Musculoskeletal Science and Practice 39 (2019) 67–72

Contents lists available at ScienceDirect

Musculoskeletal Science and Practice

journal homepage: www.elsevier.com/locate/msksp

Professional issue

The effects of a new Tendo-Achilles Pathway (TAP) on an orthopaedic department– A quality improvement study

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A B S T R A C T

Background: Achilles tendinopathy is a common pathology that is considered difficult to treat. At a time of austerity in the NHS it is essential to have carefully designed pathways that are monitored in terms of cost and effectiveness. However, a paucity of evidence exists for what the "best value" dedicated "joined up" pathway of care is for this difficult condition.

Objectives: Design, implement and evaluate the impact of a new therapist lead pathway for Tendon- Achilles Pain (TAP).

Methods: Process mapping, driver diagrams, stakeholder analysis and a series of Plan-Do-Study-Act cycles were used to design and implement TAP. To assess the impact of TAP, data was compared on whole system measures for 46 patients treated with referral to the traditional service (without TAP) and 46 patients managed according to the newly designed pathway (with TAP). A cost analysis was also conducted.

Results: A quality improvement approach led to the successful design and implementation of a therapist lead TAP.

The impact of TAP included positive effects on patient satisfaction, a decrease in duplication of treatments, investigations and inappropriate reviews with consultants. No safety concerns were found. TAP was also £44,000 cheaper per annum than the previous service.

Conclusion: Collaboration between orthopaedic and therapy services has resulted in a standardised pathway of care for patients with an Achilles tendinopathy. It has removed unwanted variation, provided an opportunity to monitor the outcomes of treatments and resulted in decreased cost for the health board.

1. Problem

Achilles tendinopathy is characterised by pain and stiffness in the Achilles tendon. It is a common pathology, affecting approximately 150,000 people in the UK each year (Riley, 2008). Although not fully understood the pathology is thought to occur because of degeneration and a failed healing response of the tendon (Riley, 2004; Khan et al., 2002).

Many modalities are used in the management of this tendon pathology and new innovative treatments are frequently emerging (Hutchison et al., 2011). Patients and clinicians face a range of non-operative treatment options such as exercise, insoles, electrotherapy and injections. Surgery is usually only considered if conservative treatments fail (Alfredson and Cook, 2007; Hunter, 2000; Paavola et al., 2000).

Although these modalities are in routine clinical use, only a few controlled clinical trials have been performed. In most cases there is little or no evidence of therapeutic effectiveness of treatment, especially long term. Clinicians are essentially reliant on anecdotal evidence and experience when treating this condition and it is therefore considered difficult to treat.

In our health board there was no defined pathway or co –ordination of patients care for this condition. Resulting in the order of interventions and investigations being haphazard and potentially not cost effective. At a time of austerity in the NHS it is essential to have carefully designed pathways of care, which are monitored in terms of effectiveness and cost (Roberts, 2014). It is also important to have equality and no disparities in the healthcare provided (Aylward et al., 2013) and make best use of the skills of each clinician. The approach for this condition was therefore not satisfactory.

2. Available knowledge

A search of the electronic data bases: Medline, CINAHL, EMBASE, AMED and PEDro (physiotherapy evidence database) identified a paucity of evidence for organisations reporting what the "best value" dedicated "joined up" pathway of care for this condition is.

At the British Orthopaedic Foot and Ankle Society (BOFAS)

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https://doi.org/10.1016/j.msksp.2018.11.002
Received 10 May 2018; Received in revised form 28 August 2018; Accepted 9 November 2018

conference Belfast, 2013 a group from Guildford, presented their pioneering development of a “one stop shop” heel pain clinic where patents are reviewed by either a consultant orthopaedic surgeon or specialist physiotherapist (Kolodziejczyk and Solan, 2013). However, they did not evaluate the impact of this way of working in relation to Achilles tendinopathy patients.

3. Aims

(1) Design a Tendo Achilles Pathway (TAP)
(2) Implement TAP
(3) Determine the effects of the TAP on the patients and the organisation.

4. Method

A quality improvement approach was used for this project.

4.1. Intervention design

4.1.1. Driver diagrams

To explore the potential for a TAP, the Foot and Ankle (F & A) subspeciality team (comprised of senior orthopaedic F & A consultants (n = 4), senior MSK radiologists (n = 2), Advanced Practitioner Physiotherapist (APP) (n = 1), senior physiotherapists with an interest in F &A (n = 2), podiatrist (n = 1) and manager (n = 1) met and discussed the needs of the service. Based on this discussion we constructed a driver diagram (Fig. 1).

4.1.2. Process mapping analysis

To identify the current situation with the management of Achilles tendinopathy patients in our health board we used process mapping (Plsek, 1999). We “talked through” the pathway with patients (at a focus group) and clinicians (at the F & A subspecialty meeting), mapping out the patient journey, from referral to discharge. The process map Fig. 2 demonstrates how patients were being managed.

This identified deficiencies with the system. These included: the order of treatment and investigation being haphazard; no established agreement amongst clinicians regarding the best treatments and investigations required and no consideration given to the most cost effective and efficient use of resources. A number of different specialities were involved in the management of this condition, each working independent of the other.

4.1.3. Redesign

The pathway was redesigned to prevent the deficiencies identified. This was based on the best available evidence from the literature on the relative effectiveness of the treatments (Krey et al., 2015; Kingma et al., 2007; Mayer et al., 2007; Scott et al., 2015; Al-Abbad and Simon, 2013; Mani-Babu et al., 2015; Roche and Calder, 2013), F & A team experience, guidelines and review of practice in other units. The new TAP is shown in Fig. 3.

As part of the pathway a Heel Pain Clinic (HPC) was developed, in which the patient would have an initial assessment by a specialist physiotherapist and podiatrist, followed by a staged treatment and investigation plan.

Patients exit the pathway appropriately as their symptoms resolve. Patients are monitored throughout each stage of the pathway by the heel pain clinic staff and the following patient related outcome measures (PROMs) are collected at all stages of the pathway to assess the efficacy of the treatments being applied. The PROMs data was collected at baseline and 12 weeks following each treatment.

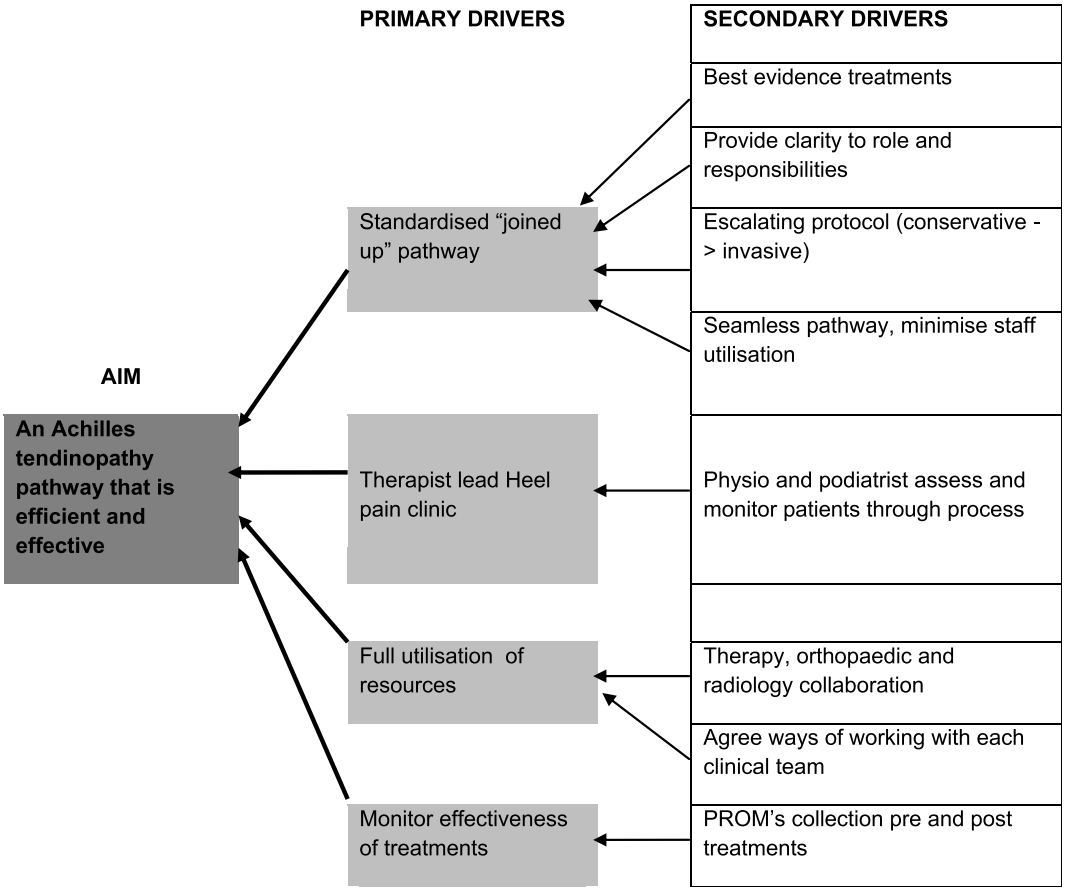

Fig. 1. Driver diagram for achieving an efficient and effective patient centred pathway for an Achilles tendinopathy.

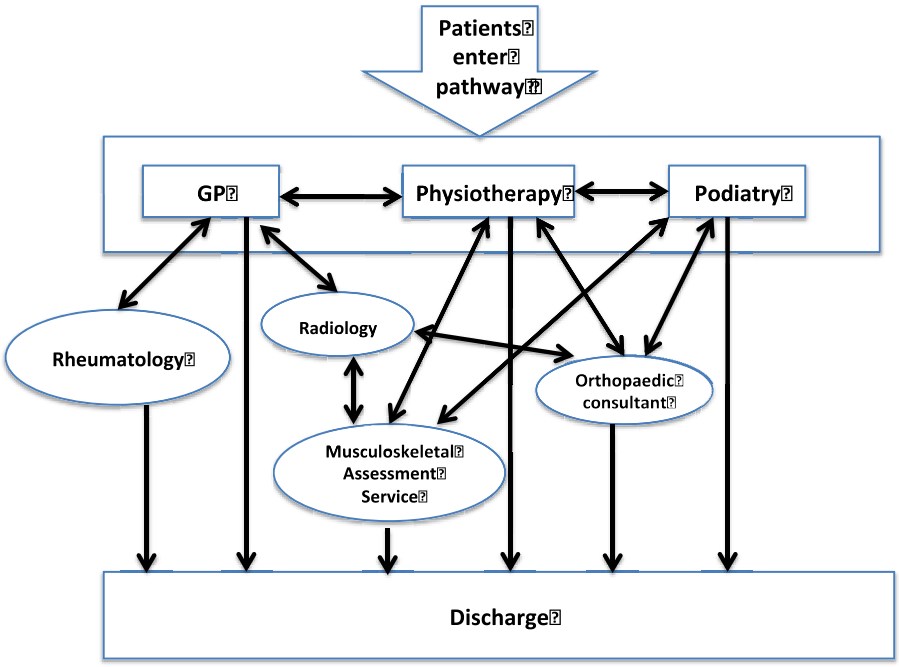

Fig. 2. A patient flow-diagram without TAP (Amended figure).

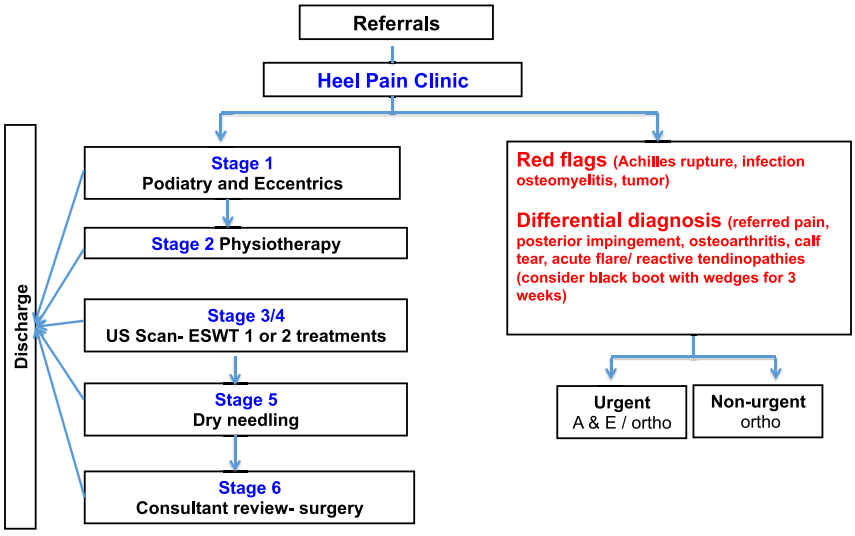

Fig. 3. A patients flow diagram post TAP.

1. The Victoria Institute of Sport Assessment –Achilles (VISA-A) questionnaire (validated outcome measure for this condition) (Robinson et al., 2001).
2. Visual Analogue Scale (VAS) for pain (the average it has been over the previous week) (Wewers and Lowe, 1990).
3. Patient response to treatment (Discharged- Patient happy with the response to treatment. Patient referred to next treatment – patient not happy with response to treatment).

4.2. Strategy for implementation

4.2.1. Stakeholder analysis

Stakeholder analysis of the project was conducted (Table 1). The process identified the individuals and groups that were likely to be affected by the proposed pathway and try to address their needs prior to the pathway implementation.

Table 1
Stakeholder analysis of the professionals involved in the management of Achilles tendinopathy in the new pathway.

Power of stake holder	High	**Meet their needs**	**Key players**
		Chief Executive	Patients
		Finance Director	Physiotherapists and podiatrists
			Orthopaedic surgeon
			Radiologists
			Service manager
			Administrative support
			Statistician
	Low	**Less important**	**Show consideration**
		Medical records	Fracture clinic staff
			Medical director
		Low	High
		Stake holding	

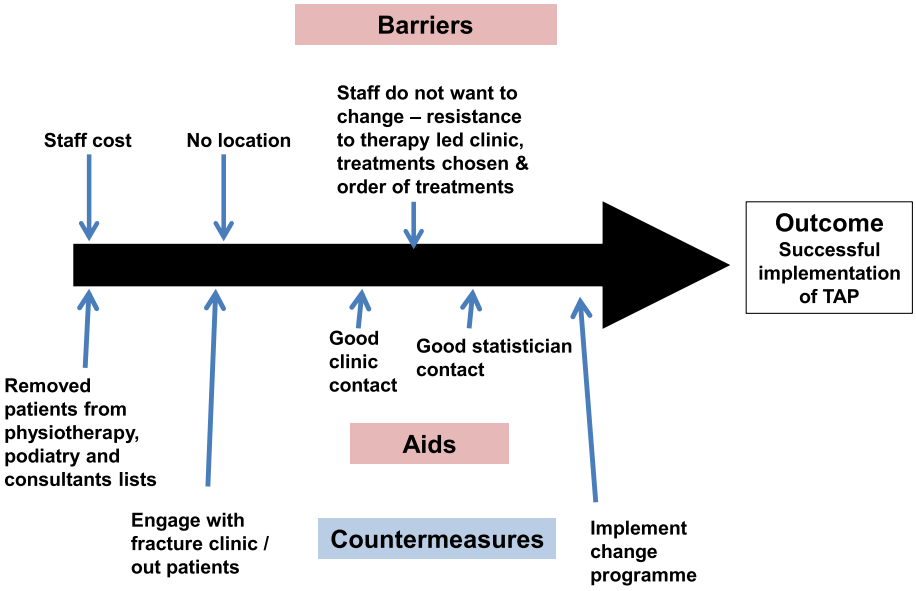

Fig. 4. Diagram showing the potential barriers, aids and countermeasures for implementing the TAP.

4.2.2. Potential constraints/barriers to implementation

We identified potential resistance to changing to the new pathway (Fig. 4), including; potential resistance to a therapist centred model of care, disagreement with the order or type of treatments selected, problems with discrepancies which may exist between organisational risks identified by managers (for example cost) and clinical risks identified by the F &A team.

4.2.3. Plan-do study-act cycles (PDSA)

We performed a number of PDSA cycles to implement the pathway (Reed and Card, 2016). The aim of the first PDSA was to pilot test the introduction of the Heel Pain Clinic. The problem identified was the wait for the clinic was 9 months. Following decision with the management team the clinics were increased to weekly instead of 3 weekly.

Other PDSA cycles performed included, implementation of a data collection sheet and a system to track the investigations requested.

4.3. Evaluation of the service redesign

4.3.1. Baseline measurements

To determine the impact of the TAP we collected data on 6 domains of quality (Table 2). These domains are recommended by the US Institute of Medicine (IOM) (Martin et al., 2007). They also cover the four principles of Prudent Health Care (Aylward et al., 2013) and the 6 strategic plans of our health board (ABMU, 2016).

Before introduction of TAP, data on these measures of quality were not routinely captured in our health board. Therefore pre TAP measures were collected from the records (notes and radiology) of patients who participated in a randomised control trial in our health board in 2012 (Hutchison et al., 2013). The post pathway measures were collected from patient's records managed according to the newly designed pathway (between 2015 and 2017 with a random selection of notes).

5. Analysis

All data was analysed using Statistical Package for Social Sciences (SPSS) Version 21 (SPSS Inc., Chicago, Illinois). A descriptive data analysis was performed of the patient satisfaction questionnaire. All other data was collated as frequencies and compared for each measure before and after implementation of the pathway. That is the number of inappropriate referrals to consultants, total number of X rays, ultrasound scans, physiotherapy and podiatry treatments, patient related outcome measures (VISA-A, VAS and discharge rate) and complications. The financial impact of the pathway was analysed using an elementary health economics evaluation.

6. Ethics

The local ethics committee confirmed that ethical permission was not required for this study. It is classed as a service evaluation.

7. Results

A total of 92 patients were reviewed in this study. The characteristics of the patients are shown in Table 3.

Using a quality improvement approach we successfully designed (Fig. 3) implemented and evaluated the impact of a TAP in our health board.

Table 2
Measures on quality of patient outcome, individual experience of care and cost of implementing TAP.

Effect on	Quality Aim	Measures
Patients	Patient centred	Health Board Patient satisfaction questionnaire
	Timely & Equitable	Number of premature referrals to an orthopaedic consultant (i.e. before failure of conservative treatments)
		Total number of treatments (physiotherapy & podiatry)
		Total number of investigations (x-rays & ultrasound scans)
	Safe	Total number of adverse events
	Effective	Patient response to treatment (discharge, VISA –A & VAS)
Organisation	Efficient	Total cost of service delivery

Table 3
Characteristics of the patients included in the study.

Characteristic	Pre TAP	Post TAP
Gender (n)		
Males	29	21
Females	17	25
Mean age (yrs) (SD; range)	47 (8; 30 to 69)	51 (12; 22 to 79)
Mean duration of symptoms (mths) (SD; range)	36 (46; 6 to 216)	22 (22; 4 to 100)

7.1. Patient centred

In the pre TAP patient focus group the majority of comments were negative. By comparison the feedback we received from the patients treated through TAP were overwhelmingly positive see Table 4.

7.2. Timely, equitable and safe

Since the introduction of the TAP we have observed a reduction in the total number of therapy treatments (physiotherapy and podiatry), radiology investigations (x-rays & us scans) and inappropriately premature referrals to an orthopaedic consultant. We are also now routinely collecting PROM data measuring patient progress and the frequency of adverse outcomes. See Table 5.

7.3. Effectiveness

Prior to TAP no outcome data regarding the effectiveness of the treatments were collected. With TAP on a sample of 46 tendons we have insufficient data to provide robust estimations of effectiveness. This is particularly true for the later stage treatments, since few patents were referred to these procedures. However, from the limited data we have available (see Table 6) the success rate for EE, Physiotherapy and ESWT are 34% (13/38), 36% (5/14) and 75% (3/4) respectively.

7.4. Effect on the organisation

7.4.1. Efficient

The total cost of service provision was estimated by summation of the costs of all individual consultations, therapies and investigations before and after the introduction of TAP. Based on these figures the total cost decreased from £13,340 (before TAP) to £6560 for the 46 patients treated after the introduction of the TAP. This represents a cost avoidance of £6780 (51%). Further details are given in Table 7. In 2016 the clinic treated 299 tendons, which, creates a potential annual cost saving of £44K to the health board. In practice these savings are unlikely to be cash-released but this increased efficiency will lead to a reduction in waiting times, treatment times and inconsistencies brought about by bottlenecks in the system.

Table 5
Comparing the total number of therapy sessions, investigations, PROMS data collected and inappropriate reviews with an orthopaedic consultant for the two groups with and without TAP (*N/R –not recorded).

	Without TAP (46 patients)	With TAP (46 patients)
Physiotherapy sessions	82	22
Podiatry sessions	39	46
X-rays	25	27
Ultra- sound scans	66	17
PROM's collection	*N/R	40
Adverse events	*N/R	0
Inappropriate consultant review	4	0

Table 6
Original removed replaced with flow of patients through TAP.

Stage	EE	Physio	ESWT	Dry Needling	Surgery
Commenced Treatment	46	24	6	1	1
Successful	13	5	3	0	0
Not finished	8	10	2	0	1
DNA	1	3	0	0	0
Refer to next stage	24	6	1	1	0

Table 7
Cost implications of TAP protocol comparing 46 patients without TAP and with TAP.

Cost (£)	Without TAP (£)	With TAP (£)	Difference (£)
Physiotherapy session x 6 (70)	5740	1540	4200
Podiatry sessions (30 insole &10)	1560	1840	−280
X-ray & report (80)	2000	2160	−160
Ultra- sound scans and report (60)	3960	1020	2940
Inappropriate consultant review 20 mins (Reed and Card, 2016)	80	0	80
Total	13,340	6560	6780

8. Discussion

Using quality improvement methodology we successfully designed and implemented a new Achilles tendinopathy pathway. We now have a highly reliable standard operating procedure/standardised way of working. It is a safer way of working, ensuring that patients do not “fall between the gaps”. It also ensures that there is not a system of random chance. It gives clarity to staff regarding their roles and expectations.

The evaluation of the redesign resulted in positive feedback from patients.

It also demonstrated a large reduction in the total number of therapy treatments, investigations and inappropriate reviews with an orthopaedic consultant. This data suggests that TAP delivers a 51% reduction in costs.

A limitation of the study is the lack of availability of pre TAP PROM's data, which means that no comparison can be made to

Table 4
Examples of patient's comments with and without TAP.

	Comments
Without TAP	*“Frustrating”* *“No one listens”* *“I had no where to turn”* *“I had to wait months to be seen”*
With TAP	*“Explanation of condition good. Friendly and helpful”. “Knowledgeable and friendly staff who have time to explain everything”* *“Every aspect was excellent. Staff were friendly and reassuring. And related with understanding of the pain I was in”.* *“I would not change any area of the experience I had as staff were very sympathetic and helpful”.*

traditional/standard practice. A consequence of this is that while we can demonstrate improvements in efficiency and reduced cost, we are unable to show this will lead directly to improvements in patient's outcome. However, given that the treatments are provided in the same way and by the same clinicians, as before the introduction of TAP it is unlikely that effectiveness will have been compromised. Furthermore the reduced time patients spend in the system and the consistency, equality in treatments and investigations offered has been shown to yield an improvement in patient experience, which may have an impact on outcomes.

The optimum pathway is still not known. However, effective data collection will allow for results to be disseminated to stakeholders to provide a feedback loop and impetus for change.

The strength of the conclusions of this project is limited by the sample size. The comparison groups may not be matched well or may not be truly representative of the Achilles tendinopathy population. This weakens the generalisations that can be made. The data collected was limited and did not include metrics such as waiting times for any of the consultations, investigations and treatments. This pathway was also developed specifically for our department and may not be suitable for primary care services.

A direct comparison of effectiveness between TAP and standard care would be difficult. There is no definition of standard care in this context, since it will vary widely between departments demanding on resource and expertise. Moving forward our next aim is to measure the effectiveness of treatments offered, in both absolute and value-based (outcome/cost) terms. This will allow us to optimise the effectiveness of the entire pathway.

We will also consider which patients are most likely to respond to particular treatments, and are currently testing/validating a heuristic model in relation to the eccentric exercises. This is a form of predictive modelling to allow us to direct patients to the most effective treatment as quickly as possible.

Additionally, we are reviewing whether the ultra sound scan can be moved further down the pathway and whether allied health professionals (physiotherapists and podiatrist) can be trained to scan the patients instead of the consultant radiologist.

Encouraged by our results we are now using this improvement approach to develop pathways for other chronic heel pain conditions, for example plantar fasciitis.

Conflict of interests

None declared.

Ethical approval

The local ethics committee confirmed that ethical permission was not required for this study. It is classed as a service audit/evaluation and uses pre-existing management level, anonymised data.

Funding

This project received no grants from any funding agency. ABM University Health Board funded AMH to participate in the Leadership Programme.

Acknowledgments

The Foot and Ankle team are thanked for their input into the design and implementation of the pathway.

Academi Wales (Medical Leadership Programme) and University of Wales Trinity Saint David's for providing training in quality improvement approaches.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.msksp.2018.11.002.

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