Research Report

The Effect of a Multidisciplinary Blended Learning Program on Palliative Care Knowledge for Health Care Professionals Involved in the Care for People with Parkinson's Disease

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Abstract.
Background: Parkinson's disease (PD) is an increasingly prevalent and progressive degenerative disease. Palliative care for PD should be integrated into the routine care for people with PD. However, PD health care professionals typically lack knowledge of palliative care, highlighting the necessity of educational programs in this field.
Objective: To determine the effectiveness of a multidisciplinary blended learning program for health care professionals specialized in PD in the Netherlands.
Methods: We used a pre-posttest intervention design. The intervention consisted of an e-learning in combination with an online network meeting in which the participating health care professionals discussed palliative care for PD with specialists from the field of palliative care. Outcome variables included self-rated level of knowledge (scale 1-10), familiarity with specialized palliative care services (5-point Likert scale) and the validated End-of-Life Professional Caregiver Survey (EPCS).
Results: A total of 1029 participants from sixteen different disciplines, all active in the care for people with PD, with a mean age of 45 years and 13 years of working experience, followed the blended learning program. Self-rated level of knowledge improved from 4.75 to 5.72 (0.96; $p < 0.001$; 95% CI change $= [0.85\ldots 1.08]$. Familiarity with palliative care services also increased by 1.06 (from 1.85 to 2.90; $p=<0.001$; 95% CI change $= [1.00\ldots 1.12]$).

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Conclusion: A blended learning program can improve self-rated knowledge about palliative care and its services. Such programs might be a first step towards optimal integration of palliative care expertise and services within PD-care.

INTRODUCTION

The prevalence of people with Parkinson's disease (PD) is rising fast [1, 2]. Despite continuous medical progress, a curative treatment for PD is not yet available. People with advanced PD face multiple symptoms for which a palliative care approach can be beneficial [3, 4]. Palliative care for PD includes providing timely, holistic, coordinated care across the health care continuum, from diagnosis until bereavement for proxies after dying of the person with PD [5–7]. Although the number of studies on palliative care for PD is increasing [5, 8–10], people with PD often do not receive adequate palliative care or have only limited access to palliative care services [11]. One of the reasons is a restrained integration of expertise between palliative care specialists and health care professionals specialized in PD [3, 11]. In addition, health care professionals involved in PD care often deny (or are merely unaware of) the existence of a palliative phase and hence lack competences for providing palliative care, highlighting the need for additional palliative care education [12, 13]. To achieve the availability of high-quality palliative care for PD, educational initiatives should target a competent interdisciplinary care setting in which PD patients and their families are involved. Such educational programs are currently lacking.

As part of the Dutch ParkinsonSupport study [9, 14, 15], a blended learning program, consisting of an e-learning module combined with an educational network meeting, has been developed to train health care professionals working in the field of multidisciplinary palliative care for PD. Although the use of blended learning programs is not widely implemented in palliative care, implementation of such programs in other fields show benefits on both organization (reduced training cost, easy to monitor workforce skill) and personal aspects (flexibility, accessibility and self-driven learning) [16–19]. A systematic review showed that blended learning programs demonstrate better effects on knowledge

outcomes compared to traditional learning programs in health education [19].

The aim of our study is to assess the effectiveness of a multidisciplinary learning program on palliative care for health care professionals working in the field of PD care, in order to optimize palliative care for people with advanced PD and their family caregivers.

METHODS

Study design

A pre-posttest study design was used to evaluate the effect of a multidisciplinary blended learning program. Data were collected between March 2020 and April 2021. We used the Guideline for Reporting Evidence-based practice Educational interventions and Teaching to guide this article [20]. Ethical approval was not required for this study, as judged by the medical ethics committee Arnhem-Nijmegen (file number 2020-6998). All participants were informed about the study and procedures and provided online informed consent. The principles of voluntariness, confidentiality and anonymity were respected throughout the research activities.

Selection of participants

The study population consisted of health care professionals, from multiple disciplines, all affiliated with ParkinsonNet. ParkinsonNet is a Dutch professional health care network with a nationwide coverage, consisting of 70 regional networks which encompass > 3,500 health care professionals specialized in PD of which approximately 80% are women [21–23]. The basic principle behind ParkinsonNet is that high quality care for persons with PD is best provided when they are being treated by a small group of selected professionals, who have a high degree of knowledge and expertise in PD, and who treat many patients. Inclusion criteria for the blended learning

program were defined at two levels: at the regional ParkinsonNet network level and at the individual level (see Supplementary Material 1).

Inclusion criteria at the network level were:

1) At least 70% of the health care professionals within the network are able and willing to follow the blended learning program;
2) One central coordinator could be appointed from the regional ParkinsonNet network that served as contact person for the blended learning program and the research team.

Inclusion criteria at the individual level were:

1) Registered as a health care professional;
2) Willing to complete two surveys (pre- and posttest);
3) Currently active in clinical practice and;
4) Member of ParkinsonNet.

Blended learning program

The blended learning program consisted of a multidisciplinary e-learning and one network meeting. The e-learning aimed to increase the participant's knowledge on principles of palliative care, treatment in the palliative phase of people with PD, shared decision making and advance care planning. The content of the multidisciplinary e-learning was systematically developed in three steps, from January–December 2019. First, we identified relevant topics from previous research [8, 24–27]. Second, we used input from patients, family caregivers and 15 expert health care professionals in PD (elderly care physicians, dietitians, a physiotherapist, neurologists, a general practitioner, a speech therapist, a PD nurse specialist, a palliative care specialist, a spiritual counsellor and an occupational therapist) to develop an educational framework and a prototype of the e-learning. Subsequently, the prototype was discussed with a test panel consisting of 11 health care professionals from the field of PD and palliative care who were not participating in the second step. Based on this discussion, the e-learning was adjusted and finalized. The final e-learning contained three modules: 1) Introduction in basis principles of palliative care; 2) Palliative care and Parkinson's disease and; 3) Shared decision making (see Supplementary Material 2). Each network organized a network-meeting on palliative care for PD. Initially, network-meetings needed to be organized in a face-to-face setting. However, due to COVID-19 all meetings were online organized.

A concept program for this network-meeting was provided by the ParkinsonSupport team (see Supplementary Material 3). The program was developed during meetings with patients, family caregivers and 15 health care professionals (step 2). Participating networks were also free to adapt a specific subject, as long as it was related to the theme "Palliative care for PD" and approved by the ParkinsonSupport team.

Procedure

All regional ParkinsonNet networks were invited to participate if they met the inclusion criteria.

Each regional ParkinsonNet network appointed a coordinator who served as a linking pin to the research ParkinsonSupport team. These coordinators were informed about the procedure of the blended learning program (see Supplementary Material 1). Coordinators registered their regional network if it met the inclusion criteria. Next, the coordinator organized a regional network-meeting on palliative care for PD. Such a meeting required a connection with a regional network Palliative care (see Box 1). A specialist from a regional network palliative care network, which could be a palliative care physician, nurse, or coordinator, should be present. Health care professionals needed to complete the e-learning within the 3 months prior to the regional network meeting. Participants completed an online pre-test 12 weeks

> **BOX 1: Regional Networks of palliative care**
> Networks of palliative care have been developed to improve the organization of palliative care in the Netherlands, since 1998. With the help of government financial input, efforts are being made to improve expertise, develop educational activities, and establish regional networks in which the primary, secondary and tertiary health care settings are presented. Health care institutions and health care professionals within a regional network collaborate to optimize palliative care sustainably by exchanging experiences, organizing educational activities, or creating services. Main goal of a network is to develop adequate availability of palliative care provisions for each person that suffers from a life limiting or life-threatening illness. In total, 65 networks are active, and each network has a network coordinator that serves as central point.

before the network meeting and post-test survey within 14 days after the network meeting. The total

duration of participation took approximately 6 h and included an e-learning (240 min), being present at the network-meeting (90 min) and completing the pre- and post-test surveys (10 min). The blended learning program was accredited, without additional costs for the participating health care professionals.

Data collection

Basic demographic information was collected in an online survey, to be completed at the pre-test, before the start of the e-learning module. The primary outcome measure was self-rated knowledge of palliative care for PD, for which participants were asked to self-rate their knowledge about palliative care for PD on a scale of 1-10, with 1 being "very little knowledge" and 10 "don't need to learn anything more". The End-of-Life Professional Caregiver Survey (EPCS) [28] served as a secondary outcome measure. The EPCS is a validated 28-item survey addressing palliative and end-of-life care specific educational needs of multidisciplinary professionals and consists of three subscales: patient- and family-centered communication (12 items), cultural and ethical values (8 items), and effective care delivery (8 items) [28]. Items represent health care professionals' comfort with a variety of situations related to palliative care for each subscale. Higher scores indicate greater skill or comfort. The total EPCS score was calculated by taking the average of the three subscales. In case no data for a subscale was present (i.e., missing data), the average of the subscales with data present was determined. Additional secondary outcome measures included the level of taboo on topics of death and dying, self-rated level of familiarity with network of palliative care, importance of collaboration with the regional network of palliative care, and level of collaboration with health care professionals of the regional network palliative care. All secondary outcome measures used a 5-point Likert scale, with 1 representing "not at all" and 5 representing "a lot". For level of taboo on topics of death and dying, a higher score represents a higher level of taboo.

Analysis

All analyses were performed using IBM SPSS V. 25, unless indicated otherwise. Demographic information was summarized by frequencies and percentages. A one-way ANOVA, with Tukey post-hoc tests, was performed to determine group differences on self-rated knowledge of palliative care at the pre-test. The intervention efficacy (pre- versus post-intervention assessment) for our primary and secondary outcomes was determined with paired t-tests on our whole sample. In an exploratory analysis we performed paired t-tests for the primary outcome measure (self-rated level of knowledge of palliative care for PD) per health care profession group, (physicians, nurses, psychosocial workers, and allied health care professionals) with a Bonferroni correction for multiple comparisons (4 groups, Bonferroni-adjusted p-value=0.0125). A multiple regression analysis was used to explore the role of self-rated knowledge of palliative care for PD at the pre-test, years of experience and health care professionals (with physicians as the reference group) in the process of estimating post-intervention self-rated knowledge of palliative care for PD. As the residuals from the regression analysis were skewed, B-values and 95% CI intervals were determined using bootstrapping with 1000 samples.

RESULTS

In total, 1,336 health care professionals from 39 ParkinsonNet networks followed the blended learning program of whom 1,029 (77%) completed the pre- and posttest. These 1,029 participants were included in our analyses. The mean age of participants was 45.0 years (SD 11.1), 85% of the health care professionals were women and the participants had 12.9 years (SD 8.9) of experience in the care of people with PD (Table 1). Most participants (86.5%) were allied health professionals, of which almost half were physiotherapists. Physicians, psychosocial workers, and nurses only represented a small percentage of the participants (Table 1).

Efficacy blended learning program

The self-rated level of knowledge of palliative care for PD of health care professionals increased from 4.75 to 5.72 (change = 0.96; $p < 0.001$; 95% CI = [0.85 … 1.08] (Table 2). Analyses based on subgroups showed only a significant increase for the self-perceived level of knowledge for allied health professionals (from 4.62 to 5.67; $p < 0.001$; 95% CI = [0.93 … 1.18]) and psychosocial workers (from 5.23 to 5.92; $p = 0.009$; 95% CI = [0.18 … 1.20]), both below the Bonferroni-adjusted p-value of 0.0125. Self-rated knowledge of palliative care for PD at the pre-test differed between health care professional groups (F(3, 1025)=12.37, $p < 0.001$). Post-hoc tests revealed that allied health profession-

Table 1
Characteristics of participants

Participants, n	1,029
Gender, n (%)	
Women	879 (85)
Age in years (SD)	45.0 (11.1)
Years of practice (SD)	12.9 (8.9)
Allied health professionals, n (%)	890 (86.5)
• Physiotherapist	452 (43.9)
• Remedial therapist	42 (4.1)
• Speech therapist	139 (13.5)
• Occupational therapist	191 (18.6)
• Dietician	66 (6.4)
Nurses, n (%)	70 (6.8)
• PD nurse specialist	65 (6.3)
• Community nurse	4 (0.4)
• Physician assistant	1 (0.1)
Psychosocial workers, n (%)	39 (3.8)
• Psychologist	26 (2.5)
• Social worker	11 (1.1)
• Chaplain	−
• Sexologist	1 (0.1)
• Case manager	1 (0.1)
Physicians, n (%)	30 (2.9)
• Elderly care physician	16 (1.6)
• Neurologist	6 (0.6)
• Psychiatrist	−
• Rehabilitation specialist	2 (0.2)
• Pharmacist	6 (0.6)

als showed lower self-rated knowledge of palliative care for PD at the pre-test scores than physicians and nurses (both $p < 0.001$), while other health care professionals were not different from each other (all $p > 0.05$). Furthermore, secondary outcomes showed significant improvement, except for the "Level of taboo on topics of death and dying" ($p = 0.080$) and "Importance of collaboration with network palliative care" ($p = 0.112$). The overall mean on the EPCS measured after the intervention increased from 2.96 to 3.37 (change = 0.40, $p < 0.001$; 95% CI = [0.34 . . . 0.43]. All subitems showed a significant increase, the highest increase was for "Effective care delivery", followed by "Cultural and ethical values" and "Patient- and family-centered communication".

Exploratory multiple regression analysis

The effects on change into self-rated level of knowledge of palliative care for PD at the pre-test, years of experience and health care professionals on the process of estimating the self-rated level of knowledge of palliative care for PD post-intervention are displayed in Table 3.

Table 2
Differences between pre- and post-test for the blended training program on palliative care principles

Primary outcome measure (1-10)	n	Pretest		Posttest		Change between pre- and posttest		p
		mean	SD	mean	SD	mean	95% CI	
Self-rated level of knowledge of palliative care for PD	1029	4.75	1.90	5.72	1.09	0.96	0.85 . . . 1.08	**<0.001**
• Allied health professionals	890	4.62	1.88	5.67	1.10	1.06	0.93 . . . 1.18	**<0.001**
• Nurses	70	5.70	1.74	5.96	0.94	0.26	−0.12 . . . 0.63	0.177
• Psychosocial workers	39	5.23	1.81	5.92	1.06	0.69	0.18 . . . 1.20	**0.009**
• Physicians	30	5.93	2.03	6.20	0.89	0.27	−0.38 . . . 0.91	0.403
Secondary outcome measures (1-5)	n	mean	SD	mean	SD	mean	95% CI	p
EPCS (total score)	1028	2.96	0.65	3.37	0.60	0.40	0.37 . . . 0.43	**<0.001**
• Patient- and family-centered communication	1027	3.39	0.63	3.56	0.61	0.17	0.14 . . . 0.20	**<0.001**
• Cultural and ethical values	1022	2.98	0.76	3.25	0.71	0.26	0.22 . . . 0.30	**<0.001**
• Effective care delivery	1024	2.52	0.79	3.30	0.66	0.77	0.73 . . . 0.81	**<0.001**
Level of taboo on topics of death and dying	1028	2.56	0.87	2.51	0.83	−0.05	−0.11 . . . 0.01	0.080
Familiarity with network palliative care	1028	1.85	0.89	2.90	0.84	1.06	1.00 . . . 1.12	**<0.001**
Importance of collaboration with network palliative care	1028	3.74	0.81	3.78	0.77	0.04	−0.01 . . . 0.10	0.112
Level of collaboration with health care professionals of the network palliative care	1028	1.35	0.73	1.55	0.83	0.20	0.15 . . . 0.25	**<0.001**

Significant p-values are displayed in bold.

Table 3
Effects on the process of estimating self-rated level of knowledge of palliative care for PD post-intervention, using a multiple regression analysis ($R^2 = 0.116$)

	B	95% CI	*p*
Self-rated level of knowledge of palliative care for PD at the pre-test	0.173	0.132 … 0.211	**<0.001**
Years of experience	0.011	0.004 … 0.019	**0.006**
Health care professional*			
Allied health professionals	–0.305	–0.568 … -0.015	**0.028**
Nurses	–0.175	–0.482 … 0.160	0.297
Psychosocial workers	–0.136	–0.527 … 0.272	0.478

The B-values are based on bootstrapping with 1000 samples. Significant *p*-values are displayed in bold. *Physicians were taken as the reference group. PD, Parkinson's disease.

DISCUSSION

In this study, we examined the effect of a blended learning program for health care professionals involved in palliative care for PD. We found that our blended learning program improved health care professionals' self-rated level of palliative care knowledge and their familiarity with palliative care services. Also, participants became more aware of palliative care aspects in PD care after the blended learning. Subgroup analyses revealed that allied health care professionals and psychosocial workers improved their self-rated palliative care knowledge, while physicians and nurses did not. The self-rated palliative care knowledge at the pre-test was positively associated with the post-test score. Furthermore, health care professionals felt more comfortable after the blended learning in all domains as assessed with the EPCS.

For our whole sample, the self-rated knowledge level of palliative care for PD was rated insufficient at the pre-test: 4.75 on average, on a scale from 1-10. Our blended learning program improved self-rated level of palliative care knowledge with approximately 1 point. As the blended learning program was quite compact, consisting of an online education of 4 h and a network meeting of 1.5 h, a large increase in palliative care knowledge was not expected. Indeed, the improvement of 1 point is small and the post-intervention score not yet satisfactory. In addition, health care professionals may have become more aware of their own lack of palliative care knowledge due to the blended learning program, which might have diminished the effect of our blended learning program [29]. This might reflect a next step in the hierarchy of competence, where the participants change from unconscious unskilled to conscious unskilled [29]. Bringing the acquired knowledge into practice could be a necessary next step to become con-

sciously skilled and competent. Although the level of palliative care knowledge among PD health care professionals needs to be improved further after the blended learning program, we believe our blended learning program can be a first step on the way towards an increased palliative care knowledge of PD health care professionals.

Subgroup analyses revealed that allied health care professionals and psychosocial workers improved their self-rated palliative care knowledge, while physicians and nurses did not. Physicians and nurses showed the highest self-rated palliative care knowledge at the pre-test, which was higher than that of allied health professionals. Of note, physicians still showed a higher post-intervention level of palliative care knowledge for PD than allied health professionals, when corrected for pre-test knowledge and years of experience. The pre-test level of knowledge of palliative care for PD and years of experience proved to be associated with the post-intervention level of knowledge. The association with of years of experience was rather small. The association with the pre-test level of palliative care knowledge for PD indicated that our blended learning program became less effective when the pre-test knowledge level was higher. As the level of palliative care knowledge at baseline can vary between health care professionals, our multidisciplinary blended learning might be more beneficial for some types of health care professionals than for others. The blended blended learning program aimed to increase palliative care knowledge across a broad range of health care professionals, as PD care is delivered by a multidisciplinary team of physicians, nurses, allied health professionals, social workers and many other health care professionals [30, 31]. Future palliative care education programs should also target profession-specific knowledge gaps. We believe an improvement in palliative care knowledge is necessary across all professions included in

this study, as the highest pre-test knowledge score, achieved by physicians, was only 5.93 on a 1-10 scale.

The integration of palliative care specialists within the multidisciplinary team involved in PD care is growing, but still scarce [30, 32]. Our blended learning seemed beneficial for the integration of palliative care within PD care as shown by an increased familiarity with the palliative care network and even an increased level of collaboration with palliative care professionals. Of note, while the familiarity with the palliative care network showed a substantial increase of approximately 1 point (on a 5-point Likert scale), the increase in level collaboration was only 0.2 points on the same scale. As the post-intervention measurement was held within the 14 days following the network session, this period was likely too short to substantially increase the level of collaboration with palliative care services within PD care. A longer period of time might be needed to bring the gained knowledge into practice and establish a more substantial increase in collaboration with palliative care networks. In addition, of the assessed domains of the EPCS, the greatest improvement was in the "effective care delivery" domain. In this domain, items focus on familiarity with palliative and end-of-life care and resource availability. Taken together, we believe that our blended learning program is a first step on the way to optimal integration of palliative care services and expertise within PD care. The integration of palliative care expertise within PD care is highly relevant for the patient, as integrated outpatient palliative care led to a better quality of life than standard care [8].

Our results are in line with previous educational programs aimed at improving the knowledge of palliative care for health care professionals, not specialized in PD. A face-to-face 2-day multidisciplinary education program on palliative care improved the levels of interest, knowledge, and confidence in relation to palliative care of 537 health workers (nurses, allied health professionals, physicians and others) [34]. In addition, a multidisciplinary face-to-face training on spiritual care for patients in palliative trajectories, improved the spiritual care competencies of both nurses ($n = 214$) and physicians ($n = 41$). Perceived barriers for spiritual care decreased in nurses, but not in physicians [35].

A key innovation of our education program is its blended aspect. The online learning environment increased the accessibility for a large group of healthcare professionals, whereas the network meeting supports the exchange of information between participants [16–19]. In line with our findings, three previous studies showed promising effects of a blended learning program on several aspects of palliative care. First, a blended learning improved the confidence in and delivery of end-of-life care among a sample of 20 nursing home staff members [36]. A second study evaluated a blended learning program on spiritual and cultural aspects of palliative care in 211 interprofessional students (medical, nursing and divinity students). Afterwards, all students recognized the roles of other professionals and the value of team collaboration in order to provide palliative care [37]. Furthermore, this blended learning program highlighted the diverse professional perspectives on spiritual care. A third study, conducted in the field of dementia, evaluated a blended learning program embedded within a large cluster-randomized trial with 166 general practitioners in Germany [38]. This blended learning program consisted of online modules and a structured discussion. The increase in knowledge about dementia management after completing the blended learning program was comparable to the knowledge increase after following a physical lecture and a structured discussion. Overall, the participants' background varied in all three studies, which makes it difficult to compare. However, all three studies show that a blended learning is an effective method to increase healthcare students' and professionals' knowledge about palliative care. Additionally, this study shows that a blended learning program can lead to increased familiarity and collaboration with specialist palliative care services. These improvements might be explained by the content of our blended learning program such as the collaboration between health care professionals from the network of ParkinsonNet and Palliative care.

Strengths and limitations

This study addresses the high need of health care professionals for education on palliative care for PD [3, 11]. Therefore, many health care professionals were willing to participate. As this study only included health care professionals from the Netherlands, who work within a dedicated care infrastructure of specialized networks in PD and palliative care, i.e., ParkinsonNet, the results may not be generalizable to a wider international context. At the same time, we have little reason to believe why professionals in other countries or in other healthcare settings would be less amenable to change following an educational program such as the one evaluated here. Our sample included predominantly women

similar to the ParkinsonNet professionals. Some further work may be required to see if men and women respond equally well to an educational program on palliative care. Furthermore, the effectiveness of the blended training program was only measured shortly after the intervention, precluding insights into long-term effects. Also, although our blended learning program improved self-rated knowledge on palliative care for PD, we did not include a control group so it remains unknown how our blended learning program compares with only e-learning or only face-to-face meeting [39]. We also did not include objective evaluations, such as a formal examination of knowledge after the education program. Last, we cannot be certain how the success of the present educational program ultimately translates into daily clinical practice.

Future directions

Educational programs on palliative care for PD are warranted but lacking. There is a need for developing education programs that also might focus on face-to-face training, in depth training or specific disciplines and comparison studies. Furthermore, education on palliative care should be integrated into the basic curriculum of various health care professionals, including specific education towards its own discipline as well as the multidisciplinary component. This study provides evidence that could lead to a widespread implementation of blended learning programs in clinical practice. Testing whether an educational program on palliative care ultimately changes actual daily clinical practice is an obvious further future direction that needs to be followed.

Conclusion

This study identified the efficacy of a multidisciplinary blended learning program on self-rated palliative care knowledge for health care professionals involved in the care for people with PD. In total, 1,029 health care professionals from the Netherlands and from sixteen different disciplines participated in this study. Our blended learning program increased the self-rated level of knowledge and familiarity with palliative care services of health care professionals. As such, blended learning could be a means to increase palliative care expertise and familiarity with palliative care services among PD health care professionals, which can ultimately lead to improved palliative care for people with advanced PD. It should be considered to integrate this blended learning program on palliative care for people with PD into the curricula of health care professionals to improve their knowledge in this area.

CONFLICT OF INTEREST

Bastiaan R. Bloem is an Editor-in-Chief of this journal, but was not involved in the peer-review process nor had access to any information regarding its peer-review. The remaining authors have no conflict of interest to report.

SUPPLEMENTARY MATERIAL

The supplementary material is available in the electronic version of this article: https://dx.doi.org/10.3233/JPD-223539.

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