SM, Haddix AC. Lessons from cost-effectiveness research for United States public health policy. *Annual Review of Public Health*. 2007; 28:365–9.
4. Logsdon RG, McCurry SM, Pike KC, Teri L. Making physical activity accessible to older adults with memory loss: A feasibility study. *The Gerontologist*. 2009; 49:S94–S9.
5. Davatzikos C, Bhatt P, Shaw LM, Batmanghelich KN, Trojanowski JQ. Prediction of MCI to AD conversion, via MRI, CSF biomarkers, and pattern classification. *Neurobiology Aging*. 2011; 32:e17–27.
6. Kello A, Koivunen J, Edison P, et al. Conversion of amyloid positive and negative MCI to AD over 3 years. *Neurology*. 2009; 73:754–60. [PubMed: 19587325]
7. Gitlin LN, Hodgson N, Jukowitz E, Pizzi L. The cost-effectiveness of a nonpharmacologic intervention for individuals with dementia and family caregivers: The tailored activity program. *American Journal of Geriatric Psychiatry*. 2010; 18:510–8. [PubMed: 20847903]
8. Groessl EJ, Kaplan RM, Blair SN, et al. A cost analysis of a physical activity intervention for older adults. *Journal of Physical Activity and Health*. 2009; 6:767–74. [PubMed: 20101920]
9. Wray LO, Shulan MD, Toseland RW, Freeman KE, Vásquez BE, Gao J. The effect of telephone support groups on cost of care for veterans with dementia. *The Gerontologist*. 2010; 50:623–31. [PubMed: 20507926]
10. Murray ME, Brennan PF, Moore SM. A model for economic analysis. *Nursing Economic*. 2003; 21:280–7. [PubMed: 14705558]
11. Bakas T, Li Y, Habermann B, McLennon SM, Weaver MT. Developing a cost template for a nurse-led stroke caregiver intervention program. *Clinical Nurse Specialist*. 2011; 25:41–6. [PubMed: 21139466]
12. Nicols L, Change C, Lummus A, et al. The cost-effectiveness of a behavioral intervention with caregivers of patients with Alzheimer's disease. *Journal of American Geriatric Society*. 2008; 56:413–20.
13. Rogerson MD, Gatchel RJ, Bierner SM. A cost utility analysis of interdisciplinary early intervention versus treatment as usual for high-risk acute low back pain patients. *Pain Practice*. 2010; 10:382–95. [PubMed: 20384967]
14. Drummond, M.; Sculpher, M.; Torrance, G.; O'Brien, B.; Stoddart, G. *Methods for the Economic Evaluation of Health Care Programs*. Oxford University Press; New York: 2005.
15. [Accessed June 29, 2012] Labor forces statistics from the current population survey: Characteristics of minimum wage workers. 2011. at <http://www.bls.gov/cps/minwage2011.htm>.
16. [Accessed May 10, 2012] Occupational Employment Statistics: Occupational Employment and Wages. May. 2011 2012, at <http://www.bls.gov/oes/current/oes311011.htm>.
17. Lu YY-F, Haase JE. Content Validity and acceptability of the daily enhancement of meaningful activity program intervention for mild cognitive impairment patient-spouse dyads. *Journal of Neuroscience Nursing*. 2011; 43:317–28. [PubMed: 22089409]

18. Winblad B, Palmer K, Kivipelto M, et al. Mild cognitive impairment-- beyond controversies, towards a consensus: A report of international working group on mild cognitive impairment. *Journal of Internal Medicine*. 2004; 256:240–6.
19. Gellis ZD, Bruce JM. Problem solving therapy for subthreshold depression in home healthcare patients with cardiovascular disease. *American Journal of Geriatric Psychiatry*. 2010; 18:464–74. [PubMed: 20871804]
20. Graff MJL, Adang EMM, Vernooij-Dassen MJM, et al. Community occupational therapy for older patients with dementia and their caregivers: Cost effectiveness study. *British Medical Journal*. 2008; 336:134–8.
21. Bellg AJ, Borrelli B, Resnick B, et al. Enhancing treatment fidelity in health behavior change studies: best practices and recommendations from the NIH Behavior Change Consortium. *Healthy Psychology*. 2004; 23:443–51.
22. Ward A, Arrighi HM, Michels S, Cedarbaum JM. Mild cognitive impairment: Disparity of incidence and prevalence estimates. *Alzheimer's & Dementia: The Journal of the Alzheimer's Association*. 2012; 8:14–21.
23. Bakas T, Farran C, Austin J, Given B, Johnson E, Williams L. Stroke caregiver outcomes from the Telephone Assessment and Skill-Building Kit (TASK). *Topics in Stroke Rehabilitation*. 2009; 16:105–21. [PubMed: 19581197]
24. Bakas T, Austin J, Buelow JM, et al. Preliminary efficacy of a stroke caregiver intervention program for reducing depressive symptoms. *Stroke*. 2010; 41(4):e104.

Table 1

Estimated Cost Template for the DEMA Intervention in Clinical Setting

Item	Provider	Description	\$ Cost/Per Dyad	Total \$ Cost/Per Dyad	% of Total Cost
Training Time Cost		Intervention Training+ Ongoing Supervision+ Team Meetings = \$200.0+\$320.0+\$25.0+\$40.0+\$18.05+\$28.89 = \$631.94		631.94	47.59%
Intervention Training	Intervener	Staff (s)/per dyad $\times$ time $\times$ \$ RN hourly wage = 1 intervener $\times$ 8 hours $\times$ \$25.00 = \$200.0	\$200.00		
	Supervisor	Supervisor/per dyad $\times$ time $\times$ \$ Supervisor hourly wage = 1Trainer $\times$ 8 hours $\times$ \$40.00 = \$320.00	\$320.00		
Ongoing Supervision	Intervener	1 session/per dyad $\times$ Time $\times$ \$ RN hourly wage = 1 session $\times$ 1 hour $\times$ \$25 = \$25.00	\$25.00		
	Supervisor	1 session/per dyad $\times$ Time $\times$ \$ supervisor hourly wage = 1 session $\times$ 1 hour $\times$ \$40 = \$40.00	\$40.00		
Team Meetings	Intervener	(26 one hour meetings $\times$ RN intervener salary) divided by total # dyads per year. = 26 meetings $\times$ \$25.00 = \$650/ 36 dyads = \$18.05	\$18.05		
	Supervisor	(26 one hour meetings $\times$ RN intervener salary) divided by total # dyads per year. = 26 meetings $\times$ \$40.00 = \$1040/ 36 dyads = \$28.89	\$28.89		
Preparation and Wrap-up		Phone call reminders + Intervention Preparation+ Intervention Wrap-up = \$7.20+\$37.50+\$75.0= \$94.20		94.20	7.10%
Phone call reminders (mean)	Assistant	Phone calls/per dyad $\times$ time (hours) $\times$ \$ hourly wage = 6 calls $\times$ 0.08 hours $\times$ \$15.00 = \$7.20	\$7.20		
Intervention Preparation	Intervener	Sessions/per dyad $\times$ time $\times$ \$ wage hourly = 6 sessions $\times$ 0.25/hour $\times$ \$25/per hour = \$37.50	\$37.50		
Intervention Wrap-up	Intervener	Sessions/ per dyad $\times$ Time $\times$ \$ RN wage hourly = 6 sessions/ per dyad $\times$ 0.33 hour $\times$ \$25/ hour = \$75.00	\$49.50		
Intervention Delivery Cost				210.00	15.81%
Meaningful activity session	Intervener	Sessions/per dyad $\times$ time (hr) $\times$ \$ RN hourly wage = 6 session $\times$ 1 hour $\times$ \$25.00 = \$150.00	\$150.00		
Materials		Intervention materials (printing, binder, postage) $\times$ \$ cost/ per package = 1 $\times$ \$60 = \$60	\$60.00		
Dyad Costs:		Gas cost+ Travel Time+ Parking fee + Time spent receiving intervention sessions = \$136.22+\$74.95+\$52.20+\$22.50+\$62.46+\$43.50 = \$ 391.83		391.83	29.50%
Gas cost (per mileage mean of round trip)	Dyad	Mileage $\times$ round trips/per dyad $\times$ Sessions $\times$ \$ Cost/per mileage = 20.64 miles one way $\times$ 2 (round trip) $\times$ 6 Sessions $\times$ \$0.55 per mile = \$ 136.22	\$136.22		
Travel Time (mean of round trip)	CG	Sessions $\times$ travel time (hour) $\times$ \$ the mean wage = 6 sessions $\times$ 1.2 hours $\times$ \$10.41 = \$ 74.95	74.95		
	PwMCI	Sessions $\times$ travel time (hour) $\times$ \$ the mean wage = 6 sessions $\times$ 1.2 hours $\times$ \$7.25 = \$ 52.20	\$52.20		
Parking fee per dyad	Dyad	Sessions $\times$ hours $\times$ \$ parking cost = 6 sessions $\times$ 1.5 $\times$ \$2.50 per hour = \$22.50	\$22.50		
Time spent receiving intervention sessions	Caregiver time	Sessions/per caregiver $\times$ time (hr) $\times$ \$ the healthcare aid's hourly wage = 6 sessions $\times$ 1 hour $\times$ \$ 10.41 = \$62.46	\$62.46		

Item	Provider	Description	\$ Cost/Per Dyad	Total \$ Cost/Per Dyad	% of Total Cost
	PwMCI	Sessions/per patient $\times$ time (hr) $\times$ \$ US minimum wage = 6 sessions $\times$ 1 hour $\times$ \$ 7.25 = \$43.50	\$43.50		
Total Cost/per Dyad in Clinical				1327.97	

Note: PwMCI = Persons with mild cognitive impairment; CG = caregivers; Dyad = PwMCI-Caregiver dyad; Training time cost + Total cost/per dyad in clinical setting = Intervention Preparation and Wrap-up + Intervention delivery cost + Dyad cost

Table 2

Estimated Cost Template for the DEMA Intervention: 2 Face-to-Face sessions + 4 Telephone Sessions

Item	Provider	Description	\$ Cost/ Per Dyad	\$Total Cost/ Per Dyad	% of Total Cost
Training Time Cost		Intervention training cost + ongoing supervision cost + Team meeting cost = \$200.0+\$200.0+\$25.00+\$30\$18.05+\$21.67+\$28.89 = \$563.61		\$563.61	52.70%
Intervention Training	Intervener	Staff (s)/per dyad $\times$ time $\times$ \$ RN hourly wage = 1 intervener $\times$ 8 hours $\times$ \$25.00 = \$200.0	\$200.00		
	Experienced trainer	Experienced trainer/per dyad $\times$ time $\times$ \$ Experienced hourly wage = 1Trainer $\times$ 8 hours $\times$ \$30.00 = \$240.00	\$240.00		
Ongoing Supervision	Intervener	1 session/per dyad $\times$ Time $\times$ \$ RN hourly wage = 1 session $\times$ 1 hour $\times$ \$25 = \$25.00	\$25.00		
	Experienced trainer	1 session/per dyad $\times$ Time $\times$ \$ RN hourly wage = 1 session $\times$ 1 hour $\times$ \$30 = \$30.00	\$30.00		
Team Meetings	Intervener	(26 one hour meetings $\times$ RN intervener salary) divided by total # dyads per year. = 26 meetings $\times$ \$25.00 = \$650/ 36 dyads = \$18.05	\$18.05		
	Experienced trainer	(26 one hour meetings $\times$ experienced trainer salary) divided by total # dyads per year. = 26 meetings $\times$ \$30.00 = \$780/ 36 dyads = \$21.67	\$21.67		
	Supervisor	(26 one hour meetings $\times$ supervisor salary) divided by total # dyads per year. = 26 meetings $\times$ \$40.00 = \$1040/ 36 dyads = \$28.89	\$28.89		
Preparation and Wrap-up		Phone call reminders (mean) + Intervention Preparation+ Intervention Wrap-up = \$7.20 + \$37.50 + \$75.0 = \$94.20		\$94.20	8.81%
Phone call reminders (mean)	Assistant	Phone calls/per dyad $\times$ time (hours) $\times$ \$ hourly wage = 6 calls $\times$ 0.08 hours $\times$ \$15.00 = \$7.20	\$7.20		
Intervention Preparation	Intervener	Sessions/per dyad $\times$ time $\times$ \$ wage hourly = 6 sessions $\times$ 0.25/hour $\times$ \$25/per hour = \$37.50	\$37.50		
Intervention Wrap-up	Intervener	Sessions/ per dyad $\times$ Time $\times$ \$ RN wage hourly = 6 sessions/ per dyad $\times$ 0.33 hour $\times$ \$25/ hour = \$75.00	\$49.50		
Intervention Delivery Cost		Meaningful activity session + Materials = \$150 + \$60.0 = \$210.0		\$210.00	19.64%
Meaningful activity session	Intervener	Sessions/per dyad $\times$ time (hr) $\times$ \$ RN hourly wage = 6 session $\times$ 1 hour $\times$ \$25.00 = \$150.00	\$150.00		
Materials		Intervention materials (printing, binder, postage) $\times$ \$ cost/per package = 1 $\times$ \$60 = \$60	\$60.00		
Dyad Costs:		Gas cost + Travel Time Cost + Parking Fee + Time Spent Receiving Intervention = \$ 45.41 + \$24.98 + \$52.20 + \$ 7.50 + \$ 62.46 + \$ 43.50 = \$236.05		\$201.25	18.82%
Gas cost (per mileage mean of round trip)	Dyad	Mileage $\times$ round trips/per dyad $\times$ Sessions $\times$ \$ Cost/per mileage = 20.64 miles one way $\times$ 2 (round trip) $\times$ 2 Sessions $\times$ \$0.55 per mile = \$ 45.41	\$45.41		
Travel Time (mean of round trip)	CG	Sessions $\times$ travel time (hour) $\times$ \$ the mean wage = 2 sessions $\times$ 1.2 hours $\times$ \$10.41 = \$ 24.98	24.98		
	PwMCI	Sessions $\times$ travel time (hour) $\times$ \$ the mean wage = 2 sessions $\times$ 1.2 hours $\times$ \$7.25 = \$ 17.40	\$17.40		

Item	Provider	Description	\$ Cost/ Per Dyad	\$Total Cost/ Per Dyad	% of Total Cost
Parking fee	Dyad	Sessions $\times$ hours $\times$ \$ parking cost = 2 sessions $\times$ 1.5 $\times$ \$2.50 per hour = \$7.50	\$7.50		
Time spent receiving intervention sessions	Caregiver time	Sessions/per caregiver $\times$ time (hr) $\times$ \$ the healthcare aid's hourly wage = 6 sessions $\times$ 1 hour $\times$ \$ 10.41 = \$62.46	\$62.46		
	PwMCI	Sessions/per patient $\times$ time (hr) $\times$ \$ US minimum wage = 6 sessions $\times$ 1 hour $\times$ \$ 7.25 = \$43.50	\$43.50		
Total Cost/per Dyad in Clinical				\$1069.06	

Note: PwMCI = Persons with mild cognitive impairment; CG = caregivers; Training time cost + Total cost/per dyad in clinical setting = Intervention Preparation and Wrap-up + Intervention delivery cost + Dyad cost