A Cybermeditation Toolkit for Hospice and Palliative Caregivers

Final Report
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Meditation can relieve stress and cultivate caregiver self-regulation skills, improve ability to focus, quality of attention and authentic presence, and modify risk for and relieve symptoms of compassion fatigue and burnout. Nearly 80% of hospice nurses are at moderate to high risk of developing compassion fatigue, with serious consequences for personal health and capacity to deliver quality patient care. The prevalence of burnout among US physicians is 22%. Workplace consequences of these conditions include reduced patient and family satisfaction and high absenteeism.

We conducted a feasibility study of adoption, use, and efficacy of an innovative Cybermeditation Toolkit to combat compassion fatigue and burnout in hospice and palliative caregivers. Our Toolkit uniquely integrated cybermeditation apps with automated, tailored, personalized email messages. The apps, developed by Heeter and Allbritton, were grounded in Mind-Body Therapy principles and practice. The apps were supported by twice-weekly tailored, personalized emails which translate aspects of one-on-one Mind-Body Therapist-client conversations into email form. The emails offered guidance, explanation, and motivation about each cybermeditation and about establishing and maintaining a regular personal meditation practice.
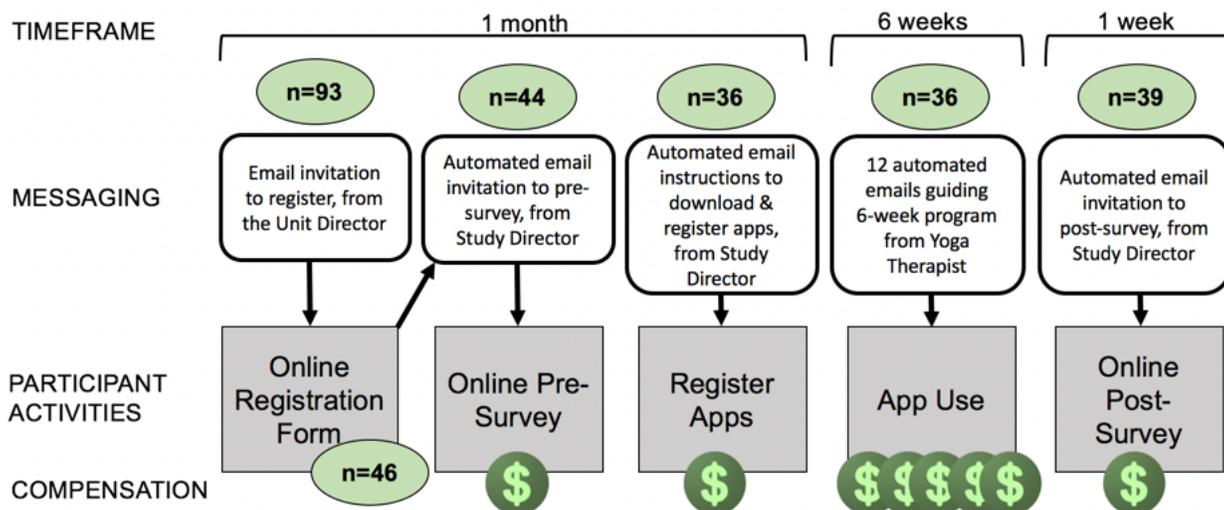
1. Study Timeline

Grant funding began on August 16, 2015. We submitted the IRB protocol on September 15 and received approval from MSU IRB on October 5. On October 20, Sparrow IRB confirmed that they had approved it and the formal approval letters were submitted to CFIR.

By request, the protocol was presented to the monthly meeting of the Sparrow Council of Nursing Research on September 31. We responded to questions from that Council on October 16. We responded to additional questions on November 9.

Five IRB revisions were submitted and approved. Three revisions were for changes in the survey instruments. One revision requested permission to survey non-participants. The final revision added a question to the post-survey asking how many times each participant had done each of the meditations.

Christmas and New Year holidays influenced our decision to wait to launch the six-week program on January 11. Vacation time off and unusual work schedules in the middle of the program would likely have disrupted the regular meditation practice the study was trying to introduce.

Figure 1 shows the timeframe, messaging, participant activities, and study compensation triggers for the recruitment period, 6-week program, and post-survey phases.

TIMEFRAME

| 1 month | | | 6 weeks | 1 week |

n=93 — Email invitation to register, from the Unit Director
n=44 — Automated email invitation to pre-survey, from Study Director
n=36 — Automated email instructions to download & register apps, from Study Director
n=36 — 12 automated emails guiding 6-week program from Yoga Therapist
n=39 — Automated email invitation to post-survey, from Study Director

MESSAGING

PARTICIPANT ACTIVITIES

Online Registration Form (n=46) | Online Pre-Survey | Register Apps | App Use | Online Post-Survey

COMPENSATION

Message Design. In fall 2015, Allbritton and PI Heeter designed the twice-weekly email messages specifically for professional hospice and palliative caregivers. In January and February as the 6-week program progressed, Allbritton and Heeter revised the messages based on participant app use data, tech support requests and participant questions and feedback.

Registration Web Site Development. In November and December, Heeter developed one database to coordinate participant registration, login, and app usage and a database plan for the eCoaching system. She directed and worked with IT Services programmer Michael Ezzo 1.) to set up the eCoaching system; 2.) to develop a registration and log-in web site and "smart" web pages where content could be customized based on user data; 3.) to write a PHP script that pulls study participants' most recent app use data from the Mindtoon Lab database and 4.) to write a PHP script that collects this updated use data and formats it to be compatible with the eCoaching system. Heeter, Allbritton, and Day developed content for the web site. Heeter worked with Media and Information Department's Web Designer, Valeta Wenslof, to create the look and feel for the site.

STEP 1: 93 Sparrow hospice and palliative caregivers were invited via email from the Director of Hospice and Palliative Care to register to participate in the 6-week meditation program and study. A link to the registration web page was provided.

Co-I Wiseman, Co-I Lehto, and graduate research assistant Tom Day introduced the project at the two all-staff Hospice and Palliative Care sessions in early December. The next week, Wiseman emailed the IRB-approved invitation to participate to all 87 caregivers (including nurses, physicians, aides, social workers, and administrators) in Sparrow's Hospice and Palliative Care units, including those who work in the inpatient Hospice House and those who travel to deliver in-home Home Hospice care throughout mid-Michigan. Reminder emails were sent in mid-December and early January. Forty-five caregivers registered to participate in the program (approximately 52%).

In January, 2016 Heeter received IRB approval and emailed the 42 caregivers on the original invitation list who had not registered, inviting them to be "survey-only' participants. This effort failed. One person joined the study in this capacity from this request (2% response rate). In retrospect this would have been a good idea to do from the beginning. Rich data about non-participation would have been very informative. We were not sure whether the budget could afford to compensate non-participants until we knew how many had registered.

STEP 2: 46 caregivers visited the registration site, filled out and submitted the registration form. The form asked for first name, last name, email address, primary unit (Home Hospice, Hospice House, or Palliative Care), and mobile device platforms (Apple, Android, Both, or Neither).

STEP 3: As soon as the registration form was submitted, a "thank you" message was shown that told the registrant their study ID number, gave them a link to the pre-survey, and explained that the pre-survey would take approximately 20 minutes to complete. Within a few hours of registration, a personalized automated email was sent, reminding participants of their study ID number and giving the link to the online pre-survey.

44 of the 46 registrants completed the pre-survey.

STEP 4: The online pre-survey began with the IRB-approved consent form. When a pre-survey was submitted, the study director matched the pre-survey study ID number to a registered participant, manually updated the Participant Database to indicate pre-survey completion and initiated a send command to the MTS system to email instructions to that participant on how to download and register the meditation apps. For clarity, the message each participant received gave detailed, illustrated instructions specifically for the smartphone platform they indicated that they used when they registered. After downloading each app, participants needed to navigate to the "ME" screen of the app and enter their Study ID number so that that app database would know to associate app use with that study ID.

36 of the 44 who completed a pre-survey downloaded and registered one or more of the apps.

STEP 5: All 44 who completed a pre-survey were sent automated meditation program emails twice a week throughout the 6-week program. The emails included instructions to use the app for that week one a day throughout the week. The 6-week program ran from January 11 to February 15, 2016.

STEP 6: At the end of week 6, an email invitation and link to the online post-survey was emailed to the 44 who had completed a pre-survey.

39 completed a post-survey.

STEP 7: *Focus Group Interviews.* In early March Lehto and Heeter conferred to determine specific participant characteristics to target for three online focus group interviews. Automated invitations were emailed and four focus groups were scheduled and conducted with a total of 11 study participants. Lehto and Heeter conducted the focus group interviews in March. Day and Heeter will worked with the budget officer to accomplish participant compensation.

STEP 8: Online gift cards in the amount commensurate with each participant's participation were purchased and email was sent to each participant with instructions for claiming their gift card.

Pre-Post Survey Analysis. Heeter and Day processed and analyzed pre- and post-survey data in March with input from Wiseman, Lehto and Allbritton. Heeter extracted app use data and integrated it with the survey data.

Focus Group Analysis. Lehto's assistants transcribed one of the focus group interviews and the other three transcribed by a transcription professional in India, contracted via the Upwork system. Over the summer, continuing into October, Lehto analyzed the transcripts, with input from Heeter and Allbritton.

Detailed App Use Log Analysis. Although not part of the original proposal, it is now clear that writing code to compare the detailed Mindtoon Lab app use log with the extracted study participant app use data can shed additional light on this form of data collection. The original algorithm relied on the most recent "times played" count. The full log includes more detail about time of day and when each participant opened and played an app. This analysis can reveal time of day of use and a more complete picture of app use. Heeter worked with programmers on this in over the summer and early fall. Heeter then compared the revised log data with the original log data and with self-reported use on the post-survey.

Sparrow Data Aggregation. After conferring with Heeter, Wiseman directed her staff to extract family satisfaction and call-in data for three time periods – 2 months prior to the study, 6 weeks of the study, and 2 months after the study. Because of the time lag in Sparrow receiving the family satisfaction data, the soonest it was possible to do this was early August 2016. Heeter then analyzed the data.

Six Month Extension. Almost all proposed work of the grant was accomplished in original 12-month time frame. During the 6-month extension there were three ongoing activities, two of which (publication of findings and grant writing) had been underway since data collection was completed. The third, conducting an experiment comparing an active "Relax and Move" control intervention to meditation in three conditions (eyes closed, Gear VR and VIVE VR), is outside of the scope of the original proposal but the results (still being analyzed) will be very helpful in grant-writing.

2. **Hypothesis 1: The Cybermeditation Program will improve Professional Quality of Life and Multidimensional Interoceptive Awareness**

Stamm's Professional Quality of Life (**ProQoL)** instrument includes 10-item subscales for **Compassion Fatigue**, and **Burnout** based on 5 response categories (1=Never to 5=Very Often).[43] Numerous studies have confirmed ProQoL's construct validity and reliability.[16,44] Cronbach's α values were 0.75 and 0.73 in this study.

The current study compared pre- and post survey subscales most related to the YT meditation foci. These subscales include: Attention Regulation (ability to sustain /control attention to bodily sensations); Emotional Awareness (awareness of bodily sensations' connections to emotions); Self-Regulation (ability to regulate distress by attention to bodily sensations); Noticing (awareness of bodily sensations); Body Listening (tendency to actively listen to the body for insights); and Body Trusting (experiencing one's body as safe and trustworthy). The two other MAIA subscales (Not Distracting; Not Worrying) measure not ignoring and worrying about feelings of pain or discomfort. Due to time constraints and the focus of 10-minute meditations on meditation objects, these dimensions were not targeted in the technology-assisted meditation. Therefore, Not Worrying and Not Distracting were not part of expected outcomes. Cronbach's α values ranged from 0.83 to 0.94 for the six subscales that are a part of this study.

Although baseline compassion fatigue and burnout scores of the HCPs in the study were low to begin with, scores were significantly lower following participation in the YT meditation program. See Table 1. Thus, the hypothesis that exposure to the technology-assisted YT meditation program would result in reductions in CF and burnout is supported.

Table 1: Pre-Post Survey Paired t-tests for Compassion Fatigue and Burnout

	Pre-Survey		Post-Survey			95% CI					
PROQoL	M	SD	M	SD	delta M	low	high	df	t	p	d
Compassion Fatigue	21.34	4.14	20.00	5.02	1.34	-2.57	-0.12	34	2.209	.034	.37

Burnout	22.22	4.52	20.64	5.00	1.58	0.03	3.14	35	2.062	.047	.34

Interoceptive awareness scores as measured by the MAIA sub-scales (attention regulation, emotional awareness, self-regulation, body listening, body trusting) are provided. Table 2 presents means, standard deviations, and paired t-test statistics for pre- and post- study participation.

Table 2: Pre-Post Survey Paired t-tests for MAIA

MAIA subscales	Pre-Survey		Post-Survey			95% CI					
	M	SD	M	SD	delta M	low	high	df	t	p	d
Attention Regulation	2.32	1.15	3.67	0.87	1.34	1.67	1.00	30	8.043	.001	1.44
Emotional Awareness	3.07	1.11	4.51	0.71	1.44	1.74	1.14	35	9.683	.001	1.59
Self-Regulation	2.57	1.02	4.17	0.69	1.60	1.88	1.31	33	11.493	.001	1.97
Noticing	3.13	0.97	4.51	0.77	1.38	1.68	1.08	35	9.302	.001	1.55
Body Listening	1.78	1.26	3.57	0.95	1.78	2.10	1.45	33	11.532	.001	1.68
Body Trusting	2.78	1.17	4.48	0.84	1.69	2.07	1.32	35	9.272	.001	1.91

Attention regulation, emotional awareness, self-regulation, noticing bodily sensations, and body listening subscale scores showed significant improvement following participation in the program. See Table 3. One case was omitted from the body trusting mean comparisons due to an extreme outlier score. After removal, pre- and post-participation scores were normally distributed, as assessed by Shapiro-Wilk's test ($p = .058$). Scores on the body trusting subscale after study participation were also significantly higher following participation in the program.

Table 2 shows that MAIA subscale post-study scores were not simply better, they were also notably high, with the mean reaching 4.5 out of a possible 5 on three of the subscales (emotional awareness, noticing, and body trusting). Because of the significant improvements noted on all 6 dimensions of MAIA, support for the second hypothesis that gains in interoceptive awareness would be achieved were demonstrated.

3. **Hypothesis 2: Higher frequency use of cybermeditation will be predictive of stronger outcomes.**

Hypothesis 2 was not supported. Meditation frequency was not correlated with professional quality of life or interoceptive awareness outcomes. This finding is interesting. No one followed the prescribed frequency of 7 days per week, yet most showed significant benefits. We are not sure what an optimal dose of cybermeditation is. Some individuals may need more regular practice to gain benefits. Others may do well with only two repetitions per week.

4. **Research Question 1: Adoption and Participation Rates**

RQ1: What is the adoption rate and subsequent cybermeditation use frequency a) overall; b) by **unit** (Palliative Care, Home Hospice, and Hospice House); c) by **inpatient versus in-home care** workplace; d) **schedule** (12 or 8 hour days) and e) by **role** (nurse, physician, aide, social worker, and administrator)?

4.1 Overall Participation

A total of 93 hospice and palliative caregivers were invited to register for the program and study.

45 people registered (48%).

Of those 45, 77% downloaded and used the apps. Most of those who did not use any apps also did not complete post-survey, so we don't know whether they were still with Sparrow or why they did not participate. However, we did urge people to register and do the pre-survey even if they didn't want to do the apps, so we do not know whether the nonparticipants intended to use the apps or not.

39.8% of those invited participated to the point of downloading and using an app.

4.2 Participation by Unit (Home Hospice, Hospice House, Palliative Care)

Considering primary assignment in the three units, Home Hospice and Hospice House are almost identical in staff size (44 and 46 staff respectively). Palliative Care is much smaller with only 9 healthcare professionals assigned to that unit.

Participation in the cybermeditation program was highest among Palliative Caregivers: two thirds of this small unit participated. Participation among full time palliative care staff was higher (80%) than among part time palliative care staff (50%).

Hospice House staff participation was higher than Home Hospice staff participation (42% versus 32%). Among Hospice House staff, full time participation was much higher (52%) than part time staff (21%). For Home Hospice, full time and part time staff participation was almost identical (30% and 33%).

4.3 Full versus Part Time Participation

39% of the caregiver staff works part time.

Full time staff were more likely to participate (46%) than part time staff (31%).

Looking only at staff roles with direct patient contact (nurse, patient care tech, physician, and social worker), 35% of the full time staff with direct patient contact participated, compared to 24% of the part time staff with direct patient contact.

Note that in hospice and palliative care more than other healthcare areas, managers and clerical and other staff often also have some direct patient or family contact.

4.4 Caregiver Roles

The roster for hospice and palliative caregivers includes 6 role categories. 50.5% of the staff are nurses; 18% are Patient Care Techs, 11% are Managers, 7.5% are Social Workers, 7.5% are Clerical or Other, and 5% are Physicians.

Managers had the highest cybermeditation program participation rate (90%) followed by clerical/other (71%). These two groups are people with the most direct contact with our champion, the director, Michelle.

40% of Physicians participated as did 38% of Nurses.

Social Workers and Patient Care Tech had the lowest participation rates (14% and 12% respectively).

4.5 Participation Synthesis and Discussion

We see distinctly different profiles of cybermeditation program use by caregiver role, by unit, and by full or part time status. The smallest unit had the highest overall participation. Full time managers and clerical/other caregivers were very likely to participate. Patient Care Techs and Social Workers were the least likely participants. Full time staff were more likely to participate than part time staff. Caregivers who worked out of a common location (Home Hospice) were more likely to participate than those whose job consisted of driving to see patients in their homes around the state.

It is likely that frequent contact with co-workers, managers and clerical/others helped encourage participation, spurred by supervisor enthusiasm and peer participation.

It is interesting that part time caregivers were less likely to participate -- we might have assumed these people would have more available time to do the meditations.

Patient Care Techs experience the most extended and arguably the most stressful direct patient contact, yet they were very unlikely to participate. They would likely have benefited from doing the meditations.

## 5. Research Question 2: Patterns of Participation

RQ2: What is the pattern of cybermeditation use during the 6-week intervention and in the 3 months after the intervention, including number of days per week, time of day, and use on work versus non-work days? Does usage change during the intervention period? What are the characteristics of heavy and light users?

Meditation frequency was measured by analysis of automatic meditation app use tracking data and post-survey self-reports of meditation app usage. Due to technical issues during data collection (such as lack of data when the apps were used but devices were not connected to the internet and inability to combine usage counts for those who sometimes used the apps on their smartphone and other times used an iPad or tablet) the final app tracking data was an undercount of actual app usage. Therefore, self-report and app tracking data were compared. Because the automatic tracking data was known to be an undercount of actual usage, the higher of the two values for each study participant was used.

Of the 36 study participants who downloaded and registered at least one app, almost all (93%) meditated once or more per week for at least 5 weeks. The average meditation frequency was 2.9 times per week. The number of times participants used a meditation app over the 6-week program varied widely, ranging from a low of 4 to a high of 33 times with a mean of 17.18 (S.D. 8.69).

Use of the apps was persistent throughout the program but less frequent than the recommendation of daily use, which would have totaled 42 times over 6 weeks. The answer to the research question about the extent of meditation use by HCPs is that the cybermeditation program motivated participants to use the meditation apps regularly across the study period. Frequency of use ranged from once per week to 6 times per week.

Figure 2 shows the meditation app use frequency for all 36 participants based on merging app use data and self-report.
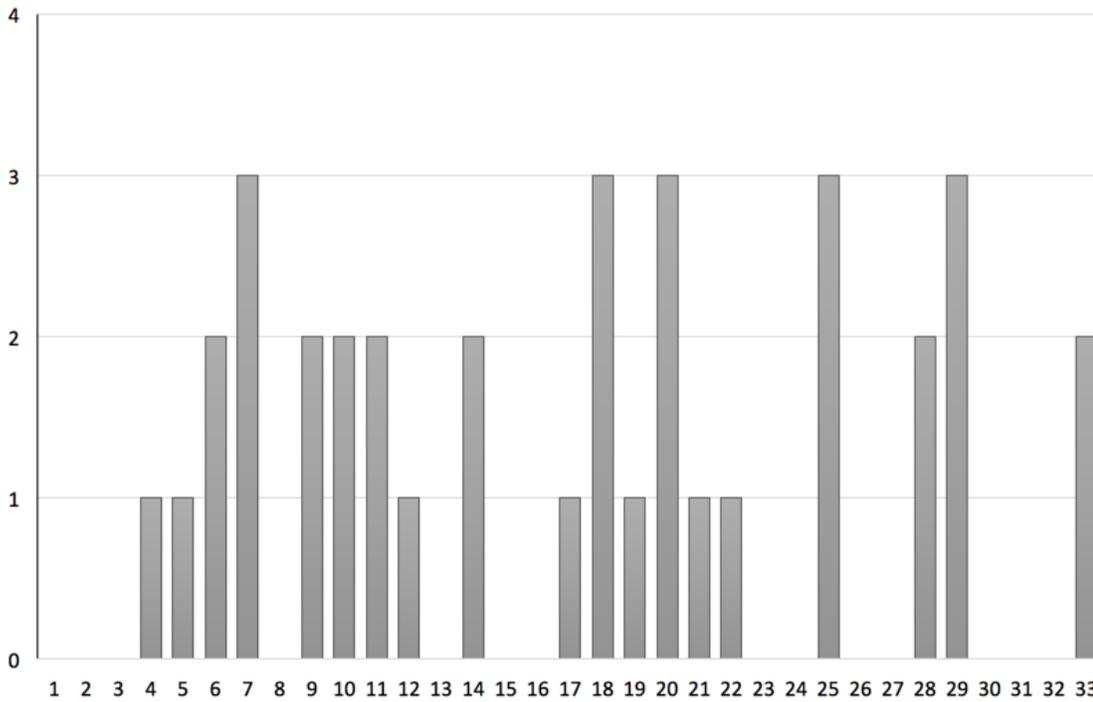
6. Research Question 3: Participant Experiences, Barriers, Recommendations

RQ3: How did participants feel about the intervention? What challenges or barriers did they encounter? What were the perceived benefits? Did the participants have recommendations?

6.1 Participant Experiences

Focus group participants described positive aspects associated with use of apps and email including convenience and flexibility. There was strong enthusiasm for the delivery mechanism (smartphone apps) and strong endorsement for the 10-minute duration of the meditations.

However, the frequency with which the focus group participant HCPs used the meditations ranged from 6 to 30 times during the 6-week program. Each individual developed her or his own strategy and approach to doing the meditations. For some it was easy: "It was only 10 minutes a shot. So I think there that was an aspect of convenience that actually drew me to it versus something that would be larger."

Several caregivers set a daily alarm to remind them. For example, one nurse said: "To incorporate it into daily life, I had to set an alarm on my phone that I did the meditations on that I thought in the beginning doing it every workday. I think I even did it a couple of times on a weekend too, but definitely every day that I worked because that was how I was using that... It was to let go of work stress. But then it was also something that I could let go of just any stress."

A manager who completed the fewest meditations remarked: "I did not fit them in in a unified way! You know, and consequently when I look back at it I maybe should have set an alarm every day to do them. So, you know, a couple of days, I started out with them, and then, you know, I have a very erratic schedule... And so what I found is that I would plan to do the meditation, and then I would just forget about it as the day would go on! My best success was when I did it first thing in the morning."

Although the flexible and short program was tailored to the unique lifestyles of busy HCPs, at least two individuals mentioned how, even though the meditations were only 10 minutes, finding that small block of time could be daunting or even prohibitive. As an example, one HCP explained: "Well, perceived time constraints. I've got to go to bed. I'm really tired. I've got to get to work. I'm running late. I've got to go see a patient. I can't do this at lunch-time. There's all those perceived things that what you found out is if you just take that time, that 10 minutes, the benefits are way more than your perception that you didn't have time to do it."

Further, the necessity of committing time and discipline to ensure that the meditation practice continued was identified as challenging. One nurse described such challenges this way: "There were a few times where I intended on doing it like, I'll do it tonight after supper. But then if I have a meeting or I'm out running errands, and then I'll be ready for bed late at night and I'm like, Oh, my gosh! I haven't done the meditation… And it may not be the same time every day as schedules change from day-to-day. But I think it's being mindful about setting that time."

6.2 Participant Reactions to the Emails

The twice weekly emails introduced the new meditation for the week, motivated participants to do the daily meditations, and explained a core principle embodied in the meditation practice. Reminding and motivating requires a delicate touch. While most participants recognized the necessity of the emails, some also found them annoying. One nurse commented: "At first, I thought they were helpful. But then later I thought they were like a bill collector who just kept reminding me that I owed money. It was like, 'Okay, you've got to make sure you do this. Make sure you do this one. You've got to make sure you do this one.'" An allied health professional concurred, "I just felt like they were nagging me."

While acknowledging that they felt a little pressured, most of the caregivers appreciated the emails. One nurse responded: "I know what you're saying [about feeling pushed]. Sometimes [the emails were] useful – useful for me to remember to start the new one because otherwise, yeah, life could be so hectic that you wouldn't remember."

The emails helped keep participants on track with doing the meditations. A nurse commented: "I liked [the emails]. The one time they reminded me, "You haven't done your meditation this week." Or something. "Can you please open it up?" I was like, "Oh, my gosh. Yes, I've got to get to that." So, yeah. And then other times they would say, "Well, you've done it twice or three times this week." Or something. So I thought it was good."

A social worker agreed: "I liked it too. It felt like almost a debriefing of that particular meditation, maybe what it was for. The same situation, I think that it reminded me on two occasions maybe I want to say that I hadn't done it at the beginning of the week and so I actually got a couple in towards the end."

As the 6-week program continued, less attention was paid to the email content: "I think towards the end I got worse about [reading them]. I think towards the end, if I saw that I hadn't logged in, I would focus on that or I'd start reading that and just go, "Okay, that's enough.""

One manager was particularly unhappy about the use of emails: "My own personal feeling is that I just can't stand emails. I have so many in a day that I try to not let my email control my life because I could sit at my computer all day long and do emails. So for me personally, I probably would have rather had a text on my phone to remind me."

6.3 Barriers to Doing the Meditations

The post-survey asked about 10 possible barriers to doing the meditations.

The top two challenges reported by slightly more than half of the 36 participants who downloaded and used the apps were 1) making time to do the apps and 2) remembering to do the apps. Another concern for about one third was that the meditations were different than the kind of meditation the participant was familiar with.

Other barriers touched only a small proportion of participants. Seventeen percent felt the 10-12 minute meditations were too long. That same percent reported 1) having trouble finding a place where they felt comfortable doing the meditations and/or 2) getting interrupted and being unable to finish the meditation.

Fourteen percent experienced one or more of the following barriers: 1) technical difficulties; 2) personal time off or 3) health issues sometimes preventing doing the meditations.

The apps did a good job of communicating how to do the meditations. Only 6% reported not understanding what they were supposed to be doing as a barrier.

BARRIERS (n=36)	% agree
It was hard to make time to do the apps	53%
It was hard to remember to do the apps.	56%

The meditations were different than the kind of meditation I am familiar with.	36%

I had trouble finding a place where I felt comfortable doing the meditations	17%
I often got interrupted and couldn't finish the meditation.	17%
The meditations were too long.	17%

I encountered technical difficulties that got in the way of doing the apps.	14%
Vacation or personal time off sometimes prevented me from doing the meditations.	14%
Health issues sometimes prevented me from doing the meditations.	14%

I did not understand what I was supposed to be doing.	6%

6.4 Experienced Benefits

The focus group manuscript includes 8-10 pages of elaboration on perceived benefits experienced by participants organized into the following categories: Stress management, improved focus, self-regulation and interoceptive awareness, emotional awareness, offsetting compassion fatigue, improving interpersonal effectiveness, personal health promotion/self-care, employee and social support. For brevity, only the employee and social support section is reported below.

Offering the Program to all HCP staff members led to solidarity in participation in the study. One member indicated: "Where it's just that shared experience where, okay, if I'm feeling the sad and grief and there's CF, well, then why wouldn't a co-worker also be feeling the same way, even though … we put on our happy faces whether we're feeling it or not? But it helps me be more aware that my co-workers are equally as frustrated, as sad, as overwhelmed… just the shared experience which then it helps me understand the big picture that it's not just me with CF, it's all of us together because of what we do."

"I think I've noticed we all have those things that annoy, and so if we're behind closed doors with our co-workers and I need to vent or we need to vent, I'm one of the first people that say, "Well, we have to take into account that we don't know where that person was coming from today. They might have had three bad visits and then they talk to you or this family is under a lot of stress right now. What you say isn't necessarily getting through to them when they're focused on their finances and the stress of potentially losing a loved one. So I'm sure that it wasn't something that was personal. So I'm almost like a little cheerleader for other people at work."

The support of management in recommending the Stress Management Cybermeditation Program to staff was viewed as a particularly salient indicator of a unified supportive atmosphere. For example, one nurse stated: "..I think that was encouraging when we would all be together and people would bring it up. When the supervisor brings it up, then me and my co-workers, "Hell yeah, we're doing that too." And I think just the fact that other people are doing it can sometimes be a motivator to participate, but having it modeled from the top-down too probably helps because I think most of our staff did participate."

One of the managers stated: "Well, we were in a meeting and there was a lot of controversy in that meeting and when we walked out, she looked at me and said, "and this was the day that I couldn't get my meditation in before I came to work. I could have really used it." And we just both kind of chuckled!"

6.5 Participant Recommendations to Improve the Program

A focus group recommendation that was intriguing was the suggestion that the participants keep a journal during the study. The journal could be used to document personal thoughts and experiences about participation and could be used by the researchers to better understand impact. In general, participants were positive about their study participation and many believed that the study was satisfactory the way it was presented. Participants appreciated that five different meditation apps were introduced progressively over a 6-week period as opposed to being offered all at once as a package. Participants appreciated the personalized nature of a cyber-delivered intervention. Not all participants were satisfied with the weekly messaging. For example, a manager suggested that text messaging would be more acceptable than emails. While half mentioned liking the meditation guides voice, several participants suggested having second guide to add variety. Participants liked the suite of five meditations over the program, with different individuals preferring specific meditations. A participant articulated that the choice was helpful in determining which apps to keep: "Some were more relaxing... that's why I kept some and got rid of the others. I kept the nature one, the space one and the calming one..."

7.   **Innovation Insights about the Cybermeditation and Tailored eMail System**

We envisioned, developed and studied a technology system that combines automated app data collection with a web site and tailored email messaging. The individual pieces are not new, but the integrated system had not existed before nor had it been tested with a population of hospice and palliative caregivers.

7.1 Automatic App Usage Data Collection.

Prior to CFIR funding, the five cybermeditation apps already saved use data to a secure server. In theory, all that Heeter needed to do was to create a simple registration app so that participants could register their study ID and add 2 lines of code to each apps and then use data for the five cybermeditation apps could be associated with that study ID.

When we proposed using a simple registration app to associate study ID with app usage, the intention was to use the Unique Device ID. The registration app would ask for study ID, and it would automatically grab the UDID. It turned out that Apple no longer allows apps to access the UDID, making this solution impossible.

Instead, we tried to use the Unique Vendor ID, which is supposedly shared by all vendor apps. There should be a Mindtoon Lab vendor ID common to all of Mindtoon Lab's apps. Heeter created the simple registration app and added two lines of code to each cybermeditation apps. She submitted the registration app to the iTunes store and 2 weeks later Apple approved it. It turned out that the Unique Vendor ID is only shared among apps that are published using the same wildcard app provisioning profile. All Mindtoon Lab apps use app-specific provisioning profiles. There was no way to retroactively change the provisioning profiles for already-published apps. So a single registration app was not possible.

Instead, participants had to add their study ID to each app. As we began to implement this functionality, Apple introduced a new OS and a new high resolution retina iPad and changed their resolution requirements for apps that run on iPads.

Apple's changes made obsolete the third party plugin Mindtoon Lab had been using to accommodate different resolutions (the third party company went out of business), leaving Heeter to search for a new solution. This meant that to be allowed to submit a revision of the app that changed one line of code in the app to enable study registration, we also had to rework how resolution was handled on every page of every app.

The third party plugin Mindtoon Lab had been using to write app use data to a server updated their plugin to be compatible with Apple's new rules, but initially the third party's update did not work properly.

It was the worst possible time to be trying to upload app revisions. Unity exports for iOS crashed every time. XCode failed to create publishable builds every time. The new resolution third party solution and the app data third party solution repeatedly gave incorrect advice as they struggled to figure out the new publishing environment. As a result, Heeter ended up publishing every app 8 times, having to wait 2 weeks for Apple review before being able to test the revision, before finally arriving at a working solution.

All 5 apps were ready, with study ID and app data collection, on Apple and Android, in time to launch the study as planned on January 11. A programming error discovered in Week 3 caused problems with Nourishing Meditation app use data reporting for some Apple devices.

Prior to the study, Mindtoon Lab charged 99 cents for each app. So that participants would not have to pay for the apps, Mindtoon Lab switched the cost to free. At that time, we learned we would never be able to charge for the apps again. So, Mindtoon Lab ended up making five of its six apps free forever to support the study.

Lessons Learned: The only way to get an app onto an Apple device is to go through the iTunes store. For android devices, there is a complicated way to "sideload" an app, but doing so requires knowing the android device's Unique Device Identifier. This would be complicated for study participants. The viable way to get apps onto Android devices is to go through Google Play. This means that app development and publishing

is strongly impacted by the ever-changing limitations and requirements of Apple and Google. Keeping up with those changes is time consuming.

Going Forward: Third party app publishers deal with those kinds of upgrade issues but charge a monthly fee. (Grant budgets should include this.)

7.2 Online Study Registration

There was an extended registration period spanning from December 6 to January 10. When Heeter set up the online registration system, her initial concern was preventing unauthorized people from signing up. So she made it so that caregivers would visit the registration page, enter their email information, and wait to receive a confirmation email and link to the pre-survey after Heeter verified that they were on the caregiver list. After about a week, it became apparent that false registrations were not an issue and it was more important to immediately give registrants a study ID number and point them to the pre-survey. She changed the system so that a message directing participants to the pre-survey appeared onscreen immediately after registration. Heeter also continued to manually send a personal welcome email, study ID, and link to the pre-survey to every new applicant.

The cybermeditation toolkit system could best be described as semi-automated. Several times a day between Dec 6 and January 10, Heeter would check the registration database to see if anyone new had signed up. If they had, she would send them a personal email welcoming them to the study, telling them their study ID, and pointing them to the pre-survey. Then she would run the two "cron jobs" IT wizard Mike Ezzo create. One parsed the app use database, tallying how many times each study ID had used each app (and whether that study ID had been registered in the app). The second created a newUser.csv and updates.mySQL file. Then Heeter would log in to the eCoach system and upload the newUsers.csv file so that the new participants were part of the eCoaching database. Next she would log in to the eCoaching MySQL database and manually run the updates.mySQL commands. Then she would "run Checkout" to refresh the eCoaching database. And finally she would initiate automatically sending the "How to download the apps" and the "How to register the apps" automated email messages.

Relying on this an extended registration process meant that Heeter went through those manual steps 42 times, once for every registered participant.

Lessons learned: 1.) immediately after registration, give participants their study ID number and point them to the pre-survey. 2.) use a shorter registration window of time. 3.) Automate more of the process.

Going Forward: The original programmer Heeter worked with on the automated email system was promoted in January 2016. His work was extraordinary – incredibly efficient and thorough, communicative and responsive including nights and weekends. Working with the IT staff who replaced him was much more difficult and less productive. This is not surprising because the new programmers had not worked with the system before. And they were not oriented toward providing above and beyond service.

Third party email and customer tracking systems provide highly polished systems for accomplishing cybermeditation communication needs but charge high monthly fees. (Grant budgets should include this.)

7.3 Message Tailoring

The MTS (Michigan Tailoring System) allowed the Study Director to compose an email using variables from the database to appear within the message (such as personalizing the message using the variable #FIRSTNAME – Dear #FIRSTNAME) and also as logic to show or not show sections of the message. For

example, in the email describing how to download and register the apps, participants who indicated when they registered that they had an Apple smartphone or tablet were shown the section of the message that described how to download from the iTunes store and how to adjust the settings. Those with Android were shown the section that described how to download from Google Play and how to adjust the settings.

Heeter would program MTS with logic and parameters for sending each message, including characteristics of who should be sent the email, the subject header, and the email address the message appeared to be coming from.

A hidden graphic was embedded in each email that sent a message back to the server indicating that the individual had read (or at least opened) the email.

There was vast potential for customization and also myriad opportunities for operator error.

The original plan was to personalize message content based on name, unit, and role; 2.) adapt message content based on how frequently and when they are using the apps; 3.) modify the amount and content of explanatory information to fit the individual's interest in how meditation works, their caregiver role, and their prior meditation experience.

Sometimes using logic to determine what text to show was essential – such as emailing platform-specific instructions based on whether participants used Apple, Android, or both for downloading the apps onto the participant's smartphone and for adjusting needed audio and lockscreen settings for app use.

There were 12 planned emails from the yoga therapist during the 6-week program (two per week) plus one clarifying email from the PI (email 13 in the list below) correcting an incorrect app use practice that we learned was spreading among participants.

We ended up doing less message tailoring than we had expected to. First, the content of the messages from Marcel mostly did not need to be customized beyond personalization (Dear #FirstName) and reminding them of their #studyID number.

We had planned two different followup messages each week – one for those what had done the meditation at least once already and one for those who had not started yet. The message to those who had not started yet were going to be more pointed urging to start and explanation of the importance of regular practice. On the week 2 follow-up email, the automated message told participants how many times they had used the Place in Nature app, and the message content was different for those who had not used it all.

We received a number of concerned emails informing us that the number we reported was wrong. For some, it was just a little lower than their real use.   For others, we told them they had not used the app yet when in fact they had been using it. At this point we realized our app use data was not reliable, and we immediately stopped including that data in emails or branching based on it.

Table 3 lists all of the emails sent to participants during the study including who the email appeared to be from, whether the message used adaptive logic to show particular paragraphs and whether the list of who received the email was selective based on programmed logic rather than going to everyone.

EMAIL SUBJECT

	FROM	ADAPTIVE	SELECTIVE
1. Cybermeditation for Caregivers Registration			
(!) 1a. Friendly Reminder: Your Cybermeditation Presurvey has not been submitted yet	PI	***	***
2. Instructions for Downloading the Cybermeditation Apps	TS	NO	**YES**
3. Instructions for Adding your StudyID to the Cybermeditation Apps	TS	**YES**	NO
(!) 3a. Time to download and register the apps and make sure email is working	TS	**YES**	NO
4. Welcome to Week 1 of Cybermeditation for Caregivers	YT	NO	**YES**
5. Calming Meditation Followup (Cybermeditation for Caregivers)	YT	NO	NO
6. Welcome to Week 2 of Cybermeditation for Caregivers	YT	**YES**	**YES**
7. Nature Meditation Followup (Cybermeditation for Caregivers)	YT	NO	NO
8. Welcome to Week 3 of Cybermeditation for Caregivers	YT	**YES**	**YES**
9. Nourishing Meditation Followup (Cybermeditation for Caregivers)	YT	NO	NO
10. Welcome to Week 4 of Cybermeditation for Caregivers	YT	NO	NO
11. Releasing Meditation Followup (Cybermeditation for Caregivers)	YT	NO	NO
12. Welcome to Week 5 of Cybermeditation for Caregivers	YT	NO	NO
13. A Technical Clarification for Cybermeditation for Caregivers	PI	NO	NO
14. Space Meditation Followup (Cybermeditation for Caregivers)	YT	NO	NO
15. Welcome to Week 6 of Cybermeditation for Caregivers	YT	NO	NO
16. The end of the beginning (Cybermeditation for Caregivers)	YT	NO	NO
17. Post-Survey and Electronic Gift Card (Cybermeditation for Caregivers)	PI	NO	NO
(!) 17a. A Gentle Reminder (Cybermeditation for Caregivers Post-Survey)	PI	NO	**YES**
(!) 17b. Another Gentle Reminder (Cybermeditation for Caregivers Post-Survey)	PI	NO	**YES**
18. You have been sent an e-Greeting and a Virtual Visa from GiftCards.com	PI	***	***

7.4 Email Tracking

Prior to submitting the cybermeditation preproposal, the PI had used the eCoaching system to send automated emails to MSU remedial math students. MSU IT systems added a tracking image file at the end of the emails that reports back to the eCoaching system if the graphic has been viewed. (If an email has been sent to a participant, that message is tagged as Sent. If the graphic has been viewed, that message is tagged as Read. Thus, we know that messages that are tagged as Read have been read.)

We do not know whether messages tagged as Sent have been received nor whether they have been read. There are three ways that emails are tagged as Sent, not as Read. 1.) People who have their email set NOT to automatically show images may have read the message but not clicked Display Images while reading; 2.) If participants' spam filters block the emails, they would not be aware of receiving them and would not have read them; 3.) Participants may have received the email, seen the subject header but decided not to open the email.

Here we get to some actual data. We have 45 registered participants. Data shows that 44% read all of the automated email messages the system sent them. Another 11% read most of the messages. 27% appear to have read a couple of the emails but the vast majority of that group's emails show up in the database only as

Sent. In other words, they might have read them with images not displayed or they may not have received them. 18% did not appear to have read any of the messages (although they might have read all of them).

Lessons Learned: 1.) In hindsight, we wish we had asked for a phone number during registration. For the handful of people who don't appear to be receiving any messages or using any apps, a simple phone call could either let us help someone who is having technical problems or determine that someone is choosing not to participate. 2.) We learned that emails with lots of images are more likely to trigger spam blockers. Thus, it was a mistake that our How to Download Apps and How to Register Apps each contained at least 12 images. A link to the web page would have been more likely to reach recipients. 3.) We added questions to the post-survey about whether participants received and read the emails. This data will be compared with the tracking information for more complete understanding.

Going forward: Third party email and customer tracking systems provide highly polished systems for customer tracking, including email verification and message action monitoring, but charge high monthly fees. Registration should include email AND mobile phone number, allowing TXT as a second method for contacting participants who do not appear to be receiving emails. (Grant budgets should include this.)

7.5 App Registration and App Use Tracking

During the registration period and the first week of the 6-week program we worked hard to reach participants to get them to download and register the apps. This was easy for the ones we knew had read the emails. For participants who did not register the apps, to try to avoid spam blocking, Heeter manually resent download and registration information.

100% of those who read all of the emails registered their apps, as did 100% of those who read most of the emails. 82% of those who read only some of the emails have registered one or more apps. And only 38% of those who appear to have read none of the emails have registered an app. Overall, 84% of registered study participants registered their study ID in one or more apps.

We tracked and responded immediately to all tech support issues. Problems participants have reported include: 1) having to delete photos or music to make room for the apps; 2) emails going to spam; 3) No sound on the apps; 4.) autoload settings were stopping the apps partway through; 5.) audio used to work but stopped working; 6.) app use count (visible on the ME page of each app) is not correct.

As reported earlier, the week 2 follow-up email, the automated message told participants how many times they had used the Place in Nature app, and the message content was different for those who had not used it all. We received five emails from concerned participants informing us that the number we reported in their personalized email was wrong. For some, it was just a little lower than their real use. For others, we told them they had not used the app yet when in fact they had been using it.

Here is what we learned about automatic collection of app use data. 1.) If the device is not connected to the internet during app usage, no data can be sent to the server. (This is quite common for iPads and tablets which are often purchased without phone network service and therefore are only sometimes connected to local Wi-Fi.) 2.) It is only possible to count usage on the device an app is used on. Some participants used both a phone and a tablet. Their total count in the online system underreports their true usage. 3.) Any time someone re-downloads an app or upgrades their operating system, local app data is wiped out.

So, there are many possible reasons why our automated app usage data is under-reporting true usage. These issues are not unique to Mindtoon Lab cybermeditation apps. They would occur with any app.

There was a programming error (omission of a chunk of XML in xCode) on the Apple version of the nourishing app that resulted in newer operating systems failing to upload Nourishing meditation app usage. This error is unique to our apps.

We realized it was essential to ask about app usage for every app on the post survey. This was not originally included because we assumed the automated data would be accurate. We went back to IRB with slight survey revisions and received approval on 2/9.

Knowing that our usage data is under-reported right now has caused us to make sure that the email messages do not falsely report use data. We also must wait to begin calculating app use data until we have the survey data.

Heeter worked with IT programming to develop and implement algorithms for more accurately extracting app use data prior to, during, and after the study period. The outcomes were sometimes consistent with survey data and focus group interview comments, and other times were opposite of those measures. The disparities were great enough that I do not trust the algorithms.

Going Forward: It is not worth the time to parse the disparities in app use data and self-report. What is clear is that the app use data was less than 100% accurate. One solution is to require that the mobile device be connected to the internet in order to use the app. In addition to this, third party app distributors have sophisticated analytics and customer tracking tools. They charge a high monthly fee for this service. But the resulting data is very accurate.

7.6 Adventures Using Online Gift Cards for Study Compensation

Our study population was older and not technology-oriented. Four fifths didn't use amazon.com for online purchases – 81% elected to receive compensation through an online Visa gift card instead of an online amazon.com gift card. Amazon.com gift cards are easy to use for study compensation. Amazon uses a gift card code, and offers a simple process to purchase, distribute, and use in any amount. The online system we found for purchasing Online Visa gift cards through giftcard.com was a nightmare for study compensation. The system had quantity limits that were not revealed until after data for all 25 cards had been entered. After re-entering multiple times, a purchase was finally completed. The PI's University Purchasing Card company denied the payment and put a hold on the account because the giftcard.com system initially charged 1 cent to confirm it was a valid credit card and then charge $1954, which trigged a fraud alert. Once the PI got the Purchasing Card reinstated, she re-entered all 25 recipients (one at a time) in to place the order again. The order was rejected because the maximum quantity (for the cancelled order) had been exceeded by order that resulted in the hold on the Purchasing Card.

Claiming the online Visa cards was also much more complicated for study participants than claiming amazon gift cards. Participants had to initially enter the name and email of the gift card purchaser (in this case, the PI), and then later their own information. Everyone eventually got their cards, but with a lot of emails to figure it out.

Going Forward: It would be much more efficient for study administrators to only offer amazon.com gift cards, but less desirable for non-technological study participants.

8. **Publications**

POSTERS & ABSTRACTS

Heeter, C., Allbritton, M., Lehto, R., Day. T. (September 2016). "*Effects of a 6-week cybermeditation program for hospice professionals on meditation engagement, interoceptive awareness, and compassion fatigue,*" Poster to be presented at the Symposium on Yoga Research, Stockbridge, MA, September 19, 2016. Abstract appeared in a supplemental issue of the International Journal of Yoga Therapy.

Heeter, C., Lehto, R.H., Allbritton, M., Day, T., Wiseman, M. (October 2016). 6-Week Cybermeditation App Program Introduces Hospice and Palliative Care Professionals to Meditation and Improves Professional Quality of Life. Poster presentation at the 18th International Psycho-Oncology Society World Congress. [abstract: *Psycho-oncology, 25*, suppl 3, 137. DOI 10.1002/pon.4272].

Heeter, C., Lehto, R.H., Allbritton, M., Day, T., Wiseman, M. (March 2017). Hospice and Palliative Care Providers Perceptions about Using Cybermeditation to Combat Compassion Fatigue: Focus Group Findings, Oncology Nursing Society's Annual Conference.

Heeter, C., Lehto, R.H., Allbritton, M., Day, T., Wiseman (April 2017). Hospice and Palliative Care Providers Perceptions about Using Cybermeditation to Combat Compassion Fatigue: Focus Group Findings, Midwestern Nursing Society annual conference.

JOURNAL ARTICLES

Heeter, C., Lehto, R., Allbritton, M., Day, T., Wiseman, M. (2017 - in press). Effects of a Technology-Assisted Meditation Program on Healthcare Providers' Interoceptive Awareness, Compassion Fatigue, and Burnout. *Journal of Hospice and Palliative Nursing*, 19:4 (August 2017).

Lehto, R.H., Heeter, C., Allbritton, M. (under review). ProfessionalProvider Perceptions about Using Meditation Apps to Manage Work-Related Stressors: A Focus Group Study. *Cancer Nursing: An International Journal for Cancer Care*.

9. **Grant Writing**

An R21 was submitted to NIH in June 2016:
Novel Strategies for Enhancing Patient Care: Cybermeditation for oncology professionals.

NIH responded that they have no funding priorities that target healthcare providers.

A revised R21 was submitted to CDC/NIOSH in October 2016:
Novel Strategies for Enhancing Caregiver Health and Safety: Cybermeditation for Oncology Professionals

10. **Barriers.**

The barriers we have encountered are part of the research – discovering and documenting the differences between how technology works "in theory" versus what happens in practice. New app store limitations forced a change from a single registration app to adding study ID to every app. The timing of our need to add study IDs to each app coincided with a period of particular chaos in iOS app publishing because all of the usual tools were broken by Apple's changes. If we had not needed to add study IDs until January, the path would have been much easier. Publishing apps is different than creating software or web sites because

Apple and Google (especially Apple) exert control over content, form, pricing, connectivity, and timing. There is no way to get an app onto an iPhone or an iPad without going through iTunes. This means that developers must adhere to and follow their ever-changing procedures and policies. Each app revision submission undergoes about a 2-week review period and can easily be rejected.

Other technology barriers we have learned more about relate to running a study online and therefore relying on email to reach participants with study information.

The study also relied on participants to download and register apps. Technical support was offered in every email, and 17 participants contacted tech support at least once.

A barrier to automatic app use data collection turned out to be that some people use their smartphones and tablets while not connected to the internet or phone network. Under that circumstance, no app would be able to save use data to an online server.

11. Conclusions

This CFIR-funded project has been a wonderful opportunity to implement and study an innovative approach to using cybermeditation to address compassion fatigue and burnout among hospice and palliative caregivers. Implementation has revealed some barriers that are inherent in the technology systems themselves. Despite those barriers, the feasibility study largely progressed as intended. Professional hospice and palliative caregivers received the twice-weekly emails and used the cybermeditation apps (to different extents) throughout the study period. The hypothesized, intended outcomes were achieved.

Many benefits described by focus group participants exemplified the range of outcomes of practicing meditation reported in research including better stress management, focus and emotion regulation skills, and interoceptive awareness, lessened CF, improved interpersonal effectiveness, health promotion and enhanced self-care. Some participants indicated that the meditation apps were a tool to add to their stress management skill set suggesting that members had already gained coping strategies prior to the study. Offering the program to the entire staff contributed to engagement. Importantly, the benefits that were described resulted from self-scheduled use of the 10-minute concentrated yoga-for-healing meditation apps, introduced and motivated through short emails, as compared to traditional time-intensive programs.

Use of technology to deliver meditation training does present barriers, particularly for caregivers with less computer literacy. Offering choices for messaging via e-mail and/or text messaging could increase program customization. Design improvements such as slowing the pace of the meditations (retaining 10 minute duration) and adding an additional guide voice would be other improvements responsive to focus group feedback.

- The cybermeditation program succeeded in motivating Hospice and Palliative caregivers **to use the meditation apps** throughout the 6-week study period.
- Reading twice weekly resulting in significantly more frequent meditation use, confirming the utility of offering a 6-week program that combines messaging and apps above and beyond simple access to the apps. Caregivers who read six or fewer emails (out of the 18 we sent) did the meditation apps an average of 10.67 times, while those who read 7 or more emails averaged 18.69 plays.
- Participation in the program **reduced already low levels of Compassion Fatigue and Burnout**.
- **Improvements on all six MAIA scales** from the 6 week, 12 emails plus 3.2 hours of meditation intervention **significantly exceeded those reported from a 13-week intensive MBSR intervention** involving 50 hours of in person training and 36.2 hours of home meditation practice. (Bornemann et al., 2015)

- The program had a **transformative impact on HCPs' emotional awareness and their ability to regulate.**
- **The cybermeditation program proved to be feasible** as a means of introducing participants to meditation and motivating them to do the meditations regularly.
- The study was successfully **conducted completely online,** and will be **viable to use similar approaches in future research.**