

Palliative Care and Parkinson's Disease: Meeting Summary and Recommendations for Clinical Research

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ABSTRACT

Introduction: Palliative care is an approach to caring for patients and families affected by serious illnesses that focuses on the relief of suffering through the management of medical symptoms, psychosocial issues, advance care planning and spiritual wellbeing. Over the past decade there has been an emerging clinical and research interest in the application of palliative care approaches to Parkinson's disease (PD) and outpatient palliative care services are now offered by several movement disorders centers.

Methods: An International Working Group Meeting on PD and Palliative Care supported by the Parkinson's Disease Foundation was held in October 2015 to review the current state of the evidence and to make recommendations for clinical research and practice.

Results: Topics included: 1) Defining palliative care for PD; 2) Lessons from palliative care for heart failure and other chronic illnesses; 3) Patient and caregiver Needs; 4) Needs assessment tools; 5) Intervention strategies; 6) Predicting prognosis and hospice referrals; 7) Choice of appropriate outcome measures; 8) Implementation, dissemination and education research; and 9) Need for research collaborations. We provide an overview of these discussions, summarize current evidence and practices, highlight gaps in our knowledge and make recommendations for future research.

Conclusions: Palliative Care for PD is a rapidly growing area which holds great promise for improving outcomes for PD patients and their caregivers. While clinical research in this area can build from lessons learned in other diseases, there is a need for observational, methodological and interventional research to address the unique needs of PD patients and caregivers.

INTRODUCTION

Growing evidence suggests current standards of care do not adequately meet many important aspects of care for Parkinson's disease (PD) patients and their caregivers including: 1) Under-recognition and treatment of non-motor symptoms such as pain, depression and fatigue [1, 2]; 2) High rates of nursing home placement, hospitalization in the last year of life and in-hospital deaths [3, 4]; 3) Caregivers being under-prepared for their role [5]; and 4) High levels of burden, depression and increased mortality among PD caregivers [6, 7]. Palliative care focuses on the relief of suffering for patients and families affected by serious illness through the assessment and treatment of physical, psychosocial and spiritual issues [8]. While traditionally associated with cancer, palliative approaches have been successfully applied to several chronic progressive illnesses including heart failure and pulmonary disease [9, 10]. Several recent reviews propose palliative care approaches for PD [11, 12], and a small but growing cadre of centers worldwide now offer interdisciplinary outpatient palliative care for PD.

Currently there are scant data and no randomized clinical trials to guide clinicians or researchers in this emerging field. While there have been several opinion pieces and reviews, there are no statements reflecting the opinions and discussions of an international working group. This is a notable gap as there is likely to be significant variability in this new field in terms of which services are offered to whom, what outcomes are followed and how to prioritize research questions.

METHODS

In recognition of these needs, the Parkinson's Disease Foundation sponsored an International Working Group meeting October 3-4, 2015 in Aurora, Colorado consisting of an expert panel of clinicians and researchers from PD and Palliative Medicine as well as patients and caregivers. This manuscript presents a summary of the major talks and related discussions including: 1) Defining

Palliative Care for PD; 2) Lessons from Palliative Care for Cancer and Heart Failure; 3) Patient Needs; 4) Predicting Prognosis and Hospice Referrals; 5) Caregiver Needs; 6) Needs Assessment Tools and Strategies; 7) Clinical Research Outcome Measures; 8) Intervention Strategies; and 9) Implementation, Dissemination and Education Research. Research priorities for each domain are discussed at the end of each section.

RESULTS

Defining Palliative Care for PD

Faculty, patients and caregivers all endorsed a broad conception of palliative care as an approach to the care of PD patients and their families which seeks to relieve suffering through the management of medical symptoms, psychosocial issues, spiritual wellbeing and advance care planning [12]. This approach is not limited to end-of-life care [13]. Patients and caregivers identified palliative care needs for early (e.g. emotional support at diagnosis), middle (e.g. discussing goals of care, nonmotor symptom management) and late-stage PD (e.g. hospice) and stressed that the time of diagnosis is particularly challenging and is a time where increased support and resources are needed. Patients proposed a “three-legged stool” model to provide palliative care including: 1) Community organizations ranging in size from local support groups to international advocacy foundations; 2) Primary care physicians, geriatricians and neurologists; and 3) Specialist palliative care including team-based outpatient clinics, home palliative care and hospice. In this model each leg has its own role and strengths.

Further research is needed to define what approaches are most appropriate for specific patient and caregiver needs. Faculty agree that palliative care is best seen as an approach to care with specialist palliative care services (e.g. interdisciplinary clinics, hospice) being only one aspect of this. It is not feasible for all PD patients to get all of their palliative care needs met in

these clinics and PCP/neurologist education as well as utilization of community resources (e.g. support groups, online education) are needed to cover the full spectrum of patient and caregiver needs.

The timing of referral and role of specialist palliative care for PD is challenging to define. Palliative care is commonly associated with end-of-life care and palliative resources are certainly needed during this time [14]. However research suggests that even in cancer, earlier palliative care may improve patient quality of life and even survival [15]. Although reimbursement for hospice care is tied to prognosis in many payment systems (e.g. Medicare), outpatient palliative care referrals are reimbursed regardless of prognosis as standard clinic visits and a more useful conceptual model for referral may be based around needs rather than prognosis, stage or specific events. A prospective study of ambulatory palliative care for PD enrolled patients with uncontrolled symptoms, neurobehavioral symptoms limiting treatment, cognitive impairment or caregiver distress [16]. For the represented PD palliative care clinics, referrals are made as limited consults for specific issues, for co-management or to assume ongoing care. As discussed below, validated needs assessment tools are needed to aid clinicians in making appropriate referrals and to define inclusion for research trials.

The term “palliative care” was discussed as potentially problematic for patients and clinicians who may have strong preconceptions about palliative care. Several clinicians described patients not interested in “palliative care” but excited to come to a team-based clinic providing intensive symptom management and psychosocial support. As a result, most clinics have changed their names to “Supportive Care,” “Next Step Clinic” or “Complex Symptom Management” to reduce confusion and increase acceptance by healthcare providers, patients and

families. Some felt that misconceptions about palliative care need to be directly tackled rather than hidden under another name.

Lessons from Palliative Care for Cancer and Heart Failure

Most palliative care services have arisen in conjunction with oncology. Although evidence supports an early integrated care service delivery model [15, 17-19] this is implemented variably, often influenced by the funding system. In the UK and Australia, an integrated service, where cancer patients access palliative care services according to need rather than prognosis and in conjunction with ongoing cancer-directed treatment, is becoming the standard of care. In the US, the largest health care system, the Veterans Health Administration, also provides concurrent cancer and palliative care [20]. US hospital-based palliative care consultation has grown significantly, while outpatient palliative care has grown more slowly due in part to low financial incentives [21, 22]. Thus the traditional view of palliative care being inconsistent with disease-directed treatment continues despite i) the evidence in support of early integrated care, and ii) being an outmoded concept for much of oncology where successive cancer treatments can modify the disease trajectory to be one more akin to a chronic disease.

Heart failure (HF) was one of the first non-cancer conditions to recognize the significant symptom burden and concerns of patients and caregivers as palliative care issues [23-27]. Despite palliative care recommendations in national guidelines and policy [28-29], implementation of this approach is patchy [30]. Barriers to implementation are well described and relevant to PD including:

1. Disease trajectory. The pattern of deteriorations and restorations, and the fact that cardiac treatments remain appropriate until very late stage disease, make it difficult to predict patients who are in the last few months of life. When palliative services are predicated upon

estimated prognosis rather than patient-identified concerns or needs, the result is that conversations about advance care planning do not occur for fear of “not being at that stage yet” (despite lack of clarity about when “that stage” starts).

2. Education and training. Few cardiology training programs have substantive training in communication, symptom management, advance care planning or joint clinical decision making [31].
3. Evidence base. The inadequate evidence base for palliative management of common symptoms such as fatigue and dyspnea, as well as the role of palliative care in HF more generally, are cited as reasons for inadequate implementation of palliative care. However, there are now published phase 2 trials, and a phase 3 randomized controlled trial, showing benefit for specialist, multi-disciplinary palliative care interventions [32]. However, questions remain regarding which HF patients need specialist palliative care referral or specific symptom interventions, and who can be adequately managed if the usual care team had appropriate palliative care skills [33, 34]. Furthermore, the growing evidence base will not address difficulties of implementation arising from limitations in clinician training and service configuration constraints. A service requiring all patients with HF to see a specialist palliative care team is clearly unsustainable, and unnecessary [33, 35].
4. Unclear lines of clinical responsibility. Patients with advanced HF are cared for across a variety of clinical settings (home, care facility, hospital, hospice), and a variety of clinicians (family physician, internist, nurse practitioner, geriatrician, cardiologist, palliative care specialist). There is a need to assess components of successful integrated services and identify core components that can be translated into different settings.

There is an emerging consensus in cardiology supporting the following approaches; i) a problem-based rather than prognosis driven identification of patients, ii) collaboration between primary care, specialist cardiology care and palliative care and iii) most of the palliative care assessment and concerns managed by primary care and cardiology with specialist palliative care services involved for help with training, education and direct clinical support for complex or persistent issues. **Patient Needs**

PD patients and their caregivers have many unmet needs due to under-recognition and under-treatment of non-motor symptoms, as well as a lack of focus on psychosocial stressors, spiritual wellbeing and advance care planning [36, 37]. We now know that motor symptoms are just the tip of the iceberg in PD [38], and that PD patients have similar rates of symptom burden as those with advanced cancer and amyotrophic lateral sclerosis (ALS) [16, 36]. Visual hallucinations, depression, cognitive impairment, apathy and daytime sleepiness have large impacts on quality of life and functional ability [16, 39, 40]. As patients with PD experience longer duration of disease with advanced therapies, non-motor and axial symptoms, which are unresponsive to levodopa, take an increasing toll on patients and their caregivers.

Psychosocial stressors play a major role in PD, with far-reaching emotional and social consequences [41]. PD significantly affects family dynamics, with changing roles, loss of autonomy, economic strain and social isolation being very common. Patients and caregivers can feel abandoned by medical providers due to trouble accessing care and limited comfort of providers addressing the needs of patients with advanced illness [42]. In addition, decreased spiritual wellbeing in PD patients often includes a devastating loss of purpose [43-45]. It is critical to help patients and their loved ones find peace and solace, as well as meaning in their

lives. We know that patients with advanced diseases who find comfort from their spiritual beliefs have an improved quality of life [43].

As a progressive, incurable, symptomatically devastating life-limiting disease [46], it is remarkable to note the low rates of hospice use in PD patients [46, 47]. In fact, the majority of those with PD die outside of their homes, and advance care planning is absent in almost all PD patients who die in hospitals [48]. Studies show that most (but not all) PD patients want prognosis and treatment information early, and many expect their healthcare providers to bring up these issues [49]. Planning for decline and death as an expected and natural outcome rather than a failure of medical treatment is one of the main paradigm shifts brought by palliative care to the treatment of those with life-limiting illnesses. Further research is needed to better define patient needs including describing their prevalence, severity, relationship to quality of life and evolution from diagnosis through end-of-life. Research is also needed to compare needs in PD to other chronic illnesses and neurologic disorders to inform models of care and educate palliative care specialists caring for these patients.

Predicting Prognosis and Hospice Referrals

A patient need which deserves independent attention is the ability to estimate prognosis as it impacts advance care planning, patient/caregiver counseling and timely referral for hospice. PD is an under-reported cause of death which increases age adjusted mortality rate by 1.3-1.8 and decreases life expectancy by 3-11 years depending on age at onset (greater for younger patients) [50-52]. There are no tools currently available to predict prognosis in PD and no specific hospice eligibility guidelines. The lack of prognostic tools is likely one contributor to low rates of hospice use (< 1%) and high rates of hospital deaths (>40%) [4, 53, 54]. Challenges in creating a predictive tool include high variability in clinical manifestations of PD and variability in rates of

progression. Hospice eligibility guidelines available in the US relevant to PD include: Generic Terminal Illness, Adult Failure to Thrive, Dementia and Neurologic Disease. These guidelines, when used, are overly restrictive and contribute to low rates of hospice use and late hospice consultation. The Gold Standards Framework in the UK includes the following as indicators of a limited life expectancy in PD: 1) Drug treatment less effective or increasingly complex regime of drug treatments; 2) Reduced independence, needs ADL help; 3) The condition is less well controlled with increasing “off” periods; 4) Dyskinesias, mobility problems and falls; 5) Psychiatric signs (depression, anxiety, hallucinations, psychosis); 6) Other frailty markers [85] [55].

Data on causes of death in PD may help guide efforts to develop prognostic tools. Reported causes of death which differ from the general population include lower risk of death from cancer and higher rates of death from complications of dementia, pneumonia, other infections (e.g. urosepsis) and falls [51, 56-59]. Only one study examined 6-month mortality predictors in PD [60] and reported only BMI less than 18.5, accelerated weight loss and reduction of dopaminergic medications as predictive, with dementia, choking episodes, comorbidities, use of antibiotics and falls not differing in the last 6 months of life compared to prior time periods. Other studies report predictors of mortality include older age, rate of motor deterioration, male gender, dementia, psychotic symptoms, gait impairment and comorbid illness (e.g. stroke) [61-65]. Clinical research in ALS and dementia suggest advantages to developing disease specific hospice guidelines in terms of both sensitivity and accuracy [66-68]. Gaps in knowledge include a need for better understanding of predictors of death in PD, particularly for a 6-month time period; a need to validate current criteria and/or develop new hospice eligibility guidelines; and to understand facilitators and barriers to hospice referral.

Caregiver Needs

The unmet needs of family caregivers are well documented. Evidence exists for increased burden as the disease progresses with responsibility for numerous tasks, financial hardship, decreased mutuality, social isolation, feelings of being unprepared, lack of information and increased physical and psychological morbidity [69-72]. At the same time family caregivers are pivotal in successful home care and make a significant economic contribution [73]. These facts strongly support the recommendation in palliative care that family caregivers should be equal recipients of care and a priority for palliative care research [74-76]. In spite of that, families are often a secondary focus of care and research is still in its infancy.

Factors that predict and mediate caregiver burden including the physical and mental health of caregivers, the mental and physical health of the patient, mutuality, preparedness, personality characteristics, amount of social support, gender and age of caregivers [71]. The dynamic interaction of positive and negative factors calls for a consistent theoretical model. An evidence-based model would also inform targeted multidimensional interventions [77]. A recent review of all research looking at the psychosocial impact of being a caregiver of a person with PD found no mention of theoretical frameworks [78].

The first step in understanding the needs of a caregiver is a systematic assessment. Given what is known about factors that predict or mediate burden, three areas of assessment emerge: the capacity of the caregiver, the knowledge of the caregiver and the health of the person with PD. The capacity of the caregiver includes availability/work status, physical and mental health, social support, gender, age, mutuality, relationship to patient and personality characteristics. The knowledge of the caregiver includes how prepared and self-confident they feel to manage the caregiver role. The health of the person with PD includes cognition and neuropsychiatric

symptoms, sleep disturbance, dietary modifications and functional needs/mobility [79]. There are a number of tools with good psychometric properties to measure many of these variables. A need exists for a comprehensive caregiver assessment that includes all three areas and consensus on which scales should be used.

Finally, research on effective caregiver interventions is limited and inconclusive. Some of this may be secondary to methodological limitations including outcome measures that are not sensitive to change or limitations in evaluating the effective components of a multidimensional intervention. What is known is that interventions building psycho-educational skills such as problem solving, goal setting and cognitive restructuring can show positive benefits [80-83].

Needs Assessment Tools and Strategies

Tools and strategies for palliative needs assessment should reflect the nature of the disease journey in PD. In particular, the potential for palliative care needs throughout the disease trajectory [84], the high prevalence of cognitive impairment in later stage disease [3, 85] and the need for integration between primary care, neurology/geriatric medicine and specialist palliative care services [86] makes the demands on a needs assessment tool complex. A three stage assessment strategy may be desirable in order to i) rapidly identify unmet needs, ii) triage need to the appropriate service and iii) quantify needs so that response to intervention can be measured, facilitating an integrated model of care as described in other non-malignant conditions [87, 88]. Here the PD specialist addresses the majority of need through a palliative approach and referrals to specialist palliative care are selective, facilitating sustainable service development.

A number of patient-completed palliative assessment tools have been adapted to assess palliative need in PD. They may be most useful where unmet palliative care needs are suspected, allowing clinicians to quantify and track symptom burden over time. The Palliative Care

Assessment Tool (PACA) rates symptoms as 1 (*present*) to 4 (*dominating the day*) using a patient generated list, followed by prompts for common symptoms, and may facilitate simple, patient centered targeting of interventions [89]. The POS-PP, an extended version of the POS (Palliative Outcome Scale) [90] rates 20 symptoms on a 4 point scale, and includes a summary score [91]. This scale has been used to track symptom burden over time in groups of people with later stage (Hoehn and Yahr stage ≥ 3) disease [92]. Similarly, the ESAS-PD, an extension of the Edmonton Symptom Assessment Scale (ESAS), generates a summary score in addition to individual symptom ratings and, importantly, demonstrates responsiveness to palliative interventions in PD [93].

The NAT-Parkinson's disease (NAT:PD) [94], an adaptation of the Needs Assessment Tool: Progressive Disease-cancer (NAT:PD-c) [95], targets the early identification and triage of unmet needs. It is clinician completed and focuses on both patient and caregiver/family needs. Clinicians are prompted first to rate their level of concern regarding unmet need in a specific area, and secondly to triage unmet needs for appropriate referral. Validity and reliability have recently been tested in a broad PD population (Hoehn and Yahr 1-5) [96]. Concerns regarding the NAT:PD include its development within a specific healthcare model (UK), time of administration and difficulties for non-palliative practitioners to determine what constitutes a moderate or significant level of concern.

Research is needed to further validate and assess the utility of available needs assessment tools. Multiple tools will likely be needed to meet the varying demands of users (e.g. PCP vs. neurologist vs. clinical research), settings (e.g. inpatient vs. outpatient) and available services (e.g. outpatient specialty palliative care clinic vs. hospice vs. telemedicine). Tools should consider several types of triggers including patient and caregiver needs, prognostic signs and

clinical/historical events (e.g. repeated hospitalizations for infection, onset of dementia, need for wheelchair) [97]. **Clinical Research Outcome Measures**

Appropriate and valid outcome measures are critical to driving changes in the practice and organization of care, by demonstrating that an intervention can improve patient-related outcomes or reduce healthcare utilization costs or caregiver burden. However, before any outcome measures may be routinely applied in clinical practice or recommended for clinical trials, more research is needed to identify the best outcome measures for use in this population. When developing or adopting outcome measures we recommend the following criteria:

Valid in PD. Outcome measures should only be used in a population in which they have been developed and/or validated. Palliative care outcomes validated in other populations must be shown to be reliable and valid in PD which differs in many respects from malignant illness, where many palliative care scales were validated, including a longer and slower period of decline and a different mix of symptoms contributing to overall burden.

Valid in advanced PD. Similarly, measures developed to measure PD symptom load must be validated specifically in advanced PD; for example many items from the PD Questionnaire-39 [98, 99] are less relevant in advanced PD. Patient and caregiver goals of care in advanced PD must be reflected in outcome measures.

Valid in dementia and/or proxy reporting. There is a high prevalence of cognitive impairment and dementia in advanced PD [3, 100] and thus patient self-report may not be possible. In addition, patient and caregivers may interpret the “worst” symptoms differently and patient and proxy reports differ for measures of disability and quality of life in PD [101].

Good psychometric properties and ecological validity. Outcome measures must demonstrate robust psychometric properties including validity (face, content, criterion and

construct validity) and reliability (inter-rater, test-retest reliability and internal consistency).

However, potential outcome measures must also have ecological validity, be feasible to use in the clinical context, short, easy to administer and score, and appropriate across multiple care settings.

Responsive to change. Outcome measures must be able to detect clinically important change over time. As small changes may have a significant impact for patient and caregiver outcome, measures need to be responsive to even small changes related to disease progression or interventions.

Developed using mixed-methods studies. People with PD and their caregivers should be part of the process of measure development and validation, including selection of key symptom domains, defining clinically meaningful change, ecological validity and user-friendliness.

Against this backdrop, we identified five knowledge gaps for future outcome measure research: i) validation of palliative care scales in PD and dementia; ii) testing of scale properties in PD palliative care (e.g. responsiveness); iii) definition of clinically meaningful change; iv) patients' requirements of outcome measures; v) determining whether new PD palliative care specific scales are needed.

Intervention Strategies

The majority of faculty were associated with team-based programs providing outpatient palliative care for PD patients and families. The team typically included a neurologist, advanced practice nurse or geriatrician and had variable inclusion of other services including nursing, chaplain, social work, physical therapy, psychology and palliative medicine specialists. The preponderance of neurology (as opposed to palliative medicine) clinics may reflect greater neurologist comfort with PD, growing interest among neurologists in palliative care as a

subspecialty, and workforce shortages in palliative medicine [102-104]. When available, most programs recommended an interdisciplinary assessment at least for the intake visit, including coverage of medical and psychiatric symptoms, psychosocial issues, spiritual wellbeing, home safety, functional status, advance care planning and goals of care. When possible, integrated team-based care is preferred to multiple referrals. There was significant interest in the use of complementary and alternative medicine (CAM) to supplement traditional care including yoga, mindfulness, massage, aromatherapy, acupuncture, art, music and pet therapies [105]. There are currently no data to suggest which traditional or CAM modalities are most beneficial although there is an ongoing randomized controlled trial of team-based outpatient palliative care for PD including a neurologist, nurse, social worker and chaplain as the core team with a palliative medicine specialist available as needed (clinicaltrials.gov identifier NCT02533921). Future studies should also examine the financial implications of these approaches to care, particularly with coming changes in healthcare payment such as Medicare Access and CHIP Reauthorization Act of 2015 ("MACRA") and Alternative Payment Models (APM) [106].

Telemedicine, the remote delivery of health care via technology, was proposed as an innovative intervention in palliative care for patients with PD. Modalities include video conferencing to a remote clinic or directly into the patient's home, e-consults, secure messaging, and smartphone applications. The chief promise of telemedicine is to improve access to care which is a notable issue in this population due to both geographic and mobility issues. PD management and clinical research is amenable to telemedicine, given the visually based examination and the focus on effective therapeutics for symptom management, requiring frequent visits [107, 108]. While there are concerns that the more personal aspects of palliative care (e.g. advance care planning, prognosis discussions, spiritual and bereavement care) may

prove difficult to conduct via telemedicine recent research, the experience of the University of California San Francisco team suggest that telemedicine can be used to provide high quality and empathetic palliative care [109]. Future efforts will need to address legal, financial and technological challenges that might be heightened for the advanced PD population who stand to benefit most from this approach. Caregiver and dyad focused interventions are encouraged given the substantial adverse effects on mental and physical health associated with caregiver distress and the critical role caregivers play in supporting PD patients.

Implementation, Dissemination and Education Research

While the majority of palliative care programs for PD are based in academic centers, the majority of PD patients do not receive care at these centers. Thus, as successful interventions are developed they must be translated into community practice to impact public health [110].

Implementation research refers to the study of methods that influence the integration of evidence-based interventions into practice settings and include efforts to identify, understand, and overcome barriers to the adoption, adaptation, integration and scale-up of evidence-based interventions, tools, policies and guidelines. *Dissemination* refers to the targeted distribution of information and intervention materials to a specific public health or clinical practice audience. The intent is to spread knowledge and the associated evidence-based interventions and to understand the extent, adoption rate and outcome of the dissemination. *Education* needs include understanding gaps in knowledge, developing materials to educate key stakeholders (e.g. clinicians, patients), barriers to developing competencies, and developing tools to assess competency, attitudes and knowledge.

While there are few studies on dissemination and implementation in PD and none in PD palliative care [111], there are studies from palliative care that will become relevant as evidence

emerges from ongoing and future efficacy trials [112-115]. Regarding education, Schuh et al. developed a successful 14-hour palliative care training for neurology residents and there is growing interest in developing neuro-palliative care as a sub-specialty [116, 117]. Outside of neurology, there are several successful models for educating clinicians in key aspects of palliative care [118-120]. Education for neurologists and neurology residents is a known gap despite ACGME requirements for palliative care training [12]. Education of palliative care physicians in neurology is also needed [103, 121].

CONCLUSIONS

Palliative care offers great promise to transform care for PD patients and their caregivers. As a relatively new field, there are significant methodological and content areas where research is needed (Table 1). Existing research collaborative groups such as the Parkinson Study Group, Palliative Care Research Cooperative or the Population-based Palliative Care Research Network should be leveraged to accelerate research.

Citations

- [1] L.M. Shulman, R.L. Taback, A.A. Rabinstein, W.J. Weiner, Non-recognition of depression and other non-motor symptoms in Parkinson's disease, *Parkinsonism Relat Disord* 8(3) (2002) 193-7.
- [2] F. Del Sorbo, A. Albanese, Clinical management of pain and fatigue in Parkinson's disease, *Parkinsonism Relat Disord* 18 Suppl 1 (2012) S233-6.
- [3] M.A. Hely, W.G. Reid, M.A. Adena, G.M. Halliday, J.G. Morris, The Sydney multicenter study of Parkinson's disease: the inevitability of dementia at 20 years, *Mov Disord* 23(6) (2008) 837-44.
- [4] K. Snell, S. Pennington, M. Lee, R. Walker, The place of death in Parkinson's disease, *Age Ageing* 38(5) (2009) 617-9.
- [5] E.R. Goy, J.H. Carter, L. Ganzini, Needs and experiences of caregivers for family members dying with Parkinson disease, *J Palliat Care* 24(2) (2008) 69-75.

- [6] P. Martinez-Martin, S. Arroyo, J.M. Rojo-Abuin, C. Rodriguez-Blazquez, B. Frades, J. de Pedro Cuesta, Burden, perceived health status, and mood among caregivers of Parkinson's disease patients, *Mov Disord* 23(12) (2008) 1673-80.
- [7] M. Nielsen, J. Hansen, B. Ritz, H. Nordahl, E. Schernhammer, L. Wermuth, N.H. Rod, Cause-specific mortality among spouses of Parkinson disease patients, *Epidemiology* 25(2) (2014) 225-32.
- [8] L.K. Bunting-Perry, Palliative care in Parkinson's disease: implications for neuroscience nursing, *J Neurosci Nurs* 38(2) (2006) 106-13.
- [9] J.G. Howlett, Palliative care in heart failure: addressing the largest care gap, *Curr Opin Cardiol* 26(2) (2011) 144-8.
- [10] D.F. Heigener, K.F. Rabe, Palliative care concepts in respiratory disease, *Respiration* 82(6) (2011) 483-91.
- [11] E.W. Richfield, E.J. Jones, J.E. Alty, Palliative care for Parkinson's disease: a summary of the evidence and future directions, *Palliat Med* 27(9) (2013) 805-10.
- [12] I. Boersma, J. Miyasaki, J. Kutner, B. Kluger, Palliative care and neurology: time for a paradigm shift, *Neurology* 83(6) (2014) 561-7.
- [13] S.A. Murray, K. Boyd, A. Sheikh, Palliative care in chronic illness, *BMJ* 330(7492) (2005) 611-2.
- [14] M.D. Aldridge, J. Hasselaar, E. Garralda, M. van der Eerden, D. Stevenson, K. McKendrick, C. Centeno, D.E. Meier, Education, implementation, and policy barriers to greater integration of palliative care: A literature review, *Palliat Med* 30(3) (2016) 224-39.
- [15] C. Zimmermann, N. Swami, M. Krzyzanowska, B. Hannon, N. Leighl, A. Oza, M. Moore, A. Rydall, G. Rodin, I. Tannock, A. Donner, C. Lo, Early palliative care for patients with advanced cancer: a cluster-randomised controlled trial, *Lancet* 383(9930) (2014) 1721-30.
- [16] J.M. Miyasaki, J. Long, D. Mancini, E. Moro, S.H. Fox, A.E. Lang, C. Marras, R. Chen, A. Strafella, R. Arshinoff, R. Ghoshe, J. Hui, Palliative care for advanced Parkinson disease: an interdisciplinary clinic and new scale, the ESAS-PD, *Parkinsonism Relat Disord* 18 Suppl 3 (2012) S6-9.
- [17] I.J. Higginson, C. Bausewein, C.C. Reilly, W. Gao, M. Gysels, M. Dzingina, P. McCrone, S. Booth, C.J. Jolley, J. Moxham, An integrated palliative and respiratory care service for patients with advanced disease and refractory breathlessness: a randomised controlled trial, *Lancet Respir Med* 2(12) (2014) 979-87.
- [18] J.S. Temel, J.A. Greer, A. Muzikansky, E.R. Gallagher, S. Admane, V.A. Jackson, C.M. Dahlin, C.D. Blinderman, J. Jacobsen, W.F. Pirl, J.A. Billings, T.J. Lynch, Early palliative care for patients with metastatic non-small-cell lung cancer, *N Engl J Med* 363(8) (2010) 733-42.
- [19] M. Bakitas, K.D. Lyons, M.T. Hegel, S. Balan, F.C. Brokaw, J. Seville, J.G. Hull, Z. Li, T.D. Tosteson, I.R. Byock, T.A. Ahles, Effects of a palliative care intervention on clinical outcomes in patients with advanced cancer: the Project ENABLE II randomized controlled trial, *JAMA* 302(7) (2009) 741-9.
- [20] V. Mor, N.R. Joyce, D.L. Cote, R.A. Gidwani, M. Ersek, C.R. Levy, K.E. Faricy-Anderson, S.C. Miller, T.H. Wagner, B.P. Kinosian, K.A. Lorenz, S.T. Shreve, The rise of concurrent care for veterans with advanced cancer at the end of life, *Cancer* (2015).
- [21] T. Dumanovsky, R. Augustin, M. Rogers, K. Lettang, D.E. Meier, R.S. Morrison, The Growth of Palliative Care in U.S. Hospitals: A Status Report, *J Palliat Med* 19(1) (2016) 8-15.

- [22] D. Hui, A. Elsayem, M. De la Cruz, A. Berger, D.S. Zhukovsky, S. Palla, A. Evans, N. Fadul, J.L. Palmer, E. Bruera, Availability and integration of palliative care at US cancer centers, *JAMA* 303(11) (2010) 1054-61.
- [23] D.B. Bekelman, E.P. Havranek, D.M. Becker, J.S. Kutner, P.N. Peterson, I.S. Wittstein, S.H. Gottlieb, T.E. Yamashita, D.L. Fairclough, S.M. Dy, Symptoms, depression, and quality of life in patients with heart failure, *J Card Fail* 13(8) (2007) 643-8.
- [24] C.D. Blinderman, P. Homel, J.A. Billings, R.K. Portenoy, S.L. Tennstedt, Symptom distress and quality of life in patients with advanced congestive heart failure, *J Pain Symptom Manage* 35(6) (2008) 594-603.
- [25] S.A. Murray, K. Boyd, M. Kendall, A. Worth, T.F. Benton, H. Clausen, Dying of lung cancer or cardiac failure: prospective qualitative interview study of patients and their carers in the community, *BMJ* 325(7370) (2002) 929.
- [26] A. Rogers, J.M. Addington-Hall, A.S. McCoy, P.M. Edmonds, A.J. Abery, A.J. Coats, J.S. Gibbs, A qualitative study of chronic heart failure patients' understanding of their symptoms and drug therapy, *Eur J Heart Fail* 4(3) (2002) 283-7.
- [27] R. Harding, L. Selman, T. Beynon, F. Hodson, E. Coady, C. Read, M. Walton, L. Gibbs, I.J. Higginson, Meeting the communication and information needs of chronic heart failure patients, *J Pain Symptom Manage* 36(2) (2008) 149-56.
- [28] T. Jaarsma, J.M. Beattie, M. Ryder, F.H. Rutten, T. McDonagh, P. Mohacsi, S.A. Murray, T. Grodzicki, I. Bergh, M. Metra, I. Ekman, C. Angermann, M. Leventhal, A. Pitsis, S.D. Anker, A. Gavazzi, P. Ponikowski, K. Dickstein, E. Delacretaz, L. Blue, F. Strasser, J. McMurray, H.F.A.o.t.E.S.C. Advanced Heart Failure Study Group of the, Palliative care in heart failure: a position statement from the palliative care workshop of the Heart Failure Association of the European Society of Cardiology, *Eur J Heart Fail* 11(5) (2009) 433-43.
- [29] National Institute for Health and Clinical Excellence, *Journal of Neonatal Nursing* 17(1) (2011) 22-23.
- [30] L. Selman, R. Harding, T. Beynon, F. Hodson, C. Hazeldine, E. Coady, L. Gibbs, I.J. Higginson, Modelling services to meet the palliative care needs of chronic heart failure patients and their families: current practice in the UK, *Palliat Med* 21(5) (2007) 385-90.
- [31] M.J. Johnson, Breaking the Deadlock, *British Journal of Cardiology* 22 (2015) 10-11.
- [32] A.C. Sidebottom, A. Jorgenson, H. Richards, J. Kirven, A. Sillah, Inpatient palliative care for patients with acute heart failure: outcomes from a randomized trial, *J Palliat Med* 18(2) (2015) 134-42.
- [33] T.E. Quill, A.P. Abernethy, Generalist plus specialist palliative care--creating a more sustainable model, *N Engl J Med* 368(13) (2013) 1173-5.
- [34] P.M. Kane, F.E. Murtagh, K. Ryan, N.G. Mahon, B. McAdam, R. McQuillan, C. Ellis-Smith, C. Howley, C. Raleigh, G. O'Gara, I.J. Higginson, B.A. Daveson, The gap between policy and practice: a systematic review of patient-centered care interventions in chronic heart failure, *Heart Failure Reviews* 20(6) (2015) 673-687.
- [35] M. Johnson, M. Fallon, Just good care? The palliative care of those with non-malignant disease, *Palliat Med* 27(9) (2013) 803-4.
- [36] E.R. Goy, J. Carter, L. Ganzini, Neurologic disease at the end of life: caregiver descriptions of Parkinson disease and amyotrophic lateral sclerosis, *J Palliat Med* 11(4) (2008) 548-54.
- [37] L.M. Shulman, R.L. Taback, A.A. Rabinstein, W.J. Weiner, Non-recognition of depression and other non-motor symptoms in Parkinson's disease, *Parkinsonism Relat Disord* 8(3) (2002) 193-7.

- [38] J.W. Langston, The Parkinson's complex: parkinsonism is just the tip of the iceberg, *Ann Neurol* 59(4) (2006) 591-6.
- [39] J. Slawek, M. Derejko, P. Lass, Factors affecting the quality of life of patients with idiopathic Parkinson's disease--a cross-sectional study in an outpatient clinic attendees, *Parkinsonism Relat Disord* 11(7) (2005) 465-8.
- [40] D. Weintraub, P.J. Moberg, J.E. Duda, I.R. Katz, M.B. Stern, Effect of psychiatric and other nonmotor symptoms on disability in Parkinson's disease, *J Am Geriatr Soc* 52(5) (2004) 784-8.
- [41] H. Ellgring, S. Seiler, B. Perleth, W. Frings, T. Gasser, W. Oertel, Psychosocial aspects of Parkinson's disease, *Neurology* 43(12 Suppl 6) (1993) S41-4.
- [42] S. Fox, A. Cashell, W.G. Kernohan, M. Lynch, C. McGlade, T. O'Brien, S.S. O'Sullivan, S. Timmons, Interviews with Irish healthcare workers from different disciplines about palliative care for people with Parkinson's disease: a definite role but uncertainty around terminology and timing, *BMC Palliat Care* 15(1) (2016) 15.
- [43] J.W. Yates, B.J. Chalmer, P. St James, M. Follansbee, F.P. McKegney, Religion in patients with advanced cancer, *Med Pediatr Oncol* 9(2) (1981) 121-8.
- [44] K.E. Steinhauer, C.I. Voils, E.C. Clipp, H.B. Bosworth, N.A. Christakis, J.A. Tulsky, "Are you at peace?": one item to probe spiritual concerns at the end of life, *Arch Intern Med* 166(1) (2006) 101-5.
- [45] C.M. Puchalski, The role of spirituality in health care, *Proc (Bayl Univ Med Cent)* 14(4) (2001) 352-7.
- [46] K. Moens, D. Houttekier, L. Van den Block, R. Harding, L. Morin, S. Marchetti, A. Csikos, M. Loucka, W.A. Naylor, D.M. Wilson, J. Teno, M. Cardenas-Turanzas, Y. Rhee, F.J. Garcia-Leon, L. Deliens, J. Cohen, Place of death of people living with Parkinson's disease: a population-level study in 11 countries, *BMC Palliat Care* 14 (2015) 28.
- [47] K. Snell, S. Pennington, M. Lee, R. Walker, The place of death in Parkinson's disease, *Age Ageing* 38(5) (2009) 617-9.
- [48] R.W. Walker, D. Churm, F. Dewhurst, M. Samuel, A. Ramsell, C. Lawrie, J. Hill, C.J. Threapleton, B. Wood, W.K. Gray, Palliative care in people with idiopathic Parkinson's disease who die in hospital, *BMJ Support Palliat Care* 4(1) (2014) 64-7.
- [49] K.K. Tuck, L. Brod, J. Nutt, E.K. Fromme, Preferences of patients with Parkinson's disease for communication about advanced care planning, *Am J Hosp Palliat Care* 32(1) (2015) 68-77.
- [50] J. Benito-Leon, E.D. Louis, A. Villarejo-Galende, J.P. Romero, F. Bermejo-Pareja, Under-reporting of Parkinson's disease on death certificates: a population-based study (NEDICES), *J Neurol Sci* 347(1-2) (2014) 188-92.
- [51] P.A. Fall, A. Saleh, M. Fredrickson, J.E. Olsson, A.K. Granerus, Survival time, mortality, and cause of death in elderly patients with Parkinson's disease: a 9-year follow-up, *Mov Disord* 18(11) (2003) 1312-6.
- [52] L.S. Ishihara, A. Cheesbrough, C. Brayne, A. Schrag, Estimated life expectancy of Parkinson's patients compared with the UK population, *J Neurol Neurosurg Psychiatry* 78(12) (2007) 1304-9.
- [53] K.E. Sleeman, Y.K. Ho, J. Verne, M. Glickman, E. Silber, W. Gao, I.J. Higginson, Place of death, and its relation with underlying cause of death, in Parkinson's disease, motor neurone disease, and multiple sclerosis: a population-based study, *Palliat Med* 27(9) (2013) 840-6.
- [54] K. Moens, D. Houttekier, L. Van den Block, R. Harding, L. Morin, S. Marchetti, A. Csikos, M. Loucka, W.A. Naylor, D.M. Wilson, J. Teno, M. Cardenas-Turanzas, Y. Rhee, F.J. Garcia-

- Leon, L. Deliens, J. Cohen, Place of death of people living with Parkinson's disease: a population-level study in 11 countries, *BMC Palliat Care* 14 (2015) 28.
- [55] K. Thomas, Prognostic Indicator Guidance (PIG) 4th Edition. <<http://www.goldstandardsframework.org.uk/cd-content/uploads/files/General Files/Prognostic Indicator Guidance October 2011.pdf>>, 2011 (accessed April 16, 2016.).
- [56] M.K. Beyer, K. Herlofson, D. Arslan, J.P. Larsen, Causes of death in a community-based study of Parkinson's disease, *Acta Neurol Scand* 103(1) (2001) 7-11.
- [57] Y.F. Huang, Y.G. Cherng, S.P. Hsu, C.C. Yeh, Y.C. Chou, C.H. Wu, T.L. Chen, C.C. Liao, Risk and adverse outcomes of fractures in patients with Parkinson's disease: two nationwide studies, *Osteoporos Int* 26(6) (2015) 1723-32.
- [58] L. Lethbridge, G.M. Johnston, G. Turnbull, Co-morbidities of persons dying of Parkinson's disease, *Prog Palliat Care* 21(3) (2013) 140-145.
- [59] C.H. Williams-Gray, S.L. Mason, J.R. Evans, T. Foltynie, C. Brayne, T.W. Robbins, R.A. Barker, The CamPaIGN study of Parkinson's disease: 10-year outlook in an incident population-based cohort, *J Neurol Neurosurg Psychiatry* 84(11) (2013) 1258-64.
- [60] E.R. Goy, A. Bohlig, J. Carter, L. Ganzini, Identifying predictors of hospice eligibility in patients with Parkinson disease, *Am J Hosp Palliat Care* 32(1) (2015) 29-33.
- [61] I.J. Posada, J. Benito-Leon, E.D. Louis, R. Trincado, A. Villarejo, M.J. Medrano, F. Bermejo-Pareja, Mortality from Parkinson's disease: a population-based prospective study (NEDICES), *Mov Disord* 26(14) (2011) 2522-9.
- [62] T.C. Vu, J.G. Nutt, N.H. Holford, Disease progress and response to treatment as predictors of survival, disability, cognitive impairment and depression in Parkinson's disease, *Br J Clin Pharmacol* 74(2) (2012) 284-95.
- [63] J. Xu, D.D. Gong, C.F. Man, Y. Fan, Parkinson's disease and risk of mortality: meta-analysis and systematic review, *Acta Neurol Scand* 129(2) (2014) 71-9.
- [64] W.K. Gray, A. Hildreth, J.A. Bilclough, B.H. Wood, K. Baker, R.W. Walker, Physical assessment as a predictor of mortality in people with Parkinson's disease: a study over 7 years, *Mov Disord* 24(13) (2009) 1934-40.
- [65] E.B. Forsaa, J.P. Larsen, T. Wentzel-Larsen, G. Alves, What predicts mortality in Parkinson disease?: a prospective population-based long-term study, *Neurology* 75(14) (2010) 1270-6.
- [66] L. McCluskey, G. Houseman, Medicare hospice referral criteria for patients with amyotrophic lateral sclerosis: a need for improvement, *J Palliat Med* 7(1) (2004) 47-53.
- [67] S.L. Mitchell, S.C. Miller, J.M. Teno, R.B. Davis, M.L. Shaffer, The advanced dementia prognostic tool: a risk score to estimate survival in nursing home residents with advanced dementia, *J Pain Symptom Manage* 40(5) (2010) 639-51.
- [68] S.L. Mitchell, S.C. Miller, J.M. Teno, D.K. Kiely, R.B. Davis, M.L. Shaffer, Prediction of 6-month survival of nursing home residents with advanced dementia using ADEPT vs hospice eligibility guidelines, *Jama* 304(17) (2010) 1929-35.
- [69] R. Bhimani, Understanding the Burden on Caregivers of People with Parkinson's: A Scoping Review of the Literature, *Rehabil Res Pract* 2014 (2014) 718527.
- [70] P. Martinez-Martin, C. Rodriguez-Blazquez, M.J. Forjaz, B. Frades-Payo, L. Aguera-Ortiz, D. Weintraub, A. Riesco, M.M. Kurtis, K.R. Chaudhuri, Neuropsychiatric symptoms and caregiver's burden in Parkinson's disease, *Parkinsonism Relat Disord* 21(6) (2015) 629-34.
- [71] J.H. Carter, B.J. Stewart, P.G. Archbold, I. Inoue, J. Jaglin, M. Lannon, E. Rost-Ruffner, M. Tennis, M.P. McDermott, D. Amyot, R. Barter, L. Cornelius, C. Demong, J. Dobson, J. Duff, J. Erickson, N. Gardiner, L. Gauger, P. Gray, B. Kanigan, B. Kiryluk, P. Lewis, K. Mistura, T.

- Malapira, K. Zoog, et al., Living with a person who has Parkinson's disease: the spouse's perspective by stage of disease. *Parkinson's Study Group, Mov Disord* 13(1) (1998) 20-8.
- [72] K.S. Lyons, B.J. Stewart, P.G. Archbold, J.H. Carter, Optimism, pessimism, mutuality, and gender: predicting 10-year role strain in Parkinson's disease spouses, *Gerontologist* 49(3) (2009) 378-87.
- [73] C. Gardiner, L. Brereton, R. Frey, L. Wilkinson-Meyers, M. Gott, Exploring the financial impact of caring for family members receiving palliative and end-of-life care: a systematic review of the literature, *Palliat Med* 28(5) (2014) 375-90.
- [74] C. Riffin, K. Pillemer, E.K. Chen, M. Warmington, R.D. Adelman, M.C. Reid, Identifying Key Priorities for Future Palliative Care Research Using an Innovative Analytic Approach, *Am J Public Health* 105(1) (2015) e15-e21.
- [75] R. Schulz, Research priorities in geriatric palliative care: informal caregiving, *J Palliat Med* 16(9) (2013) 1008-12.
- [76] P. Hudson, Improving support for family carers: key implications for research, policy and practice, *Palliat Med* 27(7) (2013) 581-2.
- [77] P. Craig, P. Dieppe, S. Macintyre, S. Michie, I. Nazareth, M. Petticrew, G. Medical Research Council, Developing and evaluating complex interventions: the new Medical Research Council guidance, *BMJ* 337 (2008) a1655.
- [78] K. Greenwell, W.K. Gray, A. van Wersch, P. van Schaik, R. Walker, Predictors of the psychosocial impact of being a carer of people living with Parkinson's disease: a systematic review, *Parkinsonism Relat Disord* 21(1) (2015) 1-11.
- [79] B. Given, P.R. Sherwood, C.W. Given, What knowledge and skills do caregivers need?, *Am J Nurs* 108(9 Suppl) (2008) 28-34; quiz 34.
- [80] M. Holm, I. Carlander, C.J. Furst, Y. Wengstrom, K. Arestedt, J. Ohlen, A. Henriksson, Delivering and participating in a psycho-educational intervention for family caregivers during palliative home care: a qualitative study from the perspectives of health professionals and family caregivers, *BMC Palliat Care* 14 (2015) 16.
- [81] P. Hudson, S. Aranda, The Melbourne Family Support Program: evidence-based strategies that prepare family caregivers for supporting palliative care patients, *BMJ Support Palliat Care* 4(3) (2014) 231-7.
- [82] M. Corry, A. While, K. Neenan, V. Smith, A systematic review of systematic reviews on interventions for caregivers of people with chronic conditions, *J Adv Nurs* 71(4) (2015) 718-34.
- [83] L. Volicer, J. Simard, Palliative care and quality of life for people with dementia: medical and psychosocial interventions, *Int Psychogeriatr* 27(10) (2015) 1623-34.
- [84] P.L. Hudson, C. Toye, L.J. Kristjanson, Would people with Parkinson's disease benefit from palliative care?, *Palliat Med* 20(2) (2006) 87-94.
- [85] D. Aarsland, K. Bronnick, J.P. Larsen, O.B. Tysnes, G. Alves, G. Norwegian ParkWest Study, Cognitive impairment in incident, untreated Parkinson disease: the Norwegian ParkWest study, *Neurology* 72(13) (2009) 1121-6.
- [86] E.W. Richfield, E.J. Jones, J.E. Alty, Palliative care for Parkinson's disease: a summary of the evidence and future directions, *Palliat Med* 27(9) (2013) 805-10.
- [87] M.J. Johnson, A. Gadoud, Palliative care for people with chronic heart failure: when is it time?, *J Palliat Care* 27(1) (2011) 37-42.
- [88] M. Fallon, P. Foley, Rising to the challenge of palliative care for non-malignant disease, *Palliat Med* 26(2) (2012) 99-100.

- [89] M.A. Lee, W.M. Prentice, A.J. Hildreth, R.W. Walker, Measuring symptom load in Idiopathic Parkinson's disease, *Parkinsonism Relat Disord* 13(5) (2007) 284-9.
- [90] J. Hearn, I.J. Higginson, Development and validation of a core outcome measure for palliative care: the palliative care outcome scale. Palliative Care Core Audit Project Advisory Group, *Qual Health Care* 8(4) (1999) 219-27.
- [91] T.Z. Saleem, I.J. Higginson, K.R. Chaudhuri, A. Martin, R. Burman, P.N. Leigh, Symptom prevalence, severity and palliative care needs assessment using the Palliative Outcome Scale: a cross-sectional study of patients with Parkinson's disease and related neurological conditions, *Palliat Med* 27(8) (2013) 722-31.
- [92] I.J. Higginson, W. Gao, T.Z. Saleem, K.R. Chaudhuri, R. Burman, P. McCrone, P.N. Leigh, Symptoms and quality of life in late stage Parkinson syndromes: a longitudinal community study of predictive factors, *PLoS One* 7(11) (2012) e46327.
- [93] J.M. Miyasaki, J. Long, D. Mancini, E. Moro, S.H. Fox, A.E. Lang, C. Marras, R. Chen, A. Strafella, R. Arshinoff, R. Ghoche, J. Hui, Palliative care for advanced Parkinson disease: an interdisciplinary clinic and new scale, the ESAS-PD, *Parkinsonism Relat Disord* 18 Suppl 3 (2012) S6-9.
- [94] E. Richfield, A. Girgis, M. Johnson, Assessing Palliative Care in Parkinson's Disease - Development of the NAT: Parkinson's Disease, European Association of Palliative Care World Congress (Lleida: Palliative Medicine) (2014).
- [95] A. Waller, A. Girgis, C. Lecathelinais, W. Scott, L. Foot, D. Sibbritt, D. Currow, t. Palliative Care Research Program, Validity, reliability and clinical feasibility of a Needs Assessment Tool for people with progressive cancer, *Psychooncology* 19(7) (2010) 726-33.
- [96] E. Richfield, E.J. Jones, M. Johnson, Validation Of A Screening Tool For Identifying Unmet Palliative Care Needs in Parkinson's Disease, *Irish Ageing Studies Review* 6(1) (2015).
- [97] C.J. Creutzfeldt, M.T. Robinson, R.G. Holloway, Neurologists as primary palliative care providers: Communication and practice approaches, *Neurol Clin Pract* 6(1) (2016) 40-48.
- [98] V. Peto, C. Jenkinson, R. Fitzpatrick, PDQ-39: a review of the development, validation and application of a Parkinson's disease quality of life questionnaire and its associated measures, *J Neurol* 245 Suppl 1 (1998) S10-4.
- [99] V. Peto, C. Jenkinson, R. Fitzpatrick, R. Greenhall, The development and validation of a short measure of functioning and well being for individuals with Parkinson's disease, *Qual Life Res* 4(3) (1995) 241-8.
- [100] T.C. Buter, A. van den Hout, F.E. Matthews, J.P. Larsen, C. Brayne, D. Aarsland, Dementia and survival in Parkinson disease: a 12-year population study, *Neurology* 70(13) (2008) 1017-22.
- [101] A. Fleming, K.F. Cook, N.D. Nelson, E.C. Lai, Proxy reports in Parkinson's disease: caregiver and patient self-reports of quality of life and physical activity, *Mov Disord* 20(11) (2005) 1462-8.
- [102] D.W. Ford, Palliative care consultation needs in United States intensive care units. Another workforce shortage?, *Am J Respir Crit Care Med* 189(4) (2014) 383-4.
- [103] E. Manu, A. Marks, C.S. Berkman, P. Mullan, M. Montagnini, C.A. Vitale, Self-perceived competence among medical residents in skills needed to care for patients with advanced dementia versus metastatic cancer, *J Cancer Educ* 27(3) (2012) 515-20.
- [104] M.T. Robinson, K.M. Barrett, Emerging subspecialties in neurology: neuropalliative care, *Neurology* 82(21) (2014) e180-2.

- [105] C.R. Lewis, A. de Vedia, B. Reuer, R. Schwan, C. Tourin, Integrating complementary and alternative medicine (CAM) into standard hospice and palliative care, *Am J Hosp Palliat Care* 20(3) (2003) 221-8.
- [106] MACRA. <<https://www.aan.com/practice/MACRA/>>, 2016 (accessed May 31, 2016.2016).
- [107] V. Venkataraman, S.J. Donohue, K.M. Biglan, P. Wicks, E.R. Dorsey, Virtual visits for Parkinson disease: A case series, *Neurol Clin Pract* 4(2) (2014) 146-152.
- [108] E.R. Dorsey, V. Venkataraman, M.J. Grana, M.T. Bull, B.P. George, C.M. Boyd, C.A. Beck, B. Rajan, A. Seidmann, K.M. Biglan, Randomized controlled clinical trial of "virtual house calls" for Parkinson disease, *JAMA Neurol* 70(5) (2013) 565-70.
- [109] J. van Gorp, M. van Selm, K. Vissers, E. van Leeuwen, J. Hasselaar, How outpatient palliative care teleconsultation facilitates empathic patient-professional relationships: a qualitative study, *PLoS One* 10(4) (2015) e0124387.
- [110] M.D. Aldridge Carlson, Research methods priorities in geriatric palliative medicine, *J Palliat Med* 16(8) (2013) 838-42.
- [111] A. Larisch, A. Reuss, W.H. Oertel, K. Eggert, Does the clinical practice guideline on Parkinson's disease change health outcomes? A cluster randomized controlled trial, *J Neurol* 258(5) (2011) 826-34.
- [112] S. Schellinger, A. Sidebottom, L. Briggs, Disease specific advance care planning for heart failure patients: implementation in a large health system, *J Palliat Med* 14(11) (2011) 1224-30.
- [113] M. Costantini, V. Romoli, S.D. Leo, M. Beccaro, L. Bono, P. Pilastrri, G. Miccinesi, D. Valenti, C. Peruselli, F. Bulli, C. Franceschini, S. Grubich, C. Brunelli, C. Martini, F. Pellegrini, I.J. Higginson, Liverpool Care Pathway for patients with cancer in hospital: a cluster randomised trial, *Lancet* 383(9913) (2014) 226-37.
- [114] F.A. Bailey, B.R. Williams, L.L. Woodby, P.S. Goode, D.T. Redden, T.K. Houston, U.S. Granstaff, T.M. Johnson, 2nd, L.C. Pennypacker, K.S. Haddock, J.M. Painter, J.M. Spencer, T. Hartney, K.L. Burgio, Intervention to improve care at life's end in inpatient settings: the BEACON trial, *J Gen Intern Med* 29(6) (2014) 836-43.
- [115] J.S. Kutner, A significant milestone for palliative care: imperative for dissemination and implementation research, *J Palliat Med* 14(11) (2011) 1194-5.
- [116] A. Dallara, D.W. Tolchin, Emerging subspecialties in neurology: palliative care, *Neurology* 82(7) (2014) 640-2.
- [117] L.A. Schuh, A. Biondo, A. An, D. Newman, S. Ryczko, S. Remer, L. Bricker, Neurology resident learning in an end-of-life/palliative care course, *J Palliat Med* 10(1) (2007) 178-81.
- [118] J.M. Hauser, M. Preodor, E. Roman, D.M. Jarvis, L. Emanuel, The Evolution and Dissemination of the Education in Palliative and End-of-Life Care Program, *J Palliat Med* 18(9) (2015) 765-70.
- [119] A.K. Pham, M.T. Bauer, S. Balan, Closing the patient-oncologist communication gap: a review of historic and current efforts, *J Cancer Educ* 29(1) (2014) 106-13.
- [120] L. Prihodova, S. Guerin, W.G. Kernohan, Knowledge transfer and exchange frameworks in health and their applicability to palliative care: scoping review protocol, *J Adv Nurs* 71(7) (2015) 1717-25.
- [121] A. Dallara, A. Meret, J. Saroyan, Mapping the literature: palliative care within adult and child neurology, *J Child Neurol* 29(12) (2014) 1728-38.