

## Interprofessional education increases knowledge, promotes team building, and changes practice in the care of Parkinson's disease



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### ABSTRACT

**Objective:** Examine outcomes for the National Parkinson Foundation (NPF) *Allied Team Training for Parkinson (ATTP)*, an interprofessional education (IPE) program in Parkinson's disease (PD) and team-based care for medicine, nursing, occupational, physical and music therapies, physician assistant, social work and speech-language pathology disciplines.

**Background:** Healthcare professionals need education in evidence-based PD practices and working effectively in teams. Few evidence-based models of IPE in PD exist.

**Methods:** Knowledge about PD, team-based care, the role of other disciplines and attitudes towards healthcare teams were measured before and after a protocol-driven training program. Knowledge, attitudes and practice changes were again measured at 6-month post-training. Trainee results were compared to results of controls.

**Results:** Twenty-six NPF–ATTP trainings were held across the U.S. (2003–2013). Compared to control participants ( $n = 100$ ), trainees ( $n = 1468$ ) showed statistically significant posttest improvement in all major outcomes, including self-perceived ( $p < 0.001$ ) and objective knowledge ( $p < 0.001$ ), Understanding Role of Other Disciplines ( $p < 0.001$ ), Attitudes Toward Health Care Teams Scale ( $p < 0.001$ ), and the Attitudes Toward Value of Teams ( $p < 0.001$ ) subscale. Despite some decline, significant improvements were largely sustained at six-month post-training. Qualitative analyses confirmed post-training practice changes.

**Conclusions:** The NPF–ATTP *model* IPE program showed sustained positive gains in knowledge of PD, team strategies and role of other disciplines, team attitudes, and important practice improvements.

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Further research should examine longer-term outcomes, objectively measure practice changes and mediators, and determine impact on patient outcomes.

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## 1. Introduction

A marked increase in chronic illness has prompted the healthcare system to place a higher premium on *collaboration* among different disciplines to address complex health challenges for integrated, longer-term care. Yet, the healthcare workforce is neither trained nor ready for collaborative practice. Professionals continue to be educated in discipline-specific silos and typically have little experience with or understanding of the education, role, expertise or contribution of other disciplines [1–5]. This “misalignment” of the healthcare workforce skill set to meet today’s healthcare needs has been called a “slow burning crisis” [6].

Parkinson’s disease (PD) highlights many issues at the forefront of healthcare challenges. PD is a complex, chronic, neurodegenerative disease affecting multiple domains (motor and non-motor), resulting in increasing disability over the years that a person lives with the disease. The highly individualized and changing symptom picture over time presents ongoing treatment and management challenges, and demands attention from multiple professions to provide “the right care, at the right time, over time” [7].

With National Parkinson Foundation (NPF) sponsorship, we developed an interprofessional education (IPE) program in PD, *Allied Team Training for Parkinson (ATTP)*, in response to significant need. Informal research at that time (2002) showed allied health professionals to be ill informed about the symptoms and latest treatment approaches in PD and largely working independently rather than in the Institute of Medicine recommended [8] team-based care. A decade later, educating healthcare professionals about both PD and how to provide effective collaborative care, and evaluating IPE outcomes remains essential [9].

## 2. Methods

### 2.1. The ATTP program

ATTP is an intensive, peer-reviewed curriculum featuring in-depth, multi-day training on best practices in (a) assessment and treatment of PD, and (b) provision of key elements for integrated, team-based care. The program targets music (MT), occupational (OT), and physical therapy (PT), social work (SW), speech-language pathology (SLP), and (as of 2007) physician (MD), nurse/nurse practitioner (RN/NP), and physician assistant (PA) disciplines. An expert interprofessional faculty, including a movement disorders MD, RN, OT, PT, MT, SW, SLP and team specialist, collaboratively developed and taught ATTP and has largely remained stable during the 2003–2013 study period. A separate paper will describe the program (*in preparation*).

Fig. 1 shows a timeline of training events and study participation, and major ATTP curriculum domains, with modules addressing *Best Practices in PD Care* in the left half and *Integrated PD Care through Teams and Networks* in the right half. A sample ATTP Training schedule appears in Appendix A.

### 2.2. Study design

The study was a non-randomized, controlled before-and-after design measuring the modified Kirkpatrick Model of Educational

Outcomes (reaction, changes in knowledge and skills, attitudes and behaviors) [10]. We hypothesized measurable and sustained: (a) improved knowledge of PD, team strategies and understanding the role of other disciplines, (b) positive changes in attitudes toward healthcare teams, and (c) reported practice changes in PD patient and team-based care. An independent Institutional Review Board convened by NPF approved evaluation protocols and consent forms prior to implementation. IRB reviewers were neither affiliated with nor compensated by NPF.

An independent researcher collected data within two-weeks before the start of training (before), at the end of each training day (after) and at six-month follow up, at first via mail surveys and then electronically using Survey Monkey. Controls received the same pretest, posttest and follow-up assessments as trainees but did not undergo the training program.

Participants in the initial 12 trainings received a traditional pretest and a retrospective pretest to assess response shift bias. Where both pretests were available, the traditional pretest was used. Given the lack of meaningful response shift, trainings 13–23 used a retrospective pretest, with return to traditional pretests in trainings 24–26. All 26 trainings included a posttest and six-month follow up survey.

### 2.3. Participants

Trainees and controls were health care practitioners and students in the targeted professions voluntarily consenting to participate. Trainees were recruited through local outreach and advertisement on national, state and local websites for each target profession, while controls were recruited, from 2003 to 2006, via snowball sampling (colleagues recommended by those enrolled).

### 2.4. Measures

#### 2.4.1. Socio-demographic questionnaire

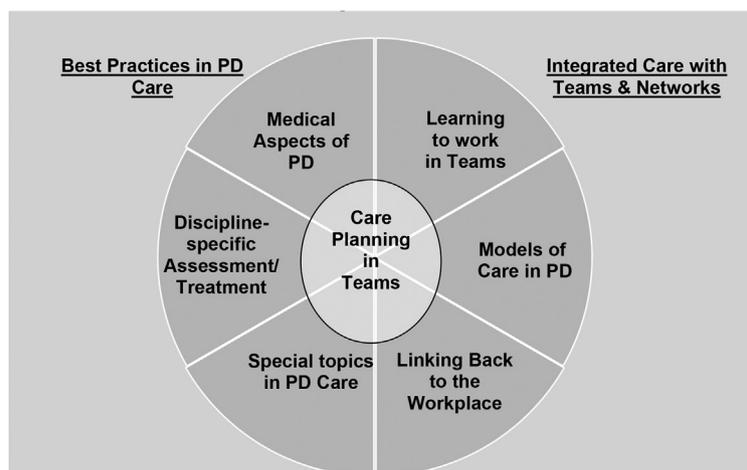
Participants completed a socio-demographic questionnaire, including questions about discipline, highest educational degree, years of experience in his/her profession, current employment and prior experience with PD and teams.

#### 2.4.2. Knowledge instruments

There were two knowledge measures as follows:

*Self-perceived Knowledge Ratings:* Trainees rated self-perceived knowledge on curriculum learning objectives, using a 7-point scale from 1 (*no knowledge*) to 7 (*complete knowledge*). ATTP averaged 40 curriculum modules, each with two to six learning objectives, per training. To reduce the paperwork burden on trainees, we selected a subset of learning objectives to test major outcome domains (bolded in Table 2). Conceptually similar learning objectives were grouped into knowledge scales (see Appendix B). The Role of Other Disciplines learning objectives are reported separately. In this study, each participant’s scores were averaged across items, with a score range from 1 (*no knowledge*) to 7 (*complete knowledge*).

*Objective PD Knowledge Test:* Each faculty member in the following disciplines (RN, PT, OT, MT, SW, SLP) developed objective test items to assess PD knowledge in their discipline. In this study, items were scored as correct or incorrect and averaged to obtain a



Allied Team Training for Parkinson Training Timeline and Study Participation														
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013			
Training #	1-3	4-7	8	9-12	13-15	16-18	19-22	23	24	25	26	<b>Trainees</b>	<b>Controls</b>	<b>Totals</b>
Pretest (n)	121	132	46	252	171	157	244	77	82	81	105	1468	100	1568
Posttest (n)	83	93	28	237	141	143	243	76	82	77	98	1301	74	1375
Follow-up (n)	44	55	22	88	38	33	40	11	19	14	26	390	15	405

**Fig. 1. Allied Team Training for Parkinson Curriculum Domains and Training Timeline/Study Participation.** This figure illustrates the major curriculum domains for the Allied Team Training for Parkinson Program. This includes domain topics in Parkinson's disease and those covering integrated, team-based and collaborative care. Figure 1 also includes the Training Timeline and study participation.

single score, ranging from 0 to 100% points, for each study participant.

#### 2.4.3. Team instruments

**Attitudes Toward Health Care Teams Scale (ATHCTS):** This instrument, used widely in IPE programs, is a reliable and valid measure of attitudes toward working in health care teams. ATHCTS is a 21-item instrument, self-rated on a 6-point scale from 1 (*strongly disagree*) to 6 (*strongly agree*). Some items are reverse-scored, with higher scores indicating a more positive attitude toward teams. In this study, an average score was obtained for each participant, with score range being from 1 to 6. This test was given in a subset of regions. A modified version [11] of the original instrument yielded three factors (subscales) as follows: Attitudes Toward Team Value, Attitudes Toward Team Efficiency, and Attitudes Toward Physician's Shared Role on Team (Cronbach alpha was 0.87 for each subscale).

For all scores created as an average of items, missing items were excluded from numerator and denominator to assure scaling consistency for all participants. Other instruments administered (e.g. satisfaction surveys) will be assessed in subsequent papers.

#### 2.5. Statistical analysis

Quantitative data were analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 22. Paired bivariate analyses were used for within-subject comparisons of pretest values with posttest and follow-up values respectively. Post minus pretest and follow-up minus pretest change scores were calculated and compared between trainees and controls, with independent samples t-test for continuous variables and chi-square for categorical variables. Potential confounds were compared between trainees and controls with bivariate analyses, and any differences were included as covariates in multivariable linear regression models. These potential confounds included discipline, training region, gender, education, years in profession, prior experience working with PD and with team, practice status (student or

practitioner) and primary work setting. Qualitative data were entered into an Excel database for content analysis based on modified grounded theory [12]. The ATTP researcher who developed themes and a second independent healthcare professional separately coded each statement, both blinded to training region and discipline. Inter-rater agreement levels (using Cohen's Kappa) for coded practice changes in working *with patients/families*, *with interdisciplinary teams*, *on-the-job*, and *other specific practice changes* were 0.83; 0.90; 0.93 and 0.94 respectively. Once coded, themes were ranked by frequency.

### 3. Results

#### 3.1. Characteristics of the study population

**Table 1** outlines trainee (n = 1468) and control (n = 100) characteristics, showing statistically significant differences on all except gender and years in profession. Control participants had more students and thus, little experience in their profession or working with people with PD (9.9% of trainees; 35.1% of controls had no PD experience) while 11.3% of trainees (vs. 3.1% controls) were very experienced in PD care. The trainee group was predominantly represented in outpatient (38.8%), acute care (28.3%) and home care (16.2%), while the top three primary work settings for controls were acute care (34.5%), followed by outpatient/other (18.4%) and home care (16.1%). Among trainees, almost 2/3 (63%) attended ATTP with work team members, and most (91.8% trainees; 79.4% controls) reported having prior experience on a work team.

#### 3.2. Primary outcomes

**Table 2** shows primary outcomes for trainees, controls, and trainees vs. controls in key domains (bolded). Within-subject analyses showed statistically significant improvements in trainees on all major outcome variables (all p < 0.001), with no significant improvements for controls (except for the Objective PD Knowledge

**Table 1**  
Characteristics of Allied Team Training for Parkinson trainee and control study cohorts.

	Trainee (T)		Control (C)		T vs. C *P-value
	%	n	%	n	
<b>Participants</b>	94.0	1468	6.0	100	
<b>Females</b>	85.2	1249	89.8	88	0.21
<b>Disciplines<sup>a</sup></b>					<0.001
MD/PA/NP	7.5	110	–	–	
MT	5.4	79	8.0	8	
RN	10.2	150	5.0	5	
OT/OTA	18.3	268	9.0	9	
PT/PTA	28.8	423	33.0	33	
SW	9.9	146	27.0	27	
SLP	14.9	219	18.0	18	
Other	5.0	73	–	–	
<b>Practice Status</b>					<0.001
Practitioner	93.6	1374	85.0	85	
Student	6.4	94	15.0	15	
<b>Highest Educational Degree</b>					0.015
Bachelor's or less	39.6	580	27.3	27	
Masters and above	60.4	884	72.7	72	
<b>Experience in Profession</b>					
Mean (SD), years**	12.8 (±10.1)	1455	10.9 (±10.1)	97	0.07
≤5 years	31.9	465	47.5	46	
≥6 years	68.1	990	52.5	51	
<b>Prior interprofessional team experience</b>	91.8	1226	79.4	77	<0.001
<b>Prior experience working w/persons w/PD and/or PD caregivers<sup>b</sup></b>					<0.001
None	9.9	56	35.1	34	
Some	78.8	447	61.9	60	
Much	11.3	64	3.1	3	
<b>Primary Employment Setting<sup>c</sup></b>					<0.001
Acute Care	28.3	383	34.5	30	
Subacute Care	4.7	63	10.3	9	
Outpatient/Priv. Practice	38.8	526	18.4	16	
Home Care	16.2	219	16.1	19	
LTC/SNF/ALF	2.5	34	2.3	2	
University/Other	9.5	129	18.4	10	

\*Chi square tests, unless specified. \*\*Independent t test.

<sup>a</sup> MD/PA/NP = Physician, Physician assistant, Nurse-practitioner; MT = Music therapy; RN = Nursing; OT/OTA=Occupational therapy/Occupational therapy assistant; PT/PTA = Physical therapy/Physical therapy assistant; SW = Social work; SLP = Speech-language pathology; Other = Other disciplines, including pharmacists and program administrators.

<sup>b</sup> PD = Parkinson's disease.

<sup>c</sup> LTC/SNF/ALF denotes Long term care/Skilled nursing/Assisted living facility; Outpatient includes private practice. University/Other includes not employed/not applicable (e.g.matriculated University students).

Test,  $p = 0.02$ ).

### 3.2.1. PD knowledge

Comparing trainees to controls, the *self-rated PD Knowledge scales'* unadjusted improvement in mean score was 1.8 (95% CI: 1.7, 2.0,  $p < 0.001$ ) greater for trainees compared to controls, and even greater after adjustment for key socio-demographic variable differences between trainees and controls (adjusted  $M_{diff} = 2.3$  (95% CI: 2.0, 2.6;  $p < 0.001$ ), in a model explaining 22.4% of the variance. For the *Objective PD Knowledge Test*, trainees' unadjusted mean improvement of 9 percentage points greater than controls (95% CI: 4.3, 13.6,  $p < 0.001$ ) showed even greater improvement after multivariable adjustment (Objective PD test: adjusted  $M_{diff} = 12.7$  percentage points, (95% CI: 7.6, 17.7,  $p < 0.001$ ) in a model explaining 16.1% of the variance.

### 3.2.2. Team knowledge

The *self-rated Overall Team Knowledge scales'* unadjusted mean improvement score (Table 2) was 1.8 (95% CI: 1.6, 2.0,  $p < 0.001$ ) greater for trainees compared to controls, and slightly greater after multivariable adjustment (adjusted  $M_{diff} = 1.9$  (95% CI: 1.6, 2.2;  $p < 0.001$ ), in a model accounting for 16.1% of the variance.

### 3.2.3. Role of other disciplines

Unadjusted mean differences (Table 2) showed highly

significant improvement for trainees vs. controls for each variable measuring Understanding of the Role of Other Disciplines ( $M_{diffRole} = 1.8$  (95% CI: 1.4, 2.2;  $p < 0.001$ ; Unique Role  $M_{diff} = 1.5$ , 95% CI: 1.0, 2.0;  $p < 0.001$ ), an effect that was unchanged after adjustment for Understanding Role (adjusted  $M_{diffRole} = 1.8$ , 95% CI: 1.3, 2.4;  $p < 0.001$ ) but slightly lower for adjusted Unique Role ( $M_{diff} = 1.4$ , 95% CI: 0.9, 1.9;  $p < 0.001$ ). The regression models accounted for 23.0% of the variance for Understanding the Role of Other Disciplines, and 10.0% for Unique Role and Expertise of Other Disciplines.

### 3.2.4. Attitudes toward healthcare teams Scale

Table 2 shows modest but statistically significant improvement for trainees vs. controls in the overall ATHCTS ( $M_{diff} = 0.2$ ; 95% CI: 0.1, 0.3,  $p < 0.001$ ) with 6.7% of variance explained, even after adjustment for potential confounds. The Attitudes Toward Team Value ( $M_{diff} = 0.3$ ; 95% CI: 0.2, 0.5,  $p < 0.001$ ) and Attitudes Toward Physician's Shared Role ( $M_{diff} = 0.2$ ; 95% CI: 0.1, 0.4;  $p < 0.01$ ) also showed significant trainee vs. control improvement, although only the Team Value subscale maintained statistically significant improvement after adjustment. There was no significant difference in either unadjusted or adjusted values for the Attitudes Toward Team Efficiency subscale (unadjusted  $M_{diff} = 0.1$ , 95% CI: -0.1, 0.2,  $p = 0.35$ ).

**Table 2**  
Allied Team Training for Parkinson Posttest vs. Pretest changes in knowledge levels and attitudes toward healthcare teams.<sup>a</sup>

Outcome Variables	Trainee		Control		Trainee vs. Control	
	n	Post minus pre difference (95% CI)	n	Post minus pre difference (95% CI)	Unadjusted Post minus pre difference (95% CI)	Adjusted <sup>b</sup> Post minus pre difference (95% CI)
<b>Learning Objectives Self-Ratings<sup>b</sup></b>						
<b>PD Knowledge Scale</b>	1187	1.8 (1.8, 1.9)***	72	0.0 (−0.2, 0.2)	1.8 (1.7, 2.0)***	2.3 (2.0, 2.6)***
<b>Overall Team Knowledge Scale</b>	1210	1.9 (1.8, 2.0)***	74	0.1 (−0.1, 0.3)	1.8 (1.6, 2.0)***	1.9 (1.6, 2.2)***
<b>Role of Other Disciplines</b>						
Understanding role of other disciplines	263	1.8 (1.6, 2.0)***	60	0.1 (−0.3, 0.4)	1.8 (1.4, 2.2)***	1.8 (1.3, 2.4)***
Delineating unique role and specific expertise of other disciplines	819	1.6 (1.5, 1.7)***	27	0.1 (−0.4, 0.6)	1.5 (1.0, 2.0)***	1.4 (0.9, 1.9)***
<b>Objective PD Knowledge Test<sup>c</sup> (percentage points)</b>	310	13.2 (11.6, 14.9)***	43	4.1 (0.4, 7.9)*	9.0 (4.3, 13.6)***	12.7 (7.6, 17.7)***
<b>Attitudes Toward Health Care Teams<sup>d</sup></b>	437	0.2 (0.2, 0.3)***	69	0.0 (−0.1, 0.1)	0.2 (0.1, 0.3)***	0.2 (0.1, 0.3)**
Attitudes Toward Team Value	437	0.3 (0.2, 0.4)***	69	0.0 (−0.1, 0.1)	0.3 (0.2, 0.5)***	0.3 (0.1, 0.4)**
Attitudes Toward Team Efficiency	437	0.1 (0.1, 0.2)***	69	0.0 (−0.1, 0.2)	0.1 (−0.1, 0.2)	0.1 (−0.1, 0.3)
Attitudes Toward Physician's Shared Role in Team	437	0.2 (0.2, 0.3)***	69	0.0 (−0.1, 0.1)	0.2 (0.1, 0.4)**	0.2 (0.0, 0.4)

<sup>a</sup> Values are unadjusted Mean (95%CI) difference scores, compared with paired t tests, unless specified otherwise. For trainee vs control, independent t-tests were used to calculate unadjusted Mean values and linear regression analysis for adjusted values. Key training domains are bolded. PD = Parkinson's disease. P-values: \* < 0.05; \*\* < 0.01; \*\*\* < 0.001.

<sup>b</sup> Learning Objective Self-Ratings are on a scale from 1 = no knowledge to 7 = complete knowledge.

<sup>c</sup> Objective PD Knowledge Test values are percentage point differences, averaged across disciplines, on a scale of 0–100%. These data are available for occupational, physical and music therapists, nurses, social workers and speech-language pathologists.

<sup>d</sup> Attitudes Toward Healthcare Teams Scale (ATHCTS), measures the impact of team training and has three subscales: Attitudes Toward Team Value, Attitudes Toward Team Efficiency and Attitudes Toward Physician's Shared Role in Team. Values are on a 6-point Likert rating scale as follows: 1 = strongly disagree 2 = moderately disagree, 3 = somewhat disagree, 4 = somewhat agree, 5 = moderately agree, 6 = strongly agree.

<sup>e</sup> Trainees compared to controls (reference) adjusted for gender, discipline, years in profession, training region, primary work setting, education, practice status and experience with team and PD.

### 3.3. Follow-up data in major domains

Within-trainee analyses showed sustained significant improvement at follow-up compared to baseline levels, for all major outcome domains (PD and Team knowledge scales, Role of Other Disciplines variables and ATHCTS; data not shown). As expected, there were no sustained improvements for the controls, except for an isolated statistically significant improvement on the Objective PD knowledge Test (percentage point  $M_{diff} = 10.7$ ; 95% CI: 1.9, 19.4,  $p = <0.02$ ). This might have reflected the larger number of students in the control group who may have been prompted to learn more about PD as a result of participation in the study. However, the limited follow-up response (26%) suggests caution in interpreting the results.

Table 3 includes proportion of themes for trainees who reported practice changes ( $n = 382$ ) at six-month follow-up. While controls reported no practice changes, 97% ( $n = 372$ ) of responding trainees reported making practice changes. The top three trainee practice change themes included improvements in Team Collaboration and Management (63%), Clinical PD Treatment (41%) and Staff and/or Self Education (37%). One-third (34%,  $n = 127$ ) reported having developed or developing a new team, PD program or PD-related service.

## 4. Discussion

To our knowledge, this is the first controlled study of a comprehensive IPE initiative for PD in the United States. We observed significant improvements, when comparing trainees to controls, in *knowledge* of PD, team strategies, discipline roles and overall *attitudes* toward healthcare teams, from pre-training to six-month follow-up. The pre-post improvement of trainees vs. controls was even stronger for all variables (except Role of Other Disciplines and ATHCTS) after adjustment for covariates, and considerably so for objective and self-perceived *PD Knowledge*. Changes were sustained at follow-up (over baseline) for trainees on major outcome variables, despite some decline in trainee PD

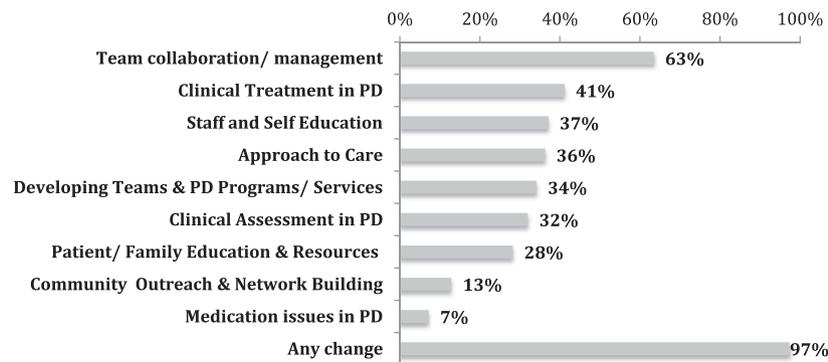
Knowledge. The limited follow-up sample, however, suggests caution in interpreting the results and would need confirmation through further research. Trainees completing the follow-up survey reported substantive practice changes, with no such changes reported by controls. Our results are consistent with other IPE studies showing improvements in knowledge and team skills (and modest changes in ATHCTS), despite wide diversity in training approaches, learner cohorts, and research methodologies [10,13–19].

Within the PD field, there is a paucity of published data on IPE effectiveness, or, indeed, on IPE initiatives, exceptions being ATTP and the Netherlands-based ParkinsonNet [20] models. While both aim to build PD expertise among allied health, nursing and medical professionals, thus expanding options for PD care in the community, the programs differ widely in approach. ATTP uses different educational approaches and explicitly emphasizes strategies for building and maintaining effective teams, and working with other disciplines.

IPE and collaborative care approaches have shown patient-level improvements in a wide range of programs, including domestic violence interventions, comprehensive geriatric assessment programs, mental health and emergency care [15,16,21,25]. Within the PD field, studies have largely focused on multidisciplinary rehabilitation, with mixed results on patient outcomes. Of two studies of multidisciplinary care by van der Marck and colleagues [22,23], the first showed no demonstrable patient-level improvements, although the results were deemed inconclusive due to study limitations. However, the second study [23] clearly demonstrated improvement in quality of life, depression, UPDRS motor and psychosocial functioning scores with multidisciplinary care vs. usual (general neurologist) care. Further research remains essential to clarify the impact of different PD-based IPE and collaborative care approaches on patient-level outcomes.

Practice changes are a high priority in continuing professional development [24], and are important indicators of IPE effectiveness. ATTP encouraged trainees to make practice changes specific to *their own or their team or organization's* unique needs. Trainees'

**Table 3**  
Proportion of ATTP trainees reporting practice change theme (n = 382) and theme Definitions.



#### Practice Change Theme Brief Definitions

**Team Collaboration & Management:** Includes improved understanding of and respect for other professions, increased team collaboration and strengthening team processes.

**Clinical Treatment in PD:** Includes individual clinician's *specific* changes in direct care such as introducing newly acquired PD-specific and validated treatment strategies, greater caregiver involvement and increased referral to other disciplines.

**Staff and Self-Education:** Includes increased self or staff education and awareness about PD symptoms, treatment and management.

**Approach to Care:** Includes changes in the individual clinician's attitudes, framework or broad approach to care, such as placing increased value on person-centered care, focus on the "whole" person and patient/family priorities, improved listening/communication skills and greater compassion, PD advocacy and willingness to treat PD.

**Developing Interprofessional Teams & PD Programs/ Services:** Includes starting or newly connecting with an interprofessional team, moving from multi- to interdisciplinary approach and actively planning for system-level changes such as new programs and services.

**Clinical Assessment in PD:** Includes individual clinician's *specific* changes to direct assessment with patients and/or caregivers, such as increased awareness and use of PD-specific validated assessment tools and improved understanding of PD signs, symptoms, disease progression and its impact on others.

**Patient/Family Education & Resources:** Includes improved patient/family education such as sharing more information about resources, developing a resource library or greater awareness of health literacy in patient/family communication.

**Community Outreach & Network Building:** Includes increased community outreach and network building through developing partnerships in the institution or community, and support group development.

**Medication Issues in PD:** Includes increased understanding / awareness of and education about medication issues in PD such as side effects and "on" and "off" states.

reported changes (Table 3) ranging in complexity from: (a) *those within the individual professional's control* (individual clinician's assessment and treatment strategy or approach to care) to (b) *those involving interprofessional communication and collaboration* (e.g. developing joint-discipline strategies, moving from multi- to interdisciplinary team, strengthening team processes) to (c) *those requiring organizational support* (e.g. developing a PD clinic or an interprofessional team or network). About one-third of trainee follow-up respondents developed new PD programs or services, and/or adopted a team-based approach to remedy fragmented PD care. Further analysis of characteristics of practice-changers will appear in a separate paper (*in preparation*).

#### 4.1. Limitations and strengths

**Limitations:** Results may reflect a self-selection bias since trainees, as volunteers, are more likely motivated to improve their knowledge, skills and behaviors. Volunteers may also have had more baseline knowledge than non-volunteers, possibly creating a bias in the opposite direction. These factors make it difficult to

generalize results to the larger population of ATTP targeted professions (e.g. all PTs, or all OTs, etc.).

Controls had several baseline differences from trainees. A larger, matched control group would have obviated the need to adjust for covariance differences between trainees and controls, but, in this study, adjusting for these differences enhanced rather than attenuated the results, suggesting that the potential confounding biased toward, rather than away from the null. We recognize, however, that adjustment might not have fully accounted for potential confounding.

The limited six-month follow-up response (26%) suggests caution in interpreting results. Nonetheless, the lack of a discernible pattern regarding who responded on the six-month follow-up and the consistency with the immediate after-training data lends support that the six-month results are reliable. It may well be that the follow-up respondents were more satisfied with ATTP or more "poised" to make practice changes.

**Strengths:** The current study included qualitative and quantitative data (mixed methods), recommended by many as better suited to studying complex and multi-dimensional "real world"

interventions like IPE [4,5,16,23,25]. Although self-report data are potentially subject to social desirability influence, in this study, self-reported knowledge and team attitude improvements were confirmed through objective measures. The use of a control group design, less common in IPE studies, also strengthens confidence in the conclusions. Finally, this is one of the few known IPE studies detailing *types* of reported practice changes.

## 5. Conclusions

In summary, the ATTP program showed that an IPE program with a replicable teaching protocol could effectively improve knowledge of best practices and collaborative care in PD, and help healthcare professionals change practice behaviors. The results confirm that ATTP is a *model* PD-focused IPE program that is a *catalyst* for meaningful knowledge and healthcare practice improvements. Future studies should focus on longer-term impacts of ATTP, impacts on patient outcomes, and identifying IPE moderating and mediating factors promoting positive practice change.

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## Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.parkreldis.2015.11.001>.

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