

Sustainment of Proactive Physical Therapy for Individuals with Early-Stage Parkinson's Disease: A Quality Improvement Study over 4 years

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Short report

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Abstract

Background: Implementation science frameworks aided the development of a new, evidence-based clinical physical therapy program. The purpose of this report is to describe the process of sustaining a clinical program in practice for over four years. We present a framework for integrating tools for sustainability with the Knowledge-to-Action model in the context of a proactive physical therapy program (PAPT) for individuals with early stage Parkinson's disease.

Methods: Sustainability of implementation strategies was addressed using the Dynamic Sustainability Framework and sustainability assessment tools. Repeated retrospective medical record reviews and semi-structured interviews were used to evaluate the reach and adoption of the PAPT over four years. Characteristics of those who engaged with PAPT, implementation fidelity, and clinical effectiveness were assessed for Year 1 and Year 3. Sustainability was measured using RE-AIM, NHS Sustainability Model, and Clinical Sustainability Assessment Tool.

Results: Reach increased from 28 to 110 total patients per year and spread occurred from one to three sites. PAPT user age, sex, Hoehn & Yahr rating, time since diagnosis and type of insurance were similar in Year 1 and Year 3 ($p>0.05$). The program sustained its effect to help participants increase or maintain self-reported exercise (Y1: 95%, Y3: 100%). However, upon evaluation PAPT users in Year 3 had longer time since symptom onset and worse UPDRS motor scores compared to the PAPT users in Year 1 ($p<0.05$). All sites sustained the core intervention components, with sustainability scores of 71/100 (± 9.9) on the NHS Sustainability Model and 6.1/7 (± 0.9) on the Clinical Sustainability Assessment Tool.

Conclusions: Integrating multiple sustainability models and assessments supported continued effectiveness, spread, and sustainment of PAPT for four years. Effective planning, anticipating common healthcare changes, and addressing sustainability determinants early in program implementation were essential aspects of long-term success.

Contributions To The Literature

- Defining sustainability goals early in the implementation process, applying implementation frameworks, and using sustainability assessments, may increase the maintenance of a novel evidence-based, clinical program.
- Repeating implementation evaluation frameworks, such as RE-AIM, can improve understanding of the clinical programs' sustainment outcomes.
- A successful, evidenced-based proactive physical therapy program for individuals with early stage PD can be sustained with careful attention to processes, staff, and organizational priorities.

Introduction

Clinical practice guidelines support physical therapy (PT) in early Parkinson's disease (PD) (1). Despite these guidelines, payer datasets and patient registries reveal infrequent utilization of PT, particularly early after diagnosis (2, 3). The ProActive Physical Therapy (PAPT) program was established in 2016 to provide PT evaluations and individually-tailored recommendations for physical activity and exercise in people with early PD (4). The care path consists of one to four visits approximately every six months to monitor for changes and update PD-specific exercise prescription. The program improved access to PT for individuals with early PD and demonstrated effectiveness through self-reported increases in exercise and high satisfaction levels (4).

Established implementation frameworks informed the development of PAPT. The Knowledge-to-Action (KTA) Cycle was used to organize the process of implementation (5). The Consolidated Framework for Implementation Research (CFIR) identified the implementation determinants (6). The RE-AIM framework organized the initial program evaluation (7). At the end of the first year, post-participation interviews suggested a demand for regional spread and sustainment to improve the program (4).

Sustainment, an essential component of implementation, has been described as using methods to preserve fidelity in an ever-changing healthcare environment (5, 7, 8). Dynamic and adaptable implementation strategies increase the likelihood of sustain program fidelity (5, 8, 9). Sustainment of a clinical program can occur in a single context or in combination with scaling or spread to new contexts, with consideration of environment-specific variations (10). Recently, a definition of sustainability has emerged as “[1] after a defined period of time, [2] a program, clinical intervention, and/or implementation strategies continue to be delivered and/or [3] individual behavior change (i.e., clinician, patient) is maintained; [4] the program and individual behavior change may evolve or adapt while [5] continuing to produce benefits for individuals/systems” (11). Several sustainability assessments for healthcare settings, including the National Health System (NHS) Sustainability Model and Clinical Sustainability Assessment Tool (CSAT) have been presented and are recommended to be performed repeatedly, but lack research on their and application (12, 13).

This report aims to describe the sustainment of PAPT as it spread to additional clinical sites over four years. We document the adaptations used to maintain the clinical effectiveness of PAPT. We document how the sustainability frameworks were integrated and the application of clinical sustainability assessments.

Methods

Context

ProActive Physical Therapy was initially adopted at one urban, outpatient department within a large healthcare organization, designated as a Parkinson's Center of Excellence. Spread occurred to two smaller suburban sites within the same rehabilitation system of care. The team leading the efforts included one physical therapist researcher, one clinical expert serving as a facilitator, the department

managers, a physical therapist from the organization's staff development program, and an external knowledge translation mentor.

Implementation and Sustainability Intervention

Implementation and sustainability strategies were identified through meetings with various stakeholders including therapists and leadership. As initial implementation transitioned to sustainment phases, using the Dynamic Sustainability Framework (DSF) allowed for adaptability of strategies targeting the intervention, context, and ecological system (9). Key strategies to aid the spread and sustainment included a program facilitator to lead stakeholder meetings and organize implementation strategies; site champions to facilitate local implementation; organizational programs to maintain resources and mentor staff; and monthly meetings for monitoring program barriers and facilitators, delivering feedback, and providing informal support. Using the Expert Recommendations for Implementing Change, the most common adaptations over time were in the following clusters: 1] use evaluative and iterative strategies, 2] develop stakeholder interrelationships, and 3] train and evaluate stakeholders. These adaptations improved upon materials and relationships based on experience and institutionalized processes. (14, 15). Site-specific adaptations at the suburban clinics were primarily related to staff and processes, including: 1] building and maintaining relationships with clients and referral sources for scheduling and long-term adherence; 2] staff support of clinical processes and paperwork; 3] leadership support strategies; 4] clinician training; and 5] providing interactive evaluative strategies to ensure fidelity. A complete list of the implementation strategies and adaptations are included in supplemental materials [Additional file 1].

Study of Intervention

Data Sources and Participants

Data sources include: [1] administrative data from the outpatient department on referrals and utilization (2016-2019), [2] retrospective electronic medical records (EMR) of first-time PAPT users in Y1 (2016) and year 3 (Y3) (2018), [3] quality improvement interview recordings of first-time PAPT users from Y1 and Y3 who responded to a quality improvement phone interview request, and [4] stakeholder survey results from the NHS Sustainability Model and CSAT to evaluate sustainment after completion of year four (Y4). PAPT users include those who were referred and attended the PAPT program. Eligible PAPT users were referred with a mild or moderate PD diagnosis or suspected prodromal PD (e.g. REM sleep behavior disorder, hyposmia) who accessed the program for the first time in Y1 and Y3. Participants were excluded from this analysis if they were referred to the PAPT program with a different diagnosis. A champion at each site (n=3) and one program facilitator were invited to complete the NHS Sustainability Model assessment tool and the CSAT. Additionally, five organization leaders and three referrers were invited to complete the CSAT.

Measures

The RE-AIM framework was used to assess and describe the spread and sustainment outcomes of PAPT, comparing outcomes from Y1 and Y3 or Y4. **Reach** of the program was measured by providing the number of PAPT users across all sites, the number of first-time users, and the number retained each year (i.e. an individual who accessed PAPT in a previous year). **Effectiveness** and satisfaction were evaluated with quality improvement phone interviews. Questions included: (1) PAPT user self-reported changes in exercise, (2) self-reported benefit of PAPT on an 11 point scale from 0 (not beneficial) to 10 (extremely beneficial), and (3) recommendation to others on a similar scale from 0 (not likely to recommend at all) to 10 (extremely likely to recommend). **Adoption** was measured as the 1) number of sites, 2) number of physical therapists trained and using the PAPT care model, 3) referral numbers from targeted referrers, 4) proportion of PAPT users who attended versus the number referred to PAPT, and 5) number of PAPT users who engaged in a long-term follow-up episode of care. **Implementation fidelity** was assessed by EMR review of (1) physical activity and exercise prescription for PAPT users through documented home exercise prescription and (2) PAPT care path utilization.

Maintenance was assessed through sustainability assessments that were administered after year four. The NHS Sustainability Model includes ten questions in three domains: staff, organization, and processes. Each item is measured on a 4-point categorical scale, and summed into a total score with a maximum of 100 points. This model's training materials propose that a score over 55 indicates optimism toward sustaining the program (12). The CSAT contains 35 questions in seven domains: engaged staff and leaders, engaged stakeholders, organizational readiness, workflow integration, implementation and training, monitoring and evaluation, outcomes and effectiveness. Each item is scored on a 7-point response scale, which is averaged within each domain and across domains for a total score from 1-7 (13).

Analysis: Data are presented with descriptive statistics. PAPT user characteristics, interview responses, and documentation of information related to program fidelity from Y1 and Y3 were compared with an unpaired t-test or Chi-square test based on the type of data.

Ethical considerations: Because of the nature of quality improvement and program evaluation the Northwestern University Institutional Review Board determined that this EMR data extraction and semi-structured interviews did not qualify as human subjects research. Data from all sources were collected and maintained using HIPAA compliant methods. Reporting was completed using the Standards for Quality Improvement Reporting Excellence (Additional file 2) (16).

Results

The results of the program are presented in Table 1 using the RE-AIM framework. Sustained PAPT is measured in Years 3 & 4.

The PAPT program's **reach** to new users more than doubled (28 to 62) over the first 4 years and is presented in Figure 1. Comparing demographics between Y1 and Y3, the PAPT users have similar age, sex, Hoehn & Yahr stage of PD, time since diagnosis and insurance [Table 2]. However, in Y3 the program

reached individuals with a worse Unified Parkinson's Disease Rating Scale (UPDRS) motor disease severity score and longer time since symptom onset.

Quality improvement phone calls measuring sustained program **effectiveness** were completed in 71% of 28 users in Y1 and 53% of 62 new users in Y3 ($\chi^2_{df=2} = 2.64, p=0.104$). The proportion of individuals in Y1 and Y3 with self-reported increased or maintained exercise is presented in Table 1 and was found to be not different between the years studied (Figure 2; $\chi^2_{df=2} = 0.228, p=0.3283$). There was increased **adoption** by outpatient clinics, physical therapists, and referrers (Table 1). Furthermore, the four initial referrers increased their overall PT referrals (PAPT program and other PT) from 115 referrals in the 2016 fiscal year to 167 in the 2019 fiscal year, a 45% increase. In the same period, the referring clinic grew approximately 11% year-over-year (approximately 37% over 4 years), suggesting that PT referrals increased beyond volume-based growth. At the level of the PAPT user, the proportion of referred individuals who completed a PAPT evaluation improved from 74% in Y1 to 84% in Y4. Finally, 37 of all 135 unique PAPT users (27%) have adopted the long-term follow-up model, defined as attending at least one return episode.

Implementation fidelity, assessed by the proportion of PAPT users who required just 1-4 visits in accordance with the original PAPT care path, was similar in Y1 and Y3 ($\chi^2_{df=2}=0.55, p=0.760$). Clinicians also documented explicit aerobic exercise prescription during the initial PAPT visit similarly in Y1 and Y3 ($\chi^2_{df=1} = 1.07, p=0.302$).

Program **maintenance** was measured using two sustainability assessments. All stakeholders who were sent a request for the NHS Sustainability Model completed the survey (n=4) and all but two referrers completed the CSAT (n=10). The average NHS Sustainability score 71/100 and the average CSAT score was 6.1/7. Specific category scores are presented in Table 3. Perfect scores were reported in in two NHS sustainability factors: "clinical leadership engagement and support" and "fit with the organizational culture."

Discussion

Several sustainability definitions, frameworks, and assessments have emerged recently (11-13, 17-21). Yet, application barriers exist due to the diversity of programs, organizations, and staff (20, 21). In Figure 3, we depict the integration of sustainability tools with our implementation process, determinants, and outcomes frameworks. The effort to identify dynamic, adaptable implementation strategies early in the implementation process using the DSF helped prepare for success despite typical and atypical healthcare setting changes (e.g. staffing changes, transition to tele-health) (9). Although formal sustainability assessments were not completed until year four in this project, repetition of evaluative tools is recommended (e.g. RE-AIM) (22) and using sustainability assessments, (e.g. CSAT & the NHS Sustainability Model) to promote a program's sustained effectiveness.

Use of existing sustainability frameworks aids in identifying and addressing sustainability barriers. Changing barriers over time could result in “program drift,” or deviation from the program’s original aims (9). The DSF promotes the maintenance of high fidelity interventions through identification of adaptable implementation strategies (9). In this study, a facilitator worked closely with trained, clinical champions at each site who monitored and led program adaptations. The champion meetings, continued adaptations of clinical tools, and electronic resources for PAPT users were sustained through healthcare staffing changes (including champion transitions), as well as less common changes such as moving facilities and a pandemic. At one clinic, the champion had autonomy to create a tracking system to address a process sustainability barrier. At the other site, the champion trained an additional therapist and educated the clinical-team due to staff sustainability barriers. Use of evaluative sustainment frameworks and assessments enabled the appraisal of ongoing implementation strategies and further tailor to site-specific needs. After administering the CSAT & the NHS Sustainability Model, the facilitator could assist the sites to identify adaptations to meet their site-specific sustainability barriers.

This program evaluation uniquely focuses on sustainability of a clinical program targeting an outpatient physical rehabilitation setting. In two recent reviews on program sustainability, none occurred in similar departments (20, 23). However, in one quasi-experimental study, behavior change strategies were implemented in a PT clinic with good uptake during the intervention, but poor sustainment at the three, six, or twelve-month follow up (24). Our sustained implementation strategies using the EMR, centralizing education, and programmatic support of a facilitator and champions have helped this program to be successful for more than four years.

Following initial implementation, demand from stakeholders, including referrers, patients, therapists, and managers, led to the spread of PAPT through our regional system of care. PAPT program growth was associated with minor population changes in the PAPT program (Table 2), and increased PT referrals from the initial referrers, which may help to address the PT referral and utilization gap noted in the health services literature (2). Adoption at new sites was accompanied by site-specific processes and implementation strategies that have been essential for the success in unique contexts.

Unintentional spread also occurred through adoption of the proactive, consultative care model by speech and occupational therapy for people with PD, as well as for other patient diagnoses, like Huntington’s disease. Data from these clinical areas were excluded from this analysis, but are well supported in the literature and bolstered PAPT sustainability (25-28). Organization leaders were empowered to lead these new programs by adapting the implementation strategies associated with the success of PAPT.

Two limitations include the lack of generalizability of retrospective quality improvement data and lack of well-studied sustainability measures. The use of retrospective measurement in a single health system limits generalizability to other organizations. However, documenting strategies to spread from academic to suburban clinics in the same health system may be impactful in similar contexts. The retrospective methods also present challenges such as inability to control potential confounding factors, including new, leadership positions within the organization. The second limitation is that the existing clinical

sustainability measures have limited reliability and validity data (12, 13). Implementation practitioners should consider using new sustainability tools as they are validated; however the varied contexts of sustainability between communities and clinical settings may require measurement adaptations (21). Despite their limitations, our clinical and research team felt that the chosen assessment tools provided valuable information for program sustainment.

Demonstrating the application of sustainability frameworks has implications for implementation practice and research. Figure 3 summarizes the process for integrating sustainability principles during implementation. Key features are identifying and addressing sustainment early, repeating implementation evaluations over time, and completing sustainability assessments. More research can improve our understanding of the complexities of sustainability. Systematic implementation research studies should measure the benefits of assessing and addressing sustainability at different implementation stages.

Conclusions

We integrated sustainability into implementation frameworks to assist with creating a resilient program and to provide a tool to improve program development. Attention to sustainability when selecting adaptable implementation strategies, repeated evaluation, and sustainability assessments successfully assisted with the four-year sustainment of the PAPT program.

Abbreviations

PAPT: Proactive Physical Therapy

PT: Physical Therapy

PD: Parkinson's disease

KTA: Knowledge-to-Action (Cycle)

CFIR: Consolidated Framework for Implementation Research

RE-AIM: Reach, Effectiveness, Adoption, Implementation Fidelity, Maintenance

CSAT: Clinical Sustainability Assessment Tool

DSF: Dynamic Sustainability Framework

EMR: Electronic Medical Record

Y1: Year 1

Y3: Year 3

Y4: Year 4

UPDRS: United Parkinson's Disease Rating Scale

Declarations

Ethical considerations: Northwestern University Institutional Review Board determined that this EMR data extraction and semi-structured interviews in Y1 and Y3 were determined to be not research involving human subjects. Data from all sources was collected and maintained using clinical quality improvement and HIPAA compliant methods. We report based on guidelines of the Standards for Quality Improvement Reporting Excellence (SQUIRE) standards (29) in Additional file 2.

Consent for Publication: Not applicable.

Availability of data and materials: The datasets generated by the current study are not publicly available, but are available from the corresponding author on reasonable request.

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Competing Interests: Three of the authors are paid salary by the organization where the work occurred.

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Tables

Table 1: Program results presented with RE-AIM in the initial year and sustained over 3-4 years.

	First year of PAPT	Sustained PAPT
Reach		
Access to PAPT	28 PAPT users	110 total PAPT users ^b 84 new PAPT users ^b
Effectiveness (program)		
Program benefit (median)	9/10 from survey respondents	9/10 from survey respondents ^a
Effectiveness (clinical)		
Self-report increase in exercise	70%	64% ^a
Adoption		
Clinics	1 clinic	3 clinics ^b
Total therapists	2 PTs	10 PTs trained over the project 6 PTs in practice ^b
Total referrers	4	15 ^b
Implementation Fidelity		
PAPT Carepath use	86%	84% ^a
Aerobic exercise instruction	79%	87% ^a
Maintenance		
Average NHS Sustainability Model score	Not applicable	71/100 (range= 57.3-81) ^b
Average Clinical Sustainability Assessment Tool score	Not applicable	6.1/7 (range= 5.7-6.5) ^b

NOTES: ^a Year 3; ^b Year 4

Table 2: Demographics and clinical characteristics of Proactive Physical Therapy Users in Years 1 & 3.

	Year 1 (n=28)	Year 3 (n=62)	t-value or X ² (DF)	p-value ^a
Age [mean years (SD)]	65.1 (11.2)	65.8 (9.1)	t (88 DF) = -0.30,	p=0.761
Male, [n (%)]	16 (57%)	37 (59%)	X ² (1 DF) = 0.05	p=0.821
UPDRS [mean (SD)]	16.2 (6.8)	23.2 (12.0)	t (50.7 DF) = -2.78	p=0.0076
Missing ^a	0	30		
Hoehn & Yahr Stage			X ² (2 DF) = 1.75	p=0.418
1	5 (18%)	9 (15%)		
2	23 (82%)	23 (37%)		
3	0 (0%)	1 (2%)		
Missing ^a	0 (%)	29 (47%)		
Time since diagnosis			X ² (4 DF) = 9.25	p=0.055
<1 month	14 (50%)	12 (19%)		
1-6 months	4 (14%)	19 (31%)		
6-12 months	4 (14%)	8 (13%)		
1-2 years	3 (11%)	7 (11%)		
2+ years	3 (11%)	13 (21%)		
Missing ^a	0 (0%)	3 (5%)		
Time since Symptoms			X ² (3 DF) = 9.06	p=0.029
<1 month	0 (0%)	0 (0%)		
1-6 months	5 (18%)	1 (2%)		
6-12 months	5 (18%)	11 (18%)		
1-2 years	5 (18%)	20 (32%)		
2+ years	13 (46%)	23 (37%)		
Missing ^a	0 (0%)	7 (11%)		
Insurance			X ² (2 DF) = 1.14	p=0.565
Medicare	15 (54%)	29 (47%)		
Blue Cross Blue Shield	9 (32%)	18 (29%)		
Other	4 (14%)	15 (26%)		

^a Missing data were excluded from analyses (UPDRS and Hoehn & Yahr were missing from provider referral notes).

Table 3: Sustainability scores from stakeholders using the NHS Sustainability Model and Clinical Sustainability Assessment Tool (CSAT).

Scale and Factor/Domain	Average Rating (range)
Staff & Stakeholders	
NHS: Clinical Leadership engagement	15/15
NHS: Staff Involvement and training to sustain the process	8.6/11.4 (0-11.4)
NHS: Senior leadership engagement	8.2/15 (5.7-15)
NHS: Staff behaviors toward sustaining the change	6.6/11 (5.1-11)
CSAT: Engaged staff & leadership	6.5/7 (6.0-7.0)
CSAT: Engaged Stakeholders	6.3/7 (5.6-7.0)
Organization	
NHS: Fit with the organization's strategic aims and culture	7/7
NHS: Infrastructure for sustainability	4.5/9.5 (0-9.5)
CSAT: Organizational Readiness	5.9/7 (4.6-6.6)
Process & Outcomes	
NHS: Credibility of the benefits	7.7/9.1 (6.3-9.1)
NHS: Effectiveness of the system to monitor progress	4.7/6.5 (2.4-6.5)
NHS: Adaptability of improved process	4.3/7 (3.4-7)
NHS: Benefits beyond helping patients	4.5/8.5 (0-8.5)
CSAT: Outcomes & Effectiveness	6.5/7 (5.8-7.0)
CSAT: Implementation & Training	6.0/7 (4.8-7.0)
CSAT: Workflow Integration	5.9/7 (4.4-7.0)
CSAT: Monitoring & Evaluation	5.7/7 (4.4-7.0)

Figures

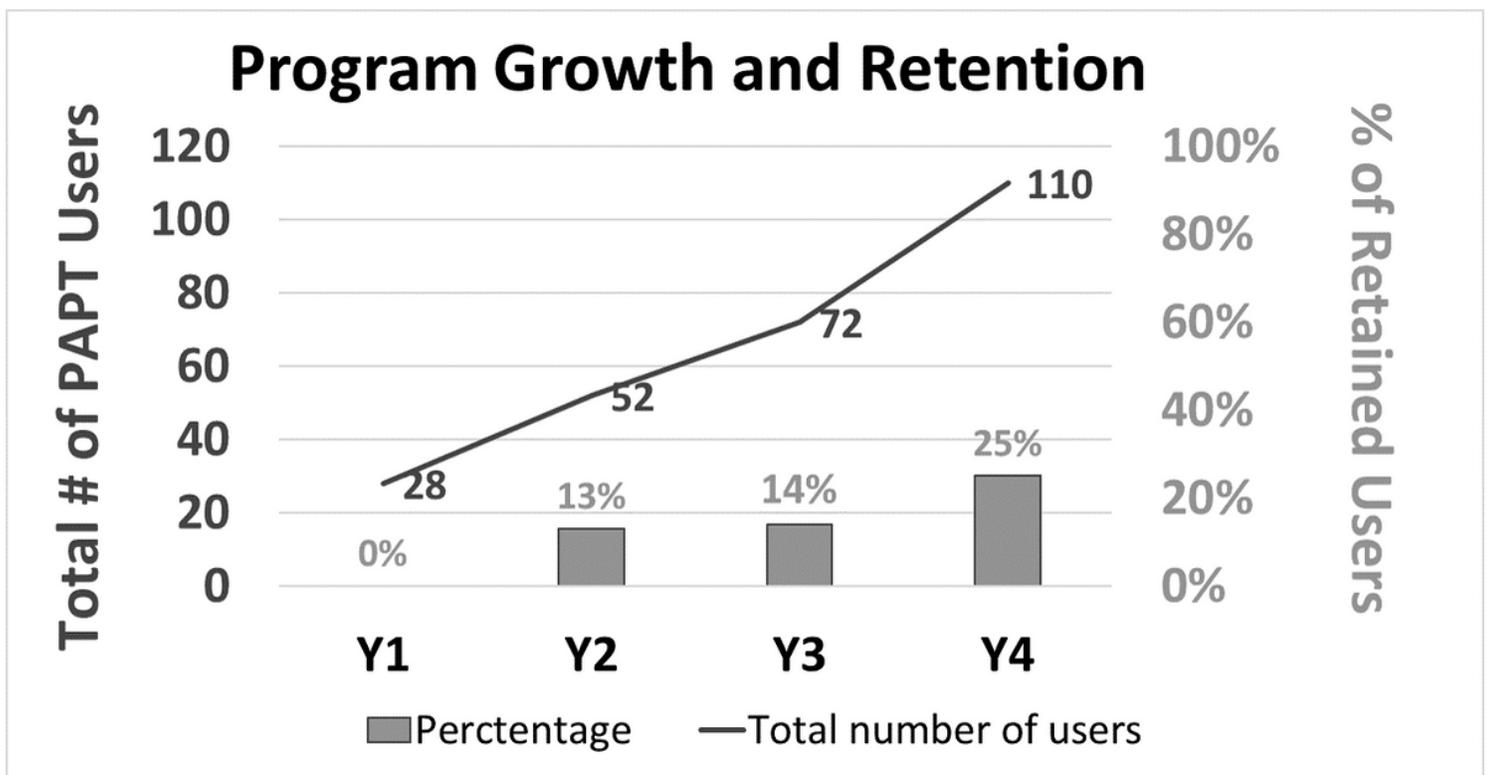


Figure 1

PAPT Program growth and retention across 4 years.

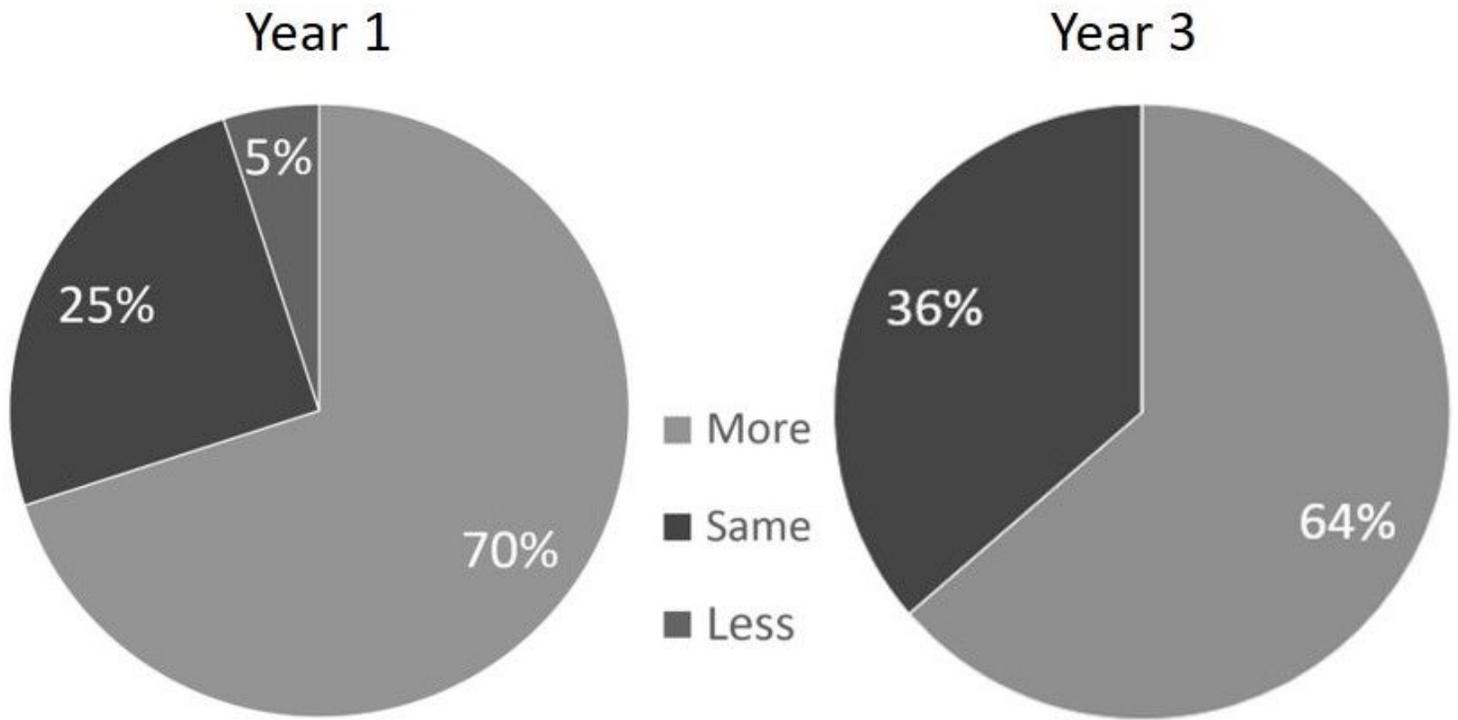


Figure 2

PAPT Program Effectiveness in Year 1 & Year 3. Report of amount of exercise in the year after accessing PAPT.

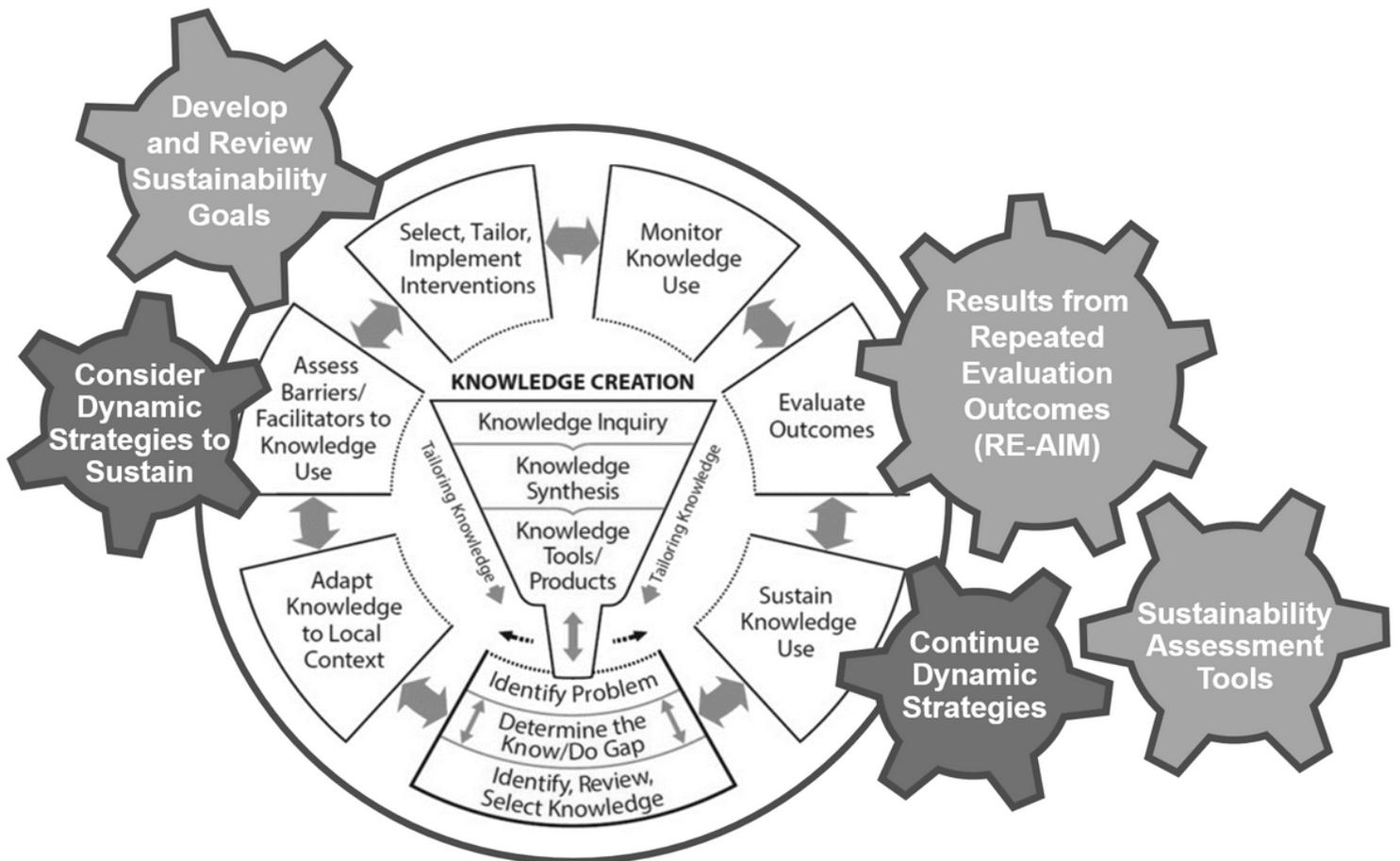


Figure 3

Applying sustainability frameworks during the implementation process. Sustainability frameworks are superimposed on the Knowledge-to-Action Cycle implementation process model (Reprinted with permission of John Wiley & Sons from: Straus SE, Tetroe J, Graham ID, eds. Knowledge Translation in Health Care: Moving From Evidence to Practice. 2nd ed. Chichester, United Kingdom: John Wiley & Sons Ltd; 2013.). Use of dynamic adaptations assists with tailoring implementation strategies for sustainability. Repeating implementation evaluation frameworks (e.g. RE-AIM), provides insight into sustainability outcomes. Sustainability assessment tools offer information about factors that affect sustainment and can guide further program adaptations.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Additionalfile1.pdf](#)
- [Additionalfile2.pdf](#)