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Developing a Cost Template for a Nurse-Led Stroke Caregiver Intervention Program

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Abstract

The purpose of this brief report was to estimate program costs for the Telephone Assessment and Skill-building Kit (TASK) for stroke caregivers, in comparison with an Information, Support, and Referral (ISR) group. Using data from our pilot trial, we developed a cost template, accounting for both the costs of organizing and implementing the TASK intervention and ISR programs, and costs of caregiver's time involved. Mean costs per caregiver were estimated to be \$421 in the TASK intervention group, compared to \$286 in the ISR group. This difference was largely due to extended training time and longer durations of phone calls in the TASK group. In addition to reporting our findings, we highlighted the general process of properly identifying, measuring and valuing resource use in a caregiver intervention, and discussed several ways a cost template can inform the evaluation and decision-making processes in nurse-led programs.

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INTRODUCTION

Cost analysis is the first step in evaluating the cost-effectiveness of a clinical intervention, and is an increasingly important component of clinical trials in the current health care environment¹. Research on caregiver interventions have traditionally focused on clinical effectiveness, largely ignoring the costs of the intervention. Large-scale adoptions of such interventions, however, require additional evidence on their cost and cost-effectiveness. Evaluation of relevant intervention costs also helps to identify resources consumed and inform researchers and clinicians of ways to potentially reduce program costs and increase efficiency.

In designing a cost analysis, the development of a cost template is a useful strategy to guide data collection necessary for estimating program costs. The purpose of this paper was to estimate program costs for the Telephone Assessment and Skill-building Kit (TASK), a nurse-led telephone intervention program that enables stroke caregivers to build skills based on assessment of their own needs²⁻⁴. Costs for the TASK program were compared to those of an Information, Support, and Referral (ISR) group using a cost template. We also discuss several ways a cost template can inform the evaluation and decision-making processes in nurse-led programs, as well as provide implications for clinical nurse specialists in practice.

BACKGROUND FOR DEVELOPING A COST TEMPLATE

Developing a cost template to estimate program costs can serve as a starting point for conducting a cost analysis. Cost analysis is guided by the production process model⁵. The production process defines how inputs are turned into output, where output is the end product or service delivered to customers, and inputs are all resources required to produce the product/service. In caregiver intervention trials, output could be a caregiver skill-building program, a telephone consulting service, or other type of program, and inputs usually include personnel, equipments, and materials devoted to the operation of the program. The total costs of production are the sum of the cost of each input, calculated as the quantity of an input multiplied by its unit price⁶. Cost analysis in caregiver trials therefore includes three tasks: identifying, measuring, and valuing resource use. These three tasks are important for the construction of a cost template to estimate program costs.

Identifying resource use

The first step in developing a cost template is to fully identify all relevant resources consumed. An opportunity cost approach should be used in this process. Opportunity cost refers to potential opportunities forgone by committing a resource to a particular program. This approach ensures that resources that do not require explicit monetary expenditures are also counted. For example, when caregivers need to spend time on taking classes or learning skills as part of the intervention, their time should be identified as a resource use, because they could have used that time to work and earn wages.

An opportunity-cost approach would lead to two broad categories of resource use: resources committed to organizing and implementing the intervention, and resources used by patients and their families. The first category includes the use of personnel, materials, equipments/devices, as well as shared resources. The second category includes patient time, transportation, and supports provided by family members and/or volunteers⁷.

Identification of resource use also depends on the perspective taken in the study. A cost analysis may be conducted from the perspective of the payer, the provider, the caregiver, or the society⁸. The relevant cost components may differ with each perspective. For example, caregiver time cost is a cost to the caregiver and the society, but not to the provider or the

payer. A societal perspective is desirable in most cases, because it captures all relevant costs and can be narrowed to accommodate other perspectives.

Measuring resource use

Once all relevant costs have been identified, measuring resource use is relatively straightforward in caregiver trials. Quantities of resource use, such as home visits, respite care, nurse consultation, and caregiver's time, can be recorded in the appropriate physical units (number of hours, days, or visits) by the interveners or the project manager.

Valuing resource use

Valuation of resource use involves assigning unit cost or price to each resource. Generally, prevailing market prices, when available, provide the most robust estimation. Often times, however, market prices of inputs to health interventions do not reflect their true costs⁷⁻⁸. For example, hospital charges in the U.S. typically differ from the actual costs. Adjustments will be necessary in such circumstances to accurately estimate the true opportunity costs of resources devoted to delivering a particular health care service. An opportunity cost approach should also be adopted when valuing non-market items, such as patient or caregiver time. Therefore, the price of caregiver time may range from zero through average wage rates to average overtime rates, depending on what assumptions are made regarding alternative use of the caregiver's time.

AN ILLUSTRATION OF COST TEMPLATE DEVELOPMENT USING TASK

Background on the TASK Intervention

In this section, we illustrate the methods for developing a cost template using the TASK intervention in comparison with an ISR group. Content validity, satisfaction, and preliminary efficacy of the TASK intervention have been described elsewhere²⁻⁴. Briefly, following approval from an institutional review board for the protection of human subjects, we recruited caregivers from a local rehabilitation hospital and three local acute care hospitals within one month after the stroke survivor was discharged to the home setting, and randomly assigned them to the TASK intervention or the Information, Support, and Referral (ISR) group. The ISR group received phone calls using the same schedule as the intervention group and the American Stroke Association (ASA) pamphlet on family caregiving. All telephone calls were audio taped. In addition to the ASA pamphlet on family caregiving, the intervention group received a TASK Resource Guide for Caregivers containing 38 tip sheets, a stress management workbook, and Caregiver Needs and Concerns Checklist (CNCC) assessment forms for each week. The tip sheets addressed five key areas of skill-building needs and provided skill-building strategies in these areas: (1) finding information about stroke, (2) managing the survivor's emotions and behaviors, (3) providing physical care, (4) providing instrumental care, and (5) dealing with personal responses to providing the care. Caregivers in both groups then received 8 weekly calls from a nurse. For the ISR group, the nurse only provided active listening and paraphrasing; for the intervention group, the nurse developed individualized skill-building strategies based on assessment of the caregiver's priority skill needs using the CNCC.

The cost template was developed accounting for both the costs of organizing and implementing the TASK intervention and ISR programs, and costs of caregiver's time. Intervention costs included costs associated with training nurses, preparation and wrap up for the intervention, delivering the intervention, and supervising nurses. We recorded the number of hours spent training the nurses and the number of nurses and supervisors involved in training. The nurses kept track of the number of hours spent preparing, delivering, and wrapping up the TASK and ISR phone contacts. There were no travel costs

because the TASK intervention was solely telephone- based and did not involve home visits. Other costs directly related to the intervention were print materials sent to the caregiver's home. Caregiver's time spent on the program, which was the same as the intervention delivery time, was also documented in the intervener's activity log.

Results

The TASK sample consisted of 40 caregivers; 21 from the intervention group and 19 from the ISR group. Data from a subsample of 15 caregivers (8 TASK; 7 ISR) were further explored who scored positive for at least mild depressive symptoms using the Primary Health Questionnaire Depression Scale (PHQ-9), where total scores of 5 or above indicated at least mild depressive symptoms. Caregiver characteristics and a participant flow diagram are published elsewhere². There were no significant group differences in terms of caregiver characteristics, and we had a very low attrition rate (10%) over the course of the study².

We estimated the personnel unit cost to be \$20/hour for nurse interveners and \$22/hour for supervisors. The unit cost of print materials was \$43 per caregiver in the TASK intervention group, and \$1 per caregiver in the ISR group. Similar to methods by Nichols⁶, we valued the caregiver's time at \$10.39/hour, the mean wage for home care aides for 2010 published by the Department of Labor. The cost template for the TASK intervention relative to the ISR group is detailed in Table 1. The cost components of the template are described below.

Training cost per caregiver

A supervisor provided 18 hours of training for 2 nurses for the TASK intervention, and 6 hours of training for 2 nurses for the ISR group. Training included orienting nurses to the TASK manual, TASK Resource guide, and the ASA pamphlet, then role-playing telephone calls to learn the process. Training for the ISR group included orienting nurses to the ISR manual, the ASA pamphlet, and role-playing telephone calls.

Intervention preparation and wrap up per caregiver

Approximately 15 minutes were needed for preparation and 15 minutes needed for wrap after each caregiver call for both TASK and ISR groups. Table 1 shows a total of 30 minutes (.50 hours) nurse time for each TASK or ISR caregiver.

Intervention delivery per caregiver

An average of 3.95 hours for all 8 calls (.49hrs/call) was spent on the 21 caregivers in the TASK group, and 2.15 hours for all 8 calls (.27hrs/call) on the 19 caregivers in the ISR group. For the depressed subgroup, an average of 4.27 hours for all 8 calls (.53hrs/call) was spent on the caregivers in the TASK group and 2.19 hours for all 8 calls (.27hrs/call) was spent in the ISR group. The averages from the total TASK (n=21) and ISR (n=19) groups were used to calculate intervention delivery costs for the nurses.

Supervision cost per caregiver

Supervision costs included treatment fidelity issues such as nurse time listening to tape recorded calls with caregivers and performing a self-evaluation, then meeting with the supervisor regarding the results. Supervisors also listened to the tape recorded calls and evaluated each of the nurses' performance while providing retraining when necessary. For the TASK group, each evaluation lasted approximately 1.5 hours, with an average of 8 evaluations over the course of the study (12 hours). For the ISR group, each evaluation lasted approximately 1 hour, with an average of 8 evaluations over the course of the study (8 hours). Supervision costs also included weekly team meetings over 1 year, with 30 minutes

per week (26 hours) spent discussing the TASK caregivers and 30 minutes per week (26 hours) spent on ISR caregivers.

Materials costs per caregiver

Material costs for the TASK intervention included the cost of the TASK Resource Guide and the ASA pamphlet. Material costs for the ISR group included the cost of the ASA pamphlet. Postage was included in the materials costs.

Caregiver time cost per caregiver

These costs were estimated using the average intervention delivery time per caregiver per call (.49/call TASK; .27/call ISR). The same procedure was used for the depressed subgroup (.53/call TASK; .27/call ISR). The averages from the total TASK (n=21) and ISR (n=19) groups were used to calculate caregiver time cost per caregiver.

As shown in Table 1, mean costs per caregiver were \$421 in the TASK intervention group, compared to \$286 in the ISR group. This difference is largely due to extended training time and longer durations of phone calls in the TASK intervention group. Because training costs are fixed, the cost difference between TASK and ISR intervention groups is expected to be reduced when larger numbers of caregivers are enrolled. Analysis of the depressed subgroup costs revealed only slightly higher costs per caregiver for the TASK subgroup (n=8) (\$430 per caregiver) and ISR subgroup (n=7) (\$287 per caregiver). In other words, for the depressed subgroup, the TASK intervention cost approximately \$9 more and the ISR intervention cost \$1 more per caregiver because of increased intervention delivery time and caregiver time cost per caregiver.

DISCUSSION

The development of a cost template can inform the evaluation and decision-making processes in several ways. First, it identifies and organizes data that must be collected to identify which aspects of the intervention process are most costly and could benefit from streamlining in future work. For example, a large proportion of the costs found in this study were allocated for supervisor time for nurse training and supervision. These costs are fixed costs, and based on this small pilot, made up a large proportion of the total costs for the TASK and ISR interventions. Because these costs are fixed, they are the same regardless of the number of caregivers enrolled in the study. In a larger study, the proportion of costs related to nurse training and supervision would be reduced. Nevertheless, more efficient training methods, such as providing nurses with videotaped or interactive computer training, could further reduce supervisor costs. Maintaining treatment fidelity was a priority in this pilot study, thus involved a great deal of supervisor time listening to tapes and evaluating the two nurses. While treatment fidelity is important in randomized controlled clinical trials, finding the right balance between supervisor time and treatment fidelity deserves further attention. Furthermore, team meetings to discuss individual caregivers in the TASK or ISR groups were costly, and might also be reduced or streamlined to provide only necessary communication for managing individual caregivers in the study.

The development of a cost template also facilitates comparison with programs with similar goals but different cost structures. Nichols et al.⁶ examined the cost and cost-effectiveness of the Resources for Enhancing Alzheimer's Caregivers Health (REACH II), using data from the Memphis REACH II site. Although the REACH II was targeted at caregivers of patients with Alzheimer's disease, its design components were similar to TASK. Since the REACH II was primarily a home-based program, it provided a unique opportunity to compare the costs of alternative intervention delivery methods with similar goals and contents. Nichols

and colleagues reported that the REACH II intervention, which involved 9 home sessions and 3 telephone sessions (supplemented by five telephone support-group sessions), cost \$1,214 per caregiver, with the in-home sessions alone accounting for \$1,065.

Evaluation of program costs is more useful when examined in relation to efficacy/effectiveness. Notwithstanding its low costs (\$421 per caregiver), the TASK intervention showed preliminary efficacy on several outcome measures. Significant improvements with medium effect sizes were found for the TASK group relative to the ISR group in terms of optimism, task difficulty, and threat appraisal². Although not statistically significant, perhaps due to the small sample size, a medium effect size was found for decreasing caregiver depressive symptoms at four weeks². In the depressed subgroup, this effect was even larger, and was sustained to post-intervention⁴. These findings are encouraging, particularly since the cost of the TASK intervention for the depressed subgroup was estimated to be only \$9 more per caregiver. These preliminary findings from this small study warrant future research to determine efficacy of the TASK program in a larger trial. If shown to be efficacious, further research would be needed to determine if the TASK program would serve as a cost effective program for practice settings.

When the costs of intervention are evaluated against potential savings in downstream health care costs due to its effectiveness, a caregiver intervention may turn out to be cost-neutral or even cost-saving. In a cost analysis of a health education program (HEP) for spouse caregivers of frail older adults, Toseland & Smith⁹ found that HEP significantly reduced subsequent health care costs of both the caregiver and the care recipient. The reduction was driven primarily by lower outpatient costs of the HEP group. In a training intervention specifically targeted at stroke caregivers, Patel et al.¹⁰ provided similar and more relevant evidence on the reduction in health care costs of the care recipients. The TASK intervention may reduce subsequent health care costs of the stroke caregivers by reducing their depressive symptoms. Numerous studies have linked depression to increased use of general medical services¹¹⁻¹². Besides the direct costs of treating depression, indirect health care costs associated with the mental illness may also be incurred. A roughly twofold cost difference has been reported in the literature between patients with and without depression diagnosis¹³⁻¹⁴. The preliminary evidence that the TASK intervention showed medium to large effect sizes in reducing depressive symptoms, especially among caregivers who had at least mild depression at baseline, suggests that the costs of the intervention may very well be offset by the lower subsequent health care costs.

Implications for Nurse-led programs

While our discussion up to this point has focused on the potential benefits of developing a cost template for formal research testing caregiver interventions, this process might also serve as a useful strategy for other nurse-led programs. Clinical nurse specialists commonly create nurse-led programs that are designed to improve outcomes, such as reducing hospital costs and improving care. They then manage the costs associated with these types of programs. The process of developing a cost template could serve an integral role in program development and evaluation for clinical nurse specialists in practice settings.

SUMMARY AND CONCLUSION

In summary, we have illustrated how we developed a cost template for estimating caregiver intervention costs that include training, preparation and wrap up, intervention delivery, supervision, materials, and caregiver time. Even when conducting a pilot study, collecting and analyzing costs can provide valuable information about the clinical feasibility of caregiver interventions and how costs might be reduced in future trials. Developing a cost template can also provide the structure for planning a future cost analysis for a cost

effectiveness trial. In today's health care environment, cost effectiveness of clinical interventions, particularly for family caregivers, is being increasingly recognized as an integral step toward translation of evidence-based interventions in clinical practice. The process of developing a cost template might also serve as a useful strategy for evaluating the costs of similar nurse-led programs.

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Table 1

Cost template for the Nurse-led TASK and ISR intervention programs.

	TASK	ISR
<i>Supervisor \$22/hr;</i> <i>Nurse Intervener \$20/hr;</i> <i>Caregiver \$10.39/hr</i>	8 telephone sessions	8 telephone sessions
Training cost per caregiver	Nurse: 18 hours × 2 nurses × \$20/hr = \$720 Supervisor: 18 hours × 1 superv × \$22/hr = \$396 Total = 720+396 = 1116 \$1116/21 cgs = \$53.14/cg	Nurse: 6 hrs × 2 nurses × \$20/hr = \$240 Supervisor: 6 hrs × 1 superv × \$22/hr = \$132 Total = 240 + 132 = \$372 \$372/19 cgs = \$19.58/cg
Intervention preparation and wrap up per caregiver	.50hr/call × 8calls/cg × \$20/hr = \$80	.50hr/call × 8 calls/eg × \$20/hr = \$80
Intervention delivery per caregiver	3.95hrs × \$20/hr = \$79	2.15hrs × \$20/hr = \$43
Supervision cost per caregiver	.49 hr tape, .51hr eval, .5hr mtg=1.5hrs 8 evaluations × 1.5 hrs each = 12 hrs Nurse: 12 hrs × 2 nurses × \$20/hr = \$480 Supervisor: 12 hrs × 1 superv × \$22/hr = \$264 12 hrs × 1 superv × \$22/hr = \$264 Team meetings Nurse: 26 hours × 2 nurses × \$20/hr = \$1040 Supervisor: 26 hours × 1 superv × \$22/hr = \$572 Total = 480+264+264 + 1040+572 = \$2620 \$2620/21 eg = \$124.76	.27hr tape, .23hr eval, .5hr mtg=1hr 8 evaluations × 1 hrs each = 8 hrs Nurse: 8 hrs × 2 nurses × \$20/hr = \$320 Supervisor: 8 hours × 1 superv × \$22/hr = \$176 8 hours × 1 superv × \$22/hr = \$176 Team meetings Nurse: 26 hours × 2 nurses × \$20/hr = \$1040 Supervisor: 26 hours × 1 superv × \$22/hr = \$572 Total = 320+176+ 176 + 1040+572 = \$2284 \$2284/19cg = \$120.21
Materials costs per caregiver	Binder, tip sheets, ASA pamphlet = \$43.00	ASA pamphlet = \$1.00
Caregiver time cost per caregiver	.49hr/call × 8 calls/eg × \$10.39 = \$40.73	.27hr/call × 8 calls/eg × \$10.39= \$22.44
Total	\$420.63/cg	\$286.23/cg

Note: cg refers to caregiver