

ORIGINAL RESEARCH ARTICLE

# Effectiveness and efficiency of patient care while enrolled in an orthopedic physical therapy fellowship program

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## Abstract

**Rationale:** Post-professional orthopedic manual physical therapy education programs have proliferated, in part due to increasing therapist demand. Despite the time, effort, and money required to complete these programs, there is scant research addressing their impact. We investigated whether physical therapists enrolled in an accredited manual physical therapy fellowship program achieved better outcomes, determined by patient changes in function, number of physical therapy visits, and episode of care duration while enrolled in the program. We also examined whether outcomes varied by clinician demographics, clinician life circumstances, and clinic characteristics.

**Methods:** Forty-two therapists contributed patient data addressing functional status, number of visits, and episode of care duration. We compared data from the first 30 patients with data from the last 30 patients seen by each therapist while enrolled in the program. We also surveyed therapists regarding their demographics, life circumstances, and clinic characteristics.

**Results:** There were no clinically meaningful or statistically significant differences in change in functional status when comparing results from the first 30 patients with the last 30 patients seen by therapists. However, there was a significant reduction in the number of visits and episode of care duration. Outcomes were influenced by entry-level degree and the presence of children at home.

**Conclusion:** In our study, enrollment in a physical therapy fellowship program did not improve patient functional status but did reduce the number of visits and episode of care duration. Outcomes were influenced by some clinician life circumstances and clinic characteristics.

MeSH Terms: Fellowships, Physical Therapy, Education

Keywords: *post-professional education; fellowships; physical therapy education*

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Physical therapy fellowship programs are post-professional educational programs addressing a focused and advanced area of physical therapy practice,<sup>1</sup> such as orthopedic manual physical therapy. Programs are designed to help therapists develop advanced clinical decision-making and patient handling skills, and to use current best evidence in clinical practice.<sup>2</sup> Requirements for acceptance into these programs include demonstration of a high level of specialized clinical knowledge and skill in the area of study. Graduation requirements include completion of a minimum of 1,000 program hours, including 150

educational hours and 850 patient-care clinic hours, of which at least 150 h must consist of 1:1 clinical mentoring.<sup>2</sup> This mentoring is considered essential for therapists to attain greater depth and breadth of knowledge and manual skills.<sup>3</sup> In 2023, 48 orthopedic physical therapy fellowship programs were accredited by the American Board of Physical Therapy Resident and Fellowship Education (ABPTRFE).<sup>2</sup> This represents an increase from 30 programs in 2015<sup>1</sup> and is attributable to an increase in patient and physical therapist market demand.<sup>1</sup> Despite this increase, there is scant research addressing the impact of fellowship programs.

Two studies compared clinical outcomes of physical therapists who had completed an orthopedic manual physical therapy fellowship program with those who had not.<sup>4,5</sup> In one study, fellowship-trained therapists achieved statistically significant and clinically relevant improvements in their patients' functional status (FS) during treatment and a greater reduction in the number of patient visits than non-fellowship-trained therapists.<sup>4</sup> In the second study, the authors evaluated therapists' ability to accurately identify evidence-based-low-back interventions<sup>6</sup> using case vignettes.<sup>5</sup> Adhering to evidence-based treatment strategies was associated with better patient outcomes compared with non-adherent interventions.<sup>7</sup> Graduates of an orthopedic fellowship program were compared with Orthopedic Clinical Specialist (OCS) therapists and those with no credentials but with experience in managing patients with low back pain.<sup>5</sup> Therapists with OCS certification and with OCS and Orthopedic Manual Therapy Fellow credentialing adhered more closely to clinical practice guidelines than those with no credentials. In a different study, investigators evaluated employer perceptions of post-professional-educated therapists.<sup>8</sup> Employers rated fellowship-trained employees higher than residency-trained employees in relation to clinical aptitude, communication, and leadership.

One concern with these study results is that they were not designed to identify whether outcomes were attributable to the training associated with credentialing or the characteristics of individuals who pursue this level of post-professional study. Individuals pursuing advanced certification might be better therapists due to their desire to excel professionally and might have achieved better outcomes irrespective of their post-professional education. Similarly, clinicians who demonstrated the clinical, communication, and leadership attributes identified by employers could also have been more likely to pursue fellowship training. Factors such as clinician demographics, clinician life circumstances, and clinic characteristics could influence outcomes. We were unable to identify research that addressed these considerations among rehabilitation clinicians; however, one review<sup>9</sup> examined some of them in relation to surgical outcomes. Authors concluded that facility organizational factors including staffing and scheduling practices can influence surgical providers' performance and patient outcomes. Surgical providers' emotional and behavioral responses to stressors also influenced these outcomes. Thus, there is a need to investigate whether clinician demographics, clinician life circumstances, and clinic characteristics while therapists are enrolled in a fellowship program affect patient outcomes.

Considering the recent expansion of these programs and the time, effort, and money required to complete them, there is a need to study the effect of fellowship programs on outcomes from both an effectiveness perspective, including changes in patients' FS, and an efficiency perspective,

including number of treatment visits and episode of care duration. We therefore investigated whether a cohort of physical therapists enrolled in one accredited orthopedic manual physical therapy fellowship program achieved better outcomes: specifically change in FS, number of physical therapy visits, and treatment duration while enrolled in the program. We also examined whether outcomes varied by clinician demographics/life circumstances and/or clinic characteristics. We hypothesized that therapists would achieve more effective and efficient outcomes in the final phase of their program compared with the initial phase, and that these outcomes would differ based on some clinician demographic/life circumstances and/or clinic characteristics.

## Methods

We conducted a retrospective observational study using data from therapists enrolled in one part-time, hybrid-model, multi-site orthopedic manual physical therapy fellowship program and practicing in an orthopedic physical therapy outpatient setting. This program was credentialed by ABPTRFE and recognized by the American Academy of Orthopedic Manual Physical Therapists (AAOMPT) throughout the data collection period. Rutgers The State University of New Jersey's IRB (Protocol 2018000428) approved this study. Patient data were deidentified by Focus on Therapeutic Outcomes (FOTO), the organization providing the database for this study. Patient-informed consent was therefore waived. Return of the surveys established the therapists' informed consent.

As part of their educational requirements, participating therapists routinely collected data using FOTO management system.<sup>10</sup> FOTO collects a standardized set of clinical data that include patient-reported outcome measures (PROM) and patient demographics and health characteristics, thereby providing a robust range of variables to examine associations with outcomes.<sup>10</sup> Since systemic patient survey-response bias may inadvertently occur because therapists or staff administer FOTO surveys, FOTO developed training modules instructing providers on how to administer PROM in a neutral manner to patients. For examples, providers using FOTO are encouraged and expected to read an instrumental manual addressing standards for administration of FOTO PROM and complete a short certification course. In addition, patients cannot skip questions, that is, they must respond to all survey questions.

To assess effectiveness, we quantified changes in patients' FS between the initial evaluation and rehabilitation discharge. FOTO developed and validated eight body-region-specific FS outcome measures related to musculoskeletal conditions.<sup>11-16</sup> Higher values indicated greater FS. Therapists used one of these eight measures to quantify change in FS (Appendix A). Data specifying the minimal clinically important improvement (MCII) are available for six of these questionnaires (Appendix A) and range from

5 to 9 FS units. Participating therapists documented two outcomes to assess efficiency: the total number of visits and the episode of care duration for each patient.

To be included in the study, therapists must have been enrolled in the fellowship program by 1/2009 and have completed the program by 1/2018. They also must have entered at least 90 patients with complete (i.e. FOTO intake, discharge, and episode closed) patient data and outcomes into FOTO database. Data from consecutive patients aged 18 years or older with orthopedic conditions seen by therapists were entered into this database.

In 2018, we sent surveys (Appendix B) to participating therapists who were enrolled in the program during the aforementioned timespan addressing clinician demographics such as age/gender, clinician life circumstances such as involvement with a significant other, and clinic characteristics such as practice setting during their enrollment in the program.

Either SAS v9.4 or SPSS 27 were used for all analyses. We first calculated means for change in FS, number of visits, and episode of care duration for the first and the last 30 patients with complete datasets seen by each therapist after enrolling in the fellowship program combining data across all therapists. We then calculated the mean patient change in FS, number of physical therapy visits, and episode of care duration for the first and last 30 patients.

We evaluated the following patient characteristic variables for possible confounding: the patient body region being treated (spine vs. other), age in years (less than 45 vs. 45 to less than 65 vs. 65 to less than 75 vs. 75 or older), gender (male vs. female), surgical history for the body region being treated (no vs. yes), condition acuity (0–21 vs. 22–90 vs. greater than 90 days), medication use for the condition being treated at intake (no vs. yes), medical comorbid conditions (none vs. 1–2 vs. 3 vs. 4 or more), exercise history (seldom or never vs. 1–2 times a week vs. at least 3 times a week), percent of patients with prescriptions, and 3rd party payer (HMO or PPO vs. Medicare vs. other). These variables have been shown to influence FS

outcomes in patients with low back pain (beta coefficients ranged from  $-5.7$  to  $12.5$ ).<sup>17</sup> To identify which of these variables were potential confounders, we ran correlations between these variables and change in function.

Repeated measures general linear modeling (GLM) was then used to calculate the unadjusted and risk-adjusted mean difference for each of the three outcomes, comparing data from the first 30 patients with the last 30 patients for each therapist. To evaluate whether combining scores from the 8 FS measures affected outcomes, we calculated unadjusted and risk-adjusted differences in changes in FS during the fellowship program, stratifying by the FS questionnaire administered. Finally, we calculated the unadjusted and risk-adjusted difference for each variable representing clinician demographic/life circumstances and/or clinic characteristics, and change in FS, number of physical therapy visits, and episode duration across all therapists using repeated-measure GLM analyses as described above.

## Results

Fifty-one therapists entered data into the FOTO database. Of these, 46 entered complete datasets for at least 90 patients, resulting in a 90.2% completion rate. Forty-two therapists returned the survey, resulting in a 91.3% survey-response rate and a completion rate based on the original 51 therapists of 82.4%. Data from these 42 therapists were used for all analyses. The mean age of therapists was 42 (range 25–50) years, whereas the mean length of time to complete fellowship was 31.8 (range 15–48) months.

Results from the analyses performed to identify potential confounders indicated that only the proportion of patients who were using medication for the condition being treated at intake attained statistical significance ( $P = 0.02$ ). This variable was included in all adjusted analyses.

Differences in FS change, number of physical therapy visits, and episode of care duration comparing the first versus last 30 patients treated by each therapist for all 42 therapists are presented in Table 1. When analyzing FS,

**Table 1.** Differences between early and late fellowship training outcomes including functional status, physical therapy visits, and episode duration ( $n = 42$  physical therapists)

Patients ( $n = 2,520$ )	Functional status change (mean)	Physical therapy number of visits (mean)	Episode duration in days (mean)
First 30 patients	17.66* range (–45.46, 86.45)	10.47* range (1, 60)	53.77* range (1, 562)
Last 30 patients	17.17* range (–50.17, 77.25)	9.25* range (1, 66)	45.13* range (1, 463)
Unadjusted difference between first & last 30 patients	–0.49* $P = 0.65$	–1.22* $P = 0.01$	–8.64* $P = 0.03$
Risk-adjusted difference between first & last 30 patients	–0.49† $P = 0.96$	–1.13† $P = 0.01$	–7.93† $P = 0.04$

\*Unadjusted.

†Risk-adjusted.

there were no clinically meaningful or statistically significant differences (adjusted difference:  $-0.49$ ;  $P = 0.96$ ). There was a significant reduction in number of visits (adjusted difference:  $-1.13$ ;  $P = 0.01$ ) and episode of care duration (adjusted difference:  $-7.93$ ;  $P = 0.04$ ).

In Table 2, we describe changes in FS comparing the first 30 patients ( $n = 1260$ ) with the last 30 patients ( $n = 1246$ ) stratified by each FS measure. We were unable to identify which FS measure was used for 14 patients comprising the last 30 patients seen by therapists. Adjusted changes ranged from  $-1.22$  to  $2.33$  FS points. In all cases in which the MCII was reported, none of these measures met the MCII for the FS measured. Furthermore, all confidence intervals encompassed the null value. Our conclusions regarding changes in FS during the fellowship program were, therefore, not likely affected by FS measure.

Table 3 describes the association between demographics/life circumstances and/or clinic characteristics, and each of the three outcomes. In adjusted analyses, only entry-level degree (those with baccalaureate degrees demonstrated greater improvements in function than those with masters' degrees) and the presence of children at home (those without children at home demonstrated greater improvements in function) attained statistical significance. Differences were in the range for the MCII for meaningful change.

## Discussion

While participation in the fellowship program did not result in improvements in FS change, there was a decrease in the number of physical therapy visits and the episode of care duration. Completion of the fellowship program did not appear to improve effectiveness but positively affected efficiency.

Our study results related to FS differ from those of Rodeghero et al.<sup>4</sup> Differences could be attributable to differences in study design: our study captured changes while therapists were enrolled in the fellowship program, whereas Rodeghero et al.<sup>4</sup> compared outcomes of therapists who had completed fellowship programs with those who had not. Two studies that included graduates from the same fellowship program as those in our study found that graduates perceived substantial clinical benefits from fellowship training,<sup>4,18</sup> specifically that the program improved their ability to achieve optimal outcomes and treat efficiently. Conversely, we did not identify significant improvements in FS over the program duration. This discrepancy suggests that either graduates' perceptions and patient-reported FS are different constructs or fellows need more maturation post-graduation to realize the program's full impact on clinical outcomes. This latter hypothesis is consistent with Rodeghero et al.'s<sup>4</sup> study results. Alternatively, the amount of time between the first and last 30 patients being seen by therapists might partially explain this finding.

**Table 2.** Functional Status (FS) differences between early (first 30 patients) and late (last 30 patients) fellowship training for patients with various orthopedic impairments

Orthopedic FS measure	FS change difference* (95% CI)
<b>Shoulder</b>	-0.47
First 30 patients ( $n = 66$ )	(-6.22, 5.28)
Number of therapists contributing data $n = 32$	
Last 30 patients ( $n = 60$ )	
Number of therapists contributing data $n = 30$	
<b>Elbow/wrist/hand</b>	0.59
First 30 patients ( $n = 75$ )	(-4.27, 5.46)
Number of therapists contributing data $n = 29$	
Last 30 patients ( $n = 103$ )	
Number of therapists contributing data $n = 36$	
<b>Hip</b>	1.85
First 30 patients ( $n = 328$ )	(-0.57, 4.26)
Number of therapists contributing data $n = 41$	
Last 30 patients ( $n = 343$ )	
Number of therapists contributing data $n = 41$	
<b>Knee</b>	-0.87
First 30 patients ( $n = 336$ )	(-3.34, 1.60)
Number of therapists contributing data $n = 42$	
Last 30 patients ( $n = 300$ )	
Number of therapists contributing data $n = 42$	
<b>Foot / ankle</b>	0.58
First 30 patients ( $n = 167$ )	(-2.68, 3.84)
Number of therapists contributing data $n = 38$	
Last 30 patients ( $n = 156$ )	
Number of therapists contributing data $n = 40$	
<b>General orthopedic</b>	2.33
First 30 patients ( $n = 233$ )	(-0.55, 5.21)
Number of therapists contributing data $n = 42$	
Last 30 patients ( $n = 239$ )	
Number of therapists contributing data $n = 41$	
<b>Neck</b>	3.43
First 30 patients ( $n = 29$ )	(-4.89, 11.76)
Number of therapists contributing data $n = 19$	
Last 30 patients ( $n = 24$ )	
Number of therapists contributing data $n = 21$	
<b>Low back</b>	-1.22
First 30 patients ( $n = 26$ )	(-11.95, 9.51)
Number of therapists contributing data $n = 12$	
Last 30 patients ( $n = 21$ )	
Number of therapists contributing data $n = 11$	

\*Risk-adjusted; positive indicates improvement in FS.

Our findings related to efficiency are consistent with several other studies in which lower utilization of care was reported when patients were managed by

**Table 3.** Impact of clinician demographics, clinician life circumstances, and clinic characteristics on patient outcomes during early versus late fellowship training

Demographic variables	Functional status: Difference between first 30 patients vs. last 30 patients during fellowship training		Physical therapy visits: Difference between first 30 patients vs. last 30 patients during fellowship training		Episode of care duration (days): Difference between first 30 patients vs. last 30 patients during fellowship training	
	Unadjusted mean difference	Risk-adjusted mean difference	Unadjusted mean difference	Risk-adjusted mean difference	Unadjusted mean difference	Risk-adjusted mean difference
	P-value	P-value	P-value	P-value	P-value	P-value
Age upon entering Fellowship (continuous data) (n = 42)	0.04 0.80	-0.03 0.83	0.01 0.85	-0.02 0.78	-0.14 0.81	0.11 0.84
Number of months to complete Fellowship (continuous data) (n = 42)	-0.07 0.69	0.005 0.63	-0.03 0.70	0.02 0.77	-0.07 0.90	0.03 0.96
<b>Entry-level PT degree</b>						
Masters' degree (n = 11) vs. Baccalaureate degree (n = 6)	-6.85 0.05	-2.63 0.81	2.27 0.11	1.18 0.93	5.74 0.49	8.28 0.51
Doctorate degree (n = 25) vs. Baccalaureate degree (n = 6)	-3.03 0.32	1.22 0.018	1.46 0.25	-0.56 0.31	10.07 0.38	5.83 0.67
Year in which the therapist received his/her entry-level PT degree (continuous data) (n = 42)	-0.08 0.64	0.07 0.66	0.01 0.94	0.00 0.98	0.31 0.60	-0.29 0.62
Full time equivalent years of practice prior to Fellowship (continuous data) (n = 42)	0.05 0.79	-0.03 0.81	-0.01 0.90	0.01 0.93	0.44 0.49	0.42 0.51
Full time equivalent years of practice in an orthopedic or sports setting before entering Fellowship (continuous data) (n = 42)	0.01 0.93	-0.01 0.96	0.02 0.80	-0.02 0.75	0.21 0.72	0.20 0.74
<b>Life circumstances</b>						
Whether the therapist perceived having a life situation that required significant time or energy outside of Fellowship						
Any life situation (n = 29) vs. No significant time or energy (n = 13)	-2.81 0.21	2.70 0.22	1.59 0.08	-1.52 0.08	7.64 0.35	-7.23 0.37
Children at home (n = 12) vs. No significant time or energy (n = 27)	-5.03 0.02	5.02 0.01	1.56 0.07	-1.56 0.06	5.99 0.45	-5.94 0.44
<b>Clinic characteristics</b>						
Practice setting(s) while completing Fellowship						
Large (6 or more clinics) physical therapy owned private practice or hospital owned / managed care clinics (n = 19) vs. Small (less than 6 clinics) physical therapy owned private practice (n = 14)	-1.37 0.58 -2.34	-1.81 0.53 -3.32	-1.37 0.40 0.77	-2.46 0.07 1.63	-2.0 0.05 -20.78	21.00 0.10 18.72
Physician owned clinic, academic institution clinic, research center, sports team, US military or public health clinic (n = 9) vs. Small (less than 6 clinics) physical therapy owned private practice (n = 14)						

(Continued)

Table 3. (Continued)

Demographic variables	Functional status: Difference between first 30 patients vs. last 30 patients during fellowship training		Physical therapy visits: Difference between first 30 patients vs. last 30 patients during fellowship training		Episode of care duration (days): Difference between first 30 patients vs. last 30 patients during fellowship training	
	Unadjusted mean difference	Risk-adjusted mean difference	Unadjusted mean difference	Risk-adjusted mean difference	Unadjusted mean difference	Risk-adjusted mean difference
	P-value	P-value	P-value	P-value	P-value	P-value
Primary position during the majority of time while completing Fellowship	-0.25 0.91	1.38 0.53	-2.05 0.07	0.02 0.98	-11.48 0.14	8.91 0.27
Owner or partner of a physical therapy practice, academic or clinical researcher (n = 16) vs. Staff physical therapist or clinical specialist / senior staff physical therapist (n = 26)						
Average number of other therapists who worked in the therapist's primary clinical setting (continuous data) (n = 42)	-0.11 0.39	0.10 0.43	0.09 0.10	-0.08 0.12	0.79 0.09	-0.75 0.10
Whether the therapist's patients were co-treated by other clinical staff employees Yes (n = 25) vs. No (n = 17)	0.50 0.83	0.28 0.26	-1.28 0.19	0.75 0.45	-8.02 0.37	4.75 0.61
Number of new evaluations performed per week (continuous data) (n = 39)	-0.08 0.55	0.08 0.54	-0.02 0.65	0.02 0.64	-0.03 0.96	0.02 0.96
Amount of time allotted for evaluating new patients 45 min or longer (n = 34) vs. Less than 45 min (n = 8)	1.62 0.54	-1.64 0.53	-1.19 0.29	1.20 0.25	-8.07 0.42	0.82 0.41
Number of follow-up visits per week (continuous data) (n = 42)	-0.06 0.20	0.06 0.17	-0.01 0.61	0.01 0.66	-0.09 0.58	0.08 0.62
Amount of time allotted for follow-up visits 30 min or longer (n = 33) vs. 20 to less than 30 min (n = 9)	-1.94 0.45	1.86 0.46	0.54 0.62	-0.50 0.65	6.11 0.53	-5.54 0.55
Whether the therapist used FOTO before beginning Fellowship Yes (n = 28) vs. No (n = 14)	1.49 0.52	-1.56 0.50	0.59 0.55	-0.54 0.56	13.32 0.12	-13.04 0.13

physical therapists with advanced specialty training.<sup>19-21</sup> For therapists to remain competitive in a value-based market, which is increasingly being emphasized over fee-for-service in physical therapy settings,<sup>22-24</sup> fellowship programs that produce both effective and efficient therapists would be more attractive to therapists considering post-professional education and to organizations considering hiring these therapists.

In relation to the assessment of clinician demographics/life circumstances and/or clinic characteristics, and changes in outcomes during fellowship training,

we were not surprised to find that children at home were associated with less improvement in patients' functional outcomes, since family responsibilities could compromise clinical decision-making. This finding warrants exploration in future studies. Our study results regarding greater improvements in patient function among therapists with entry-level baccalaureate degrees versus masters' degrees could be explained by the higher level of education afforded by a masters' degree resulting in fewer gains in to be attained from a fellowship program.

Since many analyses were performed, these findings could be due to Type I errors. We were, however, surprised that so few variables achieved statistical significance. For example, outcomes were not affected by many characteristics that we had anticipated would have an impact, such as the use of non-therapist clinicians in the care of patients and the amount of time allotted for evaluations and follow-up visits. Future research examining these observations is indicated. Conversely, our study was not powered to detect a meaningful difference in change in function ( $1-\beta = 45\%$ ). Since the average improvement in functional outcomes decreased among the last 30 patients compared with the first 30 patients, however, it is unlikely that a larger sample size would have changed study conclusions.

### Limitations

One limitation with the analyses is that we aggregated mean change in FS across different PROM. Each PROM consists of a unique item-response theory-based item bank and scoring metric, and, thus, direct comparability of scores cannot be assumed. While aggregating scores from different PROM into a single overall Orthopedic FS score is not optimal, we opted to accept the psychometric limitation of combining scores from the eight separate FS measures for the following reasons: 1) all FOTO PROM were developed using item-response theory and have item banks containing patient questions (items) that address the same construct of FS and pertain to the International Classification of Functioning, Disability and Health domains of Activities and Participation,<sup>25</sup> 2) the FOTO measures used all produce scores on a scale that is at or approximates 0–100 with higher scores indicating better FS, and 3) this approach allowed us to keep the focus of this study on fellowship training with a reasonable snapshot of outcomes performance.

Study conclusions might also be influenced by other limitations. It is possible that the interval between the first and last 30 patients treated was not sufficient to capture changes in the variables measured, or that therapists' case mix became more complicated toward the end of fellowship. Additionally, the timespan during which patient data were collected varied across therapists, a concern we were unable to evaluate in greater detail because of the method used to deidentify data. Furthermore, our decisions to compare outcomes between the first and last 30 patients seen by each therapist and to require that therapists contribute at least 90 patients to the FOTO dataset were not based on evidence, but rather on judgments regarding balancing competing objectives of obtaining precise estimates with establishing meaningful intervals between the first and last 30 patients.

We also acknowledge the possibility of selection bias such that patients who did not have complete intake

and/or discharge data were excluded from the study. Therapists were instructed to include all consecutive eligible patients; however, some patients dropped out for reasons beyond the therapists' control. Additionally, we can only evaluate measured characteristics available within the FOTO system.<sup>17</sup> It is possible that there are unmeasured risk-adjusted variables and other characteristics that might have affected study outcomes. Nevertheless, we did include a robust number of variables that are known or believed to influence outcomes.<sup>17</sup>

We only studied one orthopedic manual physical therapy fellowship program. Our findings therefore may not be generalizable to other fellowship programs. Nevertheless, the program we studied had been educating therapists for 10 years and was ABPTRFE credentialed and recognized by AAOMPT. The program has consistently met the same rigorous requirements for training as other credentialed programs, and graduate perceptions regarding the impact of the program on their personal growth, professional development, and income were positive.<sup>18,26</sup> However, it is possible that other programs might yield different results. For example, in a study using data from accredited residency programs and graduates, two of the program-level factors associated with positive outcomes (becoming board-certified and graduating from residency) were 'single site versus multifacility' and 'included live didactic teaching'.<sup>27</sup> Although this article focused on residency and not fellowship programs, it is possible that different fellowship program-level characteristics might impact outcomes.

### Conclusion

Study results suggest that completion of the fellowship program did not increase effectiveness as measured by improvement in patient FS change using FOTO but did improve efficiency. Results also suggest that these outcomes are influenced by some clinician demographics and clinic characteristics. In our analyses, we were able to address potential confounding by nine variables that have been shown to influence FS outcomes in patients with low back pain. Nevertheless, conclusions might not be generalizable to other fellowship programs.

### Conflict of interest and funding

Mark Werneke acknowledges that he worked for Net Health Systems, Inc., during part of the time that this manuscript was being conceptualized and written. This company owns the Focus on Therapeutic Outcomes (FOTO) Patient Outcomes system that gathers and manages the data analyzed in this manuscript. Research projects such as this article were a normal part of Mark's job tasks. No funds were received in support of this work. No benefits in any form have been or will be received from a commercial party related directly or indirectly to the subject of this article.

## Ethics statement

Rutgers The State University of New Jersey's IRB (Protocol 2018000428) approved this study. Patient data were deidentified by Focus on Therapeutic Outcomes (FOTO). Patient-informed consent was therefore waived. Return of the surveys established the therapists' informed consent.

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## Appendix A

*Appendix A:* Functional Status (FS) outcome measures by body region. When applicable, data specifying the minimal clinically important improvement (MCII) are also reported

Functional status outcome measure (minimal clinically important improvement (MCII) where available)	Body region
Shoulder FS questionnaire <sup>15</sup> (MCII = 8 FS units)	Shoulder
Elbow/Wrist/Hand FS questionnaire*	Upper Arm
	Elbow
	Forearm
	Wrist
	Hand
Hip FS questionnaire <sup>11</sup> (MCII = 6 FS units)	Pelvis
	Hip
	Upper Leg
Knee FS questionnaire <sup>13</sup> (MCII = 9 FS units)	Knee
	Lower Leg
Ankle / Foot FS questionnaire <sup>12</sup> (MCII = 9 FS units)	Ankle
	Foot
	Lower Leg
General Orthopedic FS questionnaire*	Craniofacial Region
	Thoracic Spine
	Ribs
	Trunk
	Neck
Neck FS questionnaire <sup>16</sup> (MCII = 8 FS units)	Neck
Low Back FS questionnaire <sup>14</sup> (MCII = 5 FS units)	Lumbar Spine

\*The General Orthopedic and Elbow/Wrist/Hand FS outcome measure MCII's have not been published; however, the National Quality Forum approved both outcome measures in 2014 as quality patient-reported outcome measures assessing functional status.<sup>28,29</sup>

## Appendix B

Appendix B: Questionnaire addressing clinician demographics, clinician life circumstances, and clinic characteristics.

What was your age (in years) upon entering Fellowship?

.....  
\_\_\_\_\_

How many months did it take for you to finish Fellowship?

.....  
\_\_\_\_\_

In which of the following practice setting(s) did you treat patients when you were in Fellowship? (check all that apply)

- Hospital or Managed Care PT Clinic(s) (Kaiser, Sutter, Mercy, Baptist, etc.)
- Small (less than 6 clinics) Private Practice – PT Owned Clinic(s)
- Large (6 or more clinics) Private Practice – PT Owned Clinics
- Private Practice – Physician (or Chiropractor) Owned Clinic(s)
- Academic Institution PT Clinic(s)
- Research Center(s)
- College or Professional Sports Team(s)
- US Military Hospital Clinic(s)
- Public Health Clinic(s)
- Other (please specify) \_\_\_\_\_

Which of the following best characterizes your primary position during the majority of your time in Fellowship?

- Staff PT
- Clinical Specialist / Senior Staff PT
- Clinical Supervisor or Director
- Partner in a PT practice or business
- Sole owner of a PT practice or business
- Academic Faculty
- Academic Administrator, other than Director
- Director of PT Education Program
- Clinical Researcher
- Clinical Researcher Assistant
- Traveling PT
- Other (please specify) \_\_\_\_\_

What clinical certification or formal post-professional education in physical therapy did you hold prior to entering Fellowship? (check all that apply)

- OCS
- SCS
- Orthopedic Residency
- Sports Residency
- MDT Certification or Diplomat
- Manual Therapy Certification (MTC, COMT, etc.)
- Womens' / Pelvic Health
- Pain Neuroscience Certification

- Athletic Training
- I did not hold any clinical certification or formal post-professional education in physical therapy prior to entering Fellowship
- Other (please specify) \_\_\_\_\_

What was the average number of PTs who worked in your primary clinical setting during Fellowship?  
\_\_\_\_\_

Were there any clinical staff employees beside you (such as PTAs, ATCs, aides, etc.), who were directly involved in treating the patients under your care who were also included in your FOTO data collection for Fellowship?

- Yes
- No, all patients under my care were seen exclusively by me

(If respondents answered 'yes' to the last question, they were prompted to answer the following question.) Please check all those involved in your patients' care.

- Other PTs who were not residents
- Other PTs who were residents
- Students
- Physical therapy assistants
- Physical therapy aides
- Athletic trainers
- Chiropractors
- Acupuncturists
- Exercise physiologists
- Massage therapists
- Other (please specify) \_\_\_\_\_

(If respondents answered the last question, they were prompted to answer the following question.) Please estimate the overall percentage of care provided by clinical staff treating patients under your care (such as PTAs, ATCs, aides, etc.) during the period of time you were submitting data to FOTO as part of Fellowship.

- All patients under my care were treated by myself or another PT
- 1 – 25% were treated by non-PT clinically focused support staff
- 26 – 50% were treated by non-PT clinically focused support staff
- 51 – 75% were treated by non-PT clinically focused support staff
- 76% or more were treated by non-PT clinically focused support staff

What type of entry-level education program did you complete to become a PT (check all that apply)

- Certificate
- Baccalaureate degree
- Masters' degree
- Doctorate degree

What year was your entry-level degree granted?  
\_\_\_\_\_

How many years (in full-time equivalents) had you been a practicing PT when you entered Fellowship?  
\_\_\_\_\_

How many years of experience (in full-time equivalents) did you have in orthopedic and/or sports physical therapy clinical practice before entering Fellowship?  
\_\_\_\_\_

When you were in Fellowship, did you have a 'significant other' for more than 50% of the time? (a 'significant other' refers to a spouse, partner, boyfriend/girlfriend, etc.)

- Yes
- No

When you were in Fellowship, did you have any other life situations that required significant time or energy outside of Fellowship? (check all that apply)

- Children at home
- Cared for aging parents
- Had other family situations that required extensive time and attention
- Did NOT have any family situations that required extensive time and attention
- Other (please specify) \_\_\_\_\_

When you were collecting FOTO data during Fellowship, how many new patient evaluations did you typically perform each week?

\_\_\_\_\_

When you were collecting FOTO data during Fellowship, how much time was typically scheduled to evaluate your patients?

- less than 30 min
- 30 to less than 45 min
- 45 min or longer

When you were collecting FOTO data during Fellowship, how many follow-up patient visits did you typically perform each week?

\_\_\_\_\_

When you were collecting FOTO data during Fellowship, how much time was typically scheduled to treat patients for follow-up visits?

- less than 20 min
- 20 to less than 30 min
- 30 min or longer

Prior to entering Fellowship, how long had you been using FOTO to collect patient data?

- I had not used FOTO to collect patient data prior to entering Fellowship
- less than 1 year
- 1 to less than 3 years
- 3 years or longer