Program Evaluation of GLA:D® Australia: Physiotherapist Training Outcomes and Effectiveness of Implementation for People With Knee Osteoarthritis

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Abstract

Background

The Good Life with osteoArthritis from Denmark (GLA:D®) program incorporates guideline-based patient education and exercise-therapy for osteoarthritis to implement guidelines into practice. We evaluated the implementation of GLA:D® for knee osteoarthritis within Australian physiotherapy practice using the RE-AIM QuEST (Reach, Effectiveness, Adoption, Implementation, Maintenance Qualitative Evaluation for Systematic Translation) framework.

Methods

Australian physiotherapists were trained and supported to deliver GLA:D® (2017-2019) and completed surveys before and after training to assess practices, beliefs about capabilities and confidence, and barriers and enablers to implementation. Patients participating in GLA:D® completed online baseline, 3-month (immediately post-treatment) and 12-month patient reported outcomes. Effective implementation was defined as within-subject moderate effect size (ES, ≥0.50) for average pain (100mm visual analogue scale) and knee osteoarthritis outcome score quality of life scores (KOOS-QoL), and small effect size (≥0.20) for health-related quality of life (EQ-5D-5L).

Results

Reach: 1,064 physiotherapists (73% private) and 1,945 (79% private) from all states and territories consented to participation. Key barriers included out-of-pocket cost to patients, and program suitability for culturally and linguistically diverse communities. *Effectiveness:* Following training, more physiotherapists discussed treatment goals and the importance of weight management, and prescribed supervised, neuromuscular exercise. Patient outcomes at 3- and 12 months (n = 1,044 [54%] and 927 [48%]) reflected effective implementation, including reduced pain intensity (ES, 95%CI = 0.72, 0.62-0.84; and 0.65, 0.54-0.77), improved KOOS-QoL scores (0.79, 0.69-0.90; and 0.93, 0.81-1.04), and improved EQ-5D-5L scores (0.43, 0.31-0.54; and 0.46, 0.35-0.58). Seventy-three percent of participants reported minimal important changes for at least one of pain severity (≥ 15 mm), KOOS-QoL (≥ 15 points) or EQ-5D-5L (≥ 0.07 points). *Adoption:* GLA:D® was implemented at 297 sites (264 private, 33 public). *Implementation:* Most patients completed at least one education (90%), and 10 exercise-therapy (78%) sessions. Adequate staffing to support program delivery was a key enabler. *Maintenance:* Ninety-nine percent of sites (293/297) continued to offer the program in July 2020.

Conclusions

Training was associated with practice changes and widespread implementation of GLA:D® in Australia. Effective implementation, and clinically meaningful improvements in pain and quality of life for most participant, supports further work to scale up GLA:D® in Australia.

Contributions To The Literature

- This program evaluation provides insight into the cross-cultural adaptation and implementation of a novel program to facilitate effective guideline-based care in physiotherapy practice.
- Outcomes illustrate the effectiveness of education and skills-based training at a health professional level, and subsequent effective implementation of guideline based education and exercise-therapy for knee osteoarthritis.
- Use of the mixed-methods RE-AIM QuEST framework provides valuable insight to health professionals and health services considering the implementation of GLA:D® and other group-based education and exercise-therapy programs for chronic disease in their setting.

Background

Osteoarthritis affects more than 500 million people worldwide (1), with knee osteoarthritis contributing most to global disability (1). Associated pain and symptoms create substantial individual burden, including poorer health-related quality of life (QoL) (2, 3) and greater risk of chronic disease (heart disease, diabetes) development (4) compared to population norms. Disease trajectory for most involves stable or slow worsening of pain and symptoms (5–7). Guidelines (8–10) recommend patient education, exercise-therapy and weight management where indicated as first-line care for knee osteoarthritis. Patient education and exercise-therapy are cost-effective (11, 12) can avert surgery (13, 14) and have compelling evidence of effectiveness including moderate improvement in pain and function compared to control interventions, regardless of radiographic or pain severity (15–17).

More than half (57%) of the 2.2 million (9%) Australians with osteoarthritis do not access guideline-based care (18, 19), and referral rates from general practitioners (GPs) to exercise-therapy are less than 4% (20). This is despite evidence supporting the implementation of exercise-therapy existing since 2002 (17). In Australia, GPs are more likely to provide medications including opioids (10%) and refer for surgical opinion (12%) (20), which are considered inappropriate without first adequately trialling exercise-therapy (8–10). Most people in Australia with knee osteoarthritis referred for surgery have not received adequate education about osteoarthritis and treatment options (21, 22). Inadequate resourcing and workforce capacity are key drivers of this guideline-practice gap (23). For example, physiotherapists should provide patient education and exercise-therapy to people with knee osteoarthritis (24). Yet, they do not always provide this care (25, 26), and doctors report frustration about the lack of standardised care in Australia (22, 27).

In 2016, we adopted the Good Life with osteoArthritis from Denmark (GLA:D®) program (28, 29) to provide education, training courses and implementation support to deliver guideline-based patient education and exercise-therapy to Australian physiotherapists. GLA:D® requires physiotherapists to (i) deliver patient education (2–3 x 60–90 minute group sessions) and supervised exercise-therapy (12 x 60 minute group sessions) as a 'minimal intervention'; and (ii) facilitate collection of patient outcomes at baseline, post program (3-months) and 12-months (29–31). Physiotherapists can provide additional

intervention based on evidence and clinical reasoning (e.g. additional exercise and additional education, taping, manual therapy) if needed. GLA:D® has been delivered to more than 48,000 patients in Denmark (32), and is associated with clinically meaningful improvements in pain and joint-related quality of life 12-months following participation (29). All implementation and evaluation activities are funded through a cost-recovery model using physiotherapist training fees. Early evaluation of GLA:D® in Australia indicates the program is feasible (33), and associated with similar outcome to Denmark (34).

In this paper, we evaluate the implementation of GLA:D® within an Australian context. Guided by the RE-AIM QuEST (Qualitative Evaluation for Systematic Translation Reach Effectiveness Adoption Implementation Maintenance) framework (35), this program evaluation investigated (i) changes in physiotherapist's practices, beliefs about capabilities and confidence to provide patient education and exercise-therapy to people with knee osteoarthritis; (ii) outcomes of people with knee osteoarthritis participating in the program, including primary (pain, knee- and health-related quality of life), and secondary (surgical desire, functional performance) measures; and (iii) barriers and enablers to reach, implementation, adoption and maintenance of the program in Australian public and private settings. The learnings from this evaluation will guide and improve training programs for physiotherapists and initiatives to better support implementation of guideline-based care for knee osteoarthritis in Australia.

Methods

Study design

A cohort study of the implementation of the GLA:D® Australia physiotherapy training program was conducted between 2017–2020. Reporting was guided by the Standards for Reporting Implementation Studies (StaRI) checklist (36, 37). A detailed logic model of inputs, outputs and planned outcome evaluations related to the GLA:D® Australia program is provided in Additional file 1. This program evaluation, guided by the RE-AIM QuEST framework (35, 38), included consideration at system, health services, health professional, patient and program levels, as well as program factors. Data for this program evaluation were provided by three sources, including (i) physiotherapist surveys; (ii) the patient data registry; and (iii) a health service implementation registry managed by the GLA:D® Australia team.

Twenty-three GLAD® Australia physiotherapist training courses (2-days) were delivered between March 2017 and December 2019 (Melbourne = 12, Brisbane = 5 Perth = 2, Adelaide = 2, Sydney = 1, Darwin = 1). Each course involved pre- and post-workshop surveys evaluating knowledge and learning needs, didactic lectures regarding osteoarthritis management, practical sessions aimed at increasing skills to provide guideline-based patient education and exercise-therapy, training to contribute patient outcomes to the national registry, and group discussions about overcoming barriers to implementation. Each trained physiotherapist received an implementation manual, ready-to-use patient education materials (PowerPoint presentation and printable booklets), and access to other online implementation resource (e.g. flyers, letter templates for referring doctors).

To help clinicians and patients identify where GLA:D® Australia is available and determine program reach and context, geographical locations of health services who implemented GLA:D® Australia were recorded and published on the study website (www.gladaustralia.com.au). Type of service (hospital, community health centre, private clinic) was also recorded.

Participant recruitment and data collection

A total of 1,068 Australian Health Professional Regulation Agency registered physiotherapists (average group size = 46) were trained during this evaluation period. Following informed consent [Ethics approval provided by La Trobe University, S16-51], and prior to training, an investigator-developed survey was administered (Additional file 2). The survey, developed by the research team (CJB, JLK, JW, NL and KMC), was informed by clinical practice guidelines (8–10) and the theoretical domains framework (TDF) (39, 40). Questions explored (i) perceived capability, opportunity and motivation to provide patient education and exercise-therapy; and (ii) current practices and confidence to provide elements of GLA:D® to people with knee osteoarthritis. This survey was repeated 1-2-weeks post-training completion. A further survey sent at 12-months post-training to explore implementation barriers and enablers via open-ended questions was completed by 147 physiotherapist participants.

Trained physiotherapists provided GLA:D® to people presenting to the Australian healthcare system with knee and/or hip joint problems; imaging (e.g. Xray) was not required for diagnosis. People with other reasons for joint problems than osteoarthritis were excluded, including recent trauma, tumor, inflammatory joint disease (e.g. rheumatoid arthritis), and other symptoms that are more pronounced than osteoarthritis (e.g. chronic generalised pain, or fibromyalgia). Following enrolment, all program participants with proficiency in English language were registered on a secure online patient data registry facilitated by the Research Electronic Data Capture (REDCap) system, with an 'opt out' consent process.

Participants with knee osteoarthritis who completed baseline questionnaires were automatically emailed 3- and 12-month follow up questionnaires. The online patient registry was launched in January 2018, with ethical approval granted by La Trobe University's Human Ethics Research Committee (S17–193). Data collection for this program evaluation captured all patient participants commencing the program between January 1, 2018 and June 30, 2019 were included, allowing 12-month data follow ups by July 31, 2020. Primary and secondary patient reported outcome measures used for this program evaluation are shown in Table 1.

Table 1
Primary and secondary patient reported outcome measures.

DOMAIN	OUTCOME	DESCRIPTION
Primary patient reported outcomes		
Pain intensity	100mm VAS: average pain*	Using anchors of 'no pain' and 'worst pain imaginable', a valid, reliable and responsive measure (41).
Knee-related quality of life	KOOS-QoL	4-item scale providing scores ranging from 0 (worst) to 100 (best) points, which is reliable and responsive (42).
Health-related quality of life	EQ-5D-5L	Five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Five severity levels: "no problems", "slight problems", "moderate problems", "severe problems", and "extreme problems" describing 3125 distinct health states. Most widely used generic patient reported outcome, and is valid and reliable.(43) The EQ-5D-5L index was calculated using an an England-based value set (43) as it closely resembled the Australian population (44).
Secondary patient outcomes		
Surgery	Surgery desire	Determined through a custom developed question "Do you have so much pain and trouble from your knee that you want to have surgery?", with answers categorised as 'yes' or 'no'.
Functional performance	30 second chair-stand test	Recommended by the OARSI,(45) and administered by physiotherapists providing GLA:D® at baseline (prior to program commencement) and 3-month follow up.
Walking speed	40m fast-paced walk test	Recommended by the OARSI,(45) and administered by physiotherapists providing GLA:D® at baseline (prior to program commencement) and 3-month follow up.
* in previous month		
EQ-5D-5L = Euroqual 5 dimensions 5 level quality of life scale; KOOS-QoL = Knee Osteoarthritis Outcomes Score Quality of Life subscale; VAS = visual analogue scale		

Data analysis

Physiotherapist data were dichotomised for statistical analysis; agreement (strongly agree and agree) and other responses (neither agree nor disagree, disagree and strongly disagree); confident (very confident or confident) and other responses (average, below average and not confident at all); or frequently providing (all of the time and most of the time) and other responses (some of the time, rarely and never). Chi-squared statistics with Yates correction were used to determine significance of changes between pre- and post-training survey results. Effect sizes (ES) were calculated using Phi for 2x2

contingency table and Cramer's V for tables larger than 2x2 contingency table, and categorised as negligible (< 0.10), small (≥ 0.10), moderate (≥ 0.30) or large (≥ 0.50) (46).

Perceived implementation barriers and enablers among physiotherapists from 12-month surveys were coded using an inductive thematic analysis (47), with initial coding structure developed by KD, MF and CJB. Coding was refined and mapped to system, health services, health professional, patient, and program factors by KD and CJB.

A linear mixed model with age and sex as covariates, patient participants as a random effect and time (baseline, 3-month and 12-month) as fixed effect was applied to patient participant outcomes where appropriate; Bonferroni's post-hoc test was applied for multiple pairwise comparisons when appropriate. To aid clinical interpretation, a responder analysis was facilitated by calculating the proportion of patients achieving a minimal clinically important change (MIC) for each primary patient reported outcome – pain reduction (15mm) (48, 49), KOOS-QoL (15 points) (50), and EQ-5D-5L (0.07 for non-surgical patients) (51); and for anyone of the primary patient reported outcomes. Paired t-tests, were used to compare functional performance outcomes (chair stand and 40m timed fast walk) between baseline and 3-months. Effect sizes (and 95% confidence intervals) for pre/post comparisons were calculated with a correction for dependence among means applied by accounting for correlations between pre and post assessments into the Eq. (52), and interpreted as small (≥ 0.20), moderate (≥ 0.50) or large (≥ 0.80) (46). Effective implementation for patient outcomes was determined if moderate or greater ES occurred for pain and knee-related quality of life outcomes, and if small or greater ES occurred for health-relate quality of life outcomes (15–17, 53). Comparison of surgical desire between baseline and 3-months, and baseline and 12-months were made descriptively as proportions (percentage of respondents).

Results

Participants

Physiotherapists: 1,064 consented to use their survey data. Years of experience varied (< 5 = 34%, n = 362; 5–10 = 20%, n = 208; 11–15 = 11%, n = 113; >15 = 36%, n = 381), and 37% (397/1,064) reported completing post-graduate training (Masters or PhD). Survey completion rate post-training (typically within 2-weeks) was 35% (371/1,064).

Patients: 2,611 people with knee osteoarthritis entered the GLA:D® Australia registry between January 2018 and June 2019, with 1,945 (75%) completing baseline data collection. Average (SD) age, height, body mass and body mass index (BMI) of respondents was 65 (9) years, 1.67 (0.1) metres, 84 (18.7) kg, and 30.1 (6.4) kg/m^2. Of the 1,945 who provided baseline data, 1,044 (54%) and 927 (48%) completed 3- and 12-month follow up questionnaires, respectively. Knee surgery was reported by 2% (n = 23; 19 joint replacements [13 most affected side at baseline]; 3 arthroscopies [1 most affected side at baseline]; and 1 tibial osteotomy) and 9% (n = 86; 71 unilateral joint replacements [47 most affected side at baseline]; 7

bilateral joint replacements; 6 arthroscopies [2 most affected side at baseline]) at 3- and 12-months respectively.

Quantitative Evaluation Outcomes

Reach

Health professional: Approximately 7% of all Australian physiotherapists practising in the musculoskeletal field (1,068/14,462(54)) were trained between March 2017 and December 2019.

Patient: Approximately 0.1% of Australians with osteoarthritis (2,611/2.2 million(18)) participated in GLA:D® between January 2018 and June 2019.

Table 2 provides break down of public/private and geographical location for reach to health professionals and patients.

Table 2
Reach related to geography (state/territory) and setting
(public/private) at a physiotherapist and patient level.

	Physiotherapist	Patient
State/territory	n = 1,068	n = 1,945
Victoria	526 (49%)	1,109 (57%)
NSW	91 (9%)	128 (7%)
ACT	19 (2%)	43 (2%)
Queensland	151 (14%)	108 (6%)
Tasmania	23 (2%)	91 (5%)
South Australia	124 (12%)	249 (13%)
Northern Territory	20 (2%)	26 (1%)
Western Australia	108 (10%)	72 (4%)
Unknown	6 (< 1%)	119 (6%)
Setting	n = 1,028	n = 1,945
Private	746 (73%)	1,546 (79%)
Public	205 (20%)	290 (15%)
Public and private	77 (7%)	-
Unknown	-	109 (6%)
ACT = Australian Capital Territory; NSW = New South Wales.		

Effectiveness

Health professional: Training had a small effect on the number of physiotherapists discussing treatment goals (ES = 0.14), prescribing neuromuscular exercise (ES = 0.26), using supervised exercise (ES = 0.19), and discussing the importance of weight management (ES = 0.10) all or most of the time (Table 3). Training had a moderate effect on the proportion of physiotherapists believing they had been trained to deliver guideline recommended education and exercise-therapy (ES = 0.46), and small effect on perceived knowledge (ES = 0.27) and skills (ES = 0.27) to do so (Table 4). Training had a large effect on the proportion of physiotherapists confident to prescribe neuromuscular exercise (ES = 0.51); and moderate effect on the proportion of physiotherapists confident to provide education and exercise-therapy following guidelines when a patient is not motivated (ES = 0.43), provide education related to self-management (ES = 0.30) and physical activity (ES = 0.35), and discuss weight management (ES = 0.34) (Table 4). Detailed data related to physiotherapy survey outcomes, including 12-month follow-up in a sub-set of trained physiotherapists (n = 147), are presented in Additional file 3.

Table 3

Practice behaviours (*'all of the time'* or *'most of the time'*) related to treatment goals, neuromuscular exercise, supervised exercise, and weight management discussion.

Survey item	Baseline	Post-course	Baseline vs post-course effect size (p value)
Discuss treatment goals	87%	94%	0.14 (< 0.001)
Prescribe neuromuscular exercise	54%	81%	0.26 (< 0.001)
Refer to, or provide supervised exercise programs	53%	72%	0.19 (< 0.001)
Discuss the importance of weight management	55%	65%	0.10 (< 0.001)

Table 4

Beliefs about capabilities related to delivering education and exercise-therapy including elements of the GLA:D® Australia program to people with knee osteoarthritis.

	Baseline	Post-course	Baseline vs post-course effect size (p value)
Knowledge, training and skills			
I know how to deliver exercise and education to people with knee osteoarthritis following current guidelines	76%	100%	0.27 (< 0.001)
I have been trained in delivering exercise and education to people with knee osteoarthritis following current guidelines	48%	100%	0.46 (< 0.001)
I have the skills to deliver exercise and education to people with knee osteoarthritis following current guidelines	77%	99%	0.27 (< 0.001)
Confidence			
I am confident I can deliver exercise and education to people with knee osteoarthritis following current guidelines	76%	100%	0.27 (< 0.001)
I am confident I can deliver exercise and education to people with knee osteoarthritis following guidelines, even when the patient is not motivated	47%	94%	0.43 (< 0.001)
I am confident in prescribing neuromuscular exercise	39%	96%	0.51 (< 0.001)
I am confident in providing education related to-self management	69%	95%	0.30 (< 0.001)
I am confident in providing education related to physical activity participation	60%	94%	0.35 (< 0.001)

	Baseline	Post-course	Baseline vs post-course effect size (p value)
I am confident in discussing the importance of weight management	51%	85%	0.34 (< 0.001)

Patient: Group-level improvements at 3- and 12-months were moderate for average pain in the previous month (ES = 0.73 and 0.65; Fig. 1A), moderate-large for knee-related quality of life (0.79 and 0.93; Fig. 1B), and small for health-related quality of life (0.43 and 0.46; Fig. 1C) (Table 5). Minimal important changes were achieved for primary patient reported outcome measures by 49–56% at 3-months, and 52–55% at 12-months (Table 5). Seventy-three percent achieved MIC for at least one primary outcome at both 3-months (544/741), and 12-months (498/679).

Table 5
Pain, knee-related quality of life, and health related quality of life comparisons between baseline and 3-months, and baseline and 12-months.

	Baseline v 3-months			Baseline v 12-months		
	Mean difference (95% CI)	Effect size (95% CI)	Responders (n=)	Mean difference (95% CI)	Effect size (95% CI)	Responders (n=)*
Average pain in previous month (mm)	14 (11 to 18)	0.73 (62 to 0.84)	56% (398/716)	15 (11 to 18)	0.65 (0.54 to 0.77)	55% (357/653)
KOOS-QoL subscale	14 (11 to 17)	0.79 (0.69 to 0.90)	50% (363/731)	17 (14 to 20)	0.93 (0.81 to 1.04)	53% (356/668)
EQ-5D-5L	0.06 (0.04 to 0.08)	0.43 (0.31 to 0.54)	49% (337/682)	0.07 (0.04 to 0.10)	0.46 (0.35 to 0.58)	52% (326/624)
* number of responders/number of participants with adequate data at baseline and follow up to determine responsiveness						

Of 1,044 participants for whom 3-month follow up data were available, 198 (19%) desired surgery before commencing GLA:D®. Of these 198, 100 (51%) had not received surgery and no longer desired surgery at 3 months. Of the 927 participants for whom 12-month follow up data were available, 157 (17%) desired surgery before commencing GLA:D®. Of these 157 participants, 117 (74%) had not received surgery and no longer desired surgery at 12 months. Significant changes in functional performance occurred between baseline and 3-months including the 30-second chair stand (3.2; 2.8 to 3.6 repetitions, ES = 0.91 [0.78 to 1.04], p-value < 0.001) and walking speed during the 40m walk test (0.21; 0.16 to 0.26m/s, ES = 0.48 [0.36 to 0.60], p-value < 0.001) (Additional file 4).

Adoption

Health services: 297 sites (Victoria = 152, NSW = 34, Western Australia = 31, Queensland = 29, South Australia = 30, ACT = 9, Tasmania = 5, Northern Territory = 4) implemented GLA:D® Australia at December 2019 (settings: private = 264, 89%; and public = 33, 11%).

Health professional: 91% (337/371) of physiotherapists responding to the post course survey had implemented GLA:D® or intended to implement in the next 6-months. 79% (116/147) of physiotherapists who responded to the 12-month survey had implemented GLA:D® Australia.

Implementation

Patient: 90% completed at least one patient education session, and 78% completed at least 10 exercise-therapy sessions (Additional file 5).

Maintenance:
Health services: Of the 297 sites who implemented the GLA:D® Australia from 2017-19, 99% (n = 293) continued to offer the program in July 2020 (i.e. 6–39 months following implementation).

Qualitative Evaluation Outcomes

Key barrier and enabler findings from this GLA:D® Australia program evaluation, guided by the RE-AIM QuEST framework (35, 38), are provided in Table 6, with detailed findings including illustrative quotes available in Additional file 6.

Table 6
Key findings from the GLA:D® Australia program evaluation guided by the RE-AIM QuEST framework (35, 38).

Dimension	Barriers and Enablers (detailed findings in Additional file 5)	
Reach	**Barriers**	
	System: personal cost to patient.	
	Patient: patient motivation and commitment.	
	Program: suitability for CALD communities; suitability for patients with complex needs; COVID-19 (preventing face-to-face care).	
	Barriers/Enablers	
	System: public/private funding to support participation.	
	Health professional: referrer (e.g. GP) buy in.	
	Patient: patient demand; patient beliefs and understanding.	
	Program: program promotion and awareness; data and evidence.	
Effectiveness	**Barriers**	
	Patient: patient motivation and commitment.	
Adoption	**Barriers**	
	Health services: Conflicting managerial and organisational priorities; inadequate time to support program administration; rural/regional location.	
	Barriers/Enablers	
	Health services: Fit of program to current services; Equipment and physical space; scheduling.	
Implementation	**Barriers**	
	Program: program ethics and legal requirements.	
	Barriers/Enablers	
	Health services: staff resourcing and capacity to meet demand.	
	Enablers	
	Program: Developing materials for CALD groups; central program support; further professional development opportunity.	
Maintenance	**Barriers/Enablers**	
	Program: Access to staff training.	

Discussion

GLA:D® Australia training reached 7% of all Australian musculoskeletal physiotherapists (54) over a three year period. Training was associated with increased confidence to, and likelihood that physiotherapists would prescribe neuromuscular exercise, educate about self-management and physical activity, and discuss the importance of weight management all or most of the time. More physiotherapists believed they had the knowledge, skills and confidence to deliver patient education and exercise-therapy to people with knee osteoarthritis following training, and the majority adopted the GLA:D® program. Widespread implementation was indicated by 297 public and private sites across all Australian states and territories adopting the program. High education and exercise-therapy adherence, combined with moderate-to-large improvements in pain and knee-related quality of life, and small improvements in health-related quality of life following GLA:D® in Australia indicates effective implementation.

Pain and knee-related quality of life outcomes are consistent with clinical trials evaluating education and exercise-therapy (15–17, 53), implementation of GLA:D® in Denmark (29, 34) and Canada (34, 55), and other similar nationwide implementation initiatives (56, 57). Considering stable or slow worsening of pain and symptoms that typically occurs in the longer term for people with knee osteoarthritis (5–7), including in those receiving usual care in clinical trials (11), these improvements are important for people with knee osteoarthritis. Notably, 73% of participants reported minimal important changes in at least one of pain severity, knee-related quality of life, or health-related quality of life 12-months following GLA:D® participation. Although small, health-related quality of life improvements at 3- and 12-months may highlight the broader health and well-being benefits to Australians with knee osteoarthritis participating in GLA:D®. Further evaluation will determine if effective implementation of GLA:D® in Australia is sustained as the program is further scaled up.

Effective implementation of education and exercise-therapy through GLA:D® is further indicated by functional performance and walking speed improvements at 3-months. Additionally, 74% who desired surgery prior to GLA:D® Australia, had not undergone surgery and no longer desired surgery at 12-months. This real-world outcome is consistent with clinical trial findings reported by Skou et al, where 74% of people with moderate to severe knee osteoarthritis who received patient education, exercise-therapy and other non-surgical treatment prior to joint replacement surgery chose to forgo surgery at 12-months (13). Approximately 10% of our registry participants with knee osteoarthritis did report having knee surgery at 12-months, which is a higher rate than the 5% reported following GLA:D® in Denmark (29). Baseline demographics and pain severity, along with pain and quality of life outcomes are comparable between the two countries. Therefore, the reason for higher surgery rates in Australia requires further investigation with consideration to potential health system funding and cultural differences.

Effective implementation of education and exercise-therapy through GLA:D® is likely the result of multiple factors. At a health professional level, GLA:D® has a strong focus on skills-based training, which is an effective means to change physiotherapy practice (58–60). Standardisation of education and exercise-therapy through GLA:D® addresses variation in physiotherapy practice for osteoarthritis (25), which is desired by many surgeons, general practitioners and rheumatologists in Australia (22, 27).

Supporting evidence and data for the program is also considered a key enabler to improving program reach and trust from referrers. At a patient level, education, supervision of exercise-therapy to develop exercise skills, and guidance on appropriate progression and management of pain provided may be important to address key barriers to exercise participation in people with osteoarthritis (15, 61–63).

Despite evidence of effective implementation of education and exercise-therapy through GLA:D®, not all people with knee osteoarthritis improved. Approximately one in two participants reported changes above the threshold for minimal important changes for pain severity, knee-related quality of life, and health-related quality of life at 3- and 12-months. This variability in outcomes highlights the need to consider alternate or additional interventions beyond guideline-based programs such as GLA:D® where indicated. Previous detailed evaluation of the Danish GLA:D® registry could not predict outcomes with greater precision than the respective group average changes for pain, joint-related quality of life and function (64) Additionally, the presence of co-morbidities does not appear to influence potential to respond to GLA:D® (65). Thus, further work is encouraged to establish novel screening methods to identify non-responders for GLA:D®, and to test the effectiveness of alternate approaches to exercise-therapy (e.g. greater focus on aerobic exercise) or additional care in these people (e.g. psychology, diet, etc.).

GLA:D® Australia's reach to people with knee osteoarthritis in its first 18-months was small (0.1%: 2,611/~2.2 million). Improved funding to support program implementation and delivery will be key to making guideline-based programs like GLA:D® Australia's more accessible. Consistent with qualitative findings among patients and referrers (27), changing reimbursement models to improve access to GLA:D® Australia was a key suggested enabler. Further work is urgently needed to better understand barriers to changing reimbursement models for effective chronic disease programs like GLA:D® in Australia. A recent budget impact analysis indicates nationwide implementation of GLA:D® could translate to savings of more than $300 million to the Australian healthcare system annually (66).

Reach and adoption was more limited in public settings, with few trained physiotherapists (15%) and implementation sites (11%), and public funded participants making up just 15% of those entering the registry. Comparatively, 27% of Australian physiotherapists work in the public setting (54). Barriers to people with osteoarthritis accessing GLA:D® in Australia in public settings and contributing to the registry are priorities to address. Key initiatives that might increase reach in public settings include culturally and linguistically diverse (CALD) patient education resource development, and supporting legal and ethics requirements related to data collection. Additional barriers specific to public health implementation and adoption were also identified, including conflicting managerial and organisation priorities, fit of the program to current services, inadequate time to support administration, and capacity to provide staffing to support program delivery. Once adopted, maintenance at a health services level was strong, with 99% of the 297 public and private sites continuing to offer the program 6–39 months following implementation. This highlights the importance of ensuring adequate support is provided to various health services to overcome initial implementation barriers.

Addressing patient beliefs and understanding about osteoarthritis and treatment options, and facilitating referrer buy-in to improve program reach were key themes from physiotherapist surveys. Future education initiatives targeting health professionals and the community to address misinformation about osteoarthritis (27) and promote the value of education and exercise-therapy for knee osteoarthritis may help to improve the reach and effectiveness of GLA:D® in Australia to provide first-line care (27). Rapid and substantial increase in efforts to support osteoarthritis education from research and healthcare communities may also help address limited patient motivation and commitment to participate, which were identified as other key barriers to participation and program effectiveness.

Limitations and future directions

Follow-up responses rates were low for both physiotherapists (35%) and people with knee osteoarthritis (48% at 12-months), which is common in real-world implementation evaluations. As a comparison, evaluations of GLA:D® in Denmark, and the Better Management of osteoaAthritis (BOA) program in Sweden reported 12-month response rates of 68% (29) and 42% (56) respectively. Fidelity of treatment provided by trained physiotherapists was not evaluated, but underway following a published protocol (55). It is unclear what level of maintenance occurs at a health professional level. A recurrent accreditation process was implemented for GLA:D® Australia in 2020, which will provide greater insight into this.

This program evaluation focussed on knee osteoarthritis, but GLA:D® Australia is also implemented for people with hip osteoarthritis. Further evaluation is needed, and planned, to determine GLA:D® Australia's reach and effectiveness for people with hip osteoarthritis.

Our barriers and enablers evaluation were limited to physiotherapists attending training courses. Further evaluation with patients, other medical professionals (general practitioners, surgeons, etc.), organisational administrative staff, health insurance companies, and government policy makers is needed. The generalisability of findings from this study to provide insight into implementation at individual health services within Australia requires consideration, due to the large diversity in resources, staffing, funding for services, and surrounding community demographics.

Conclusion

Our evaluation of GLA:D® in Australia using the mixed-methods RE-AIM QuEST framework (35, 38) provides valuable insight to health professionals and health services considering the program in their setting. Targeted physiotherapist training provides physiotherapists with knowledge, skills and confidence to deliver guideline-based education and exercise-therapy. Reflecting effective implementation, delivering GLA:D® in Australia was associated with moderate effect for improvements in pain and knee-related quality of life, small effect for health-related quality of life, and reduced desire for surgery. Further work is warranted to address barriers, and to leverage enablers, in order to scale up GLA:D® Australia, particularly in public in settings.

Declarations

Ethics approval and consent to participate

Ethics approval for physiotherapists data collection was provided by La Trobe University's Human Ethics Research Committee (S16-51), with consent provided via a tick box on the first page of the online survey. Ethics approval for patient data collection was provided by La Trobe University's Human Ethics Research Committee (S17 – 193), with an online 'opt out' consent process.

Consent for publication

All authors consent to publication of this manuscript.

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Availability of data and materials

Efforts will be made to make data available, upon reasonable request.

Competing interests

CJB, JLK and KMC are program leads of GLA:D® Australia, which is a not for profit implementation initiative. Their institution has received payment for training GLA:D® practitioners. ER and STS are the co-founders of Good Life with Osteoarthritis in Denmark (GLA:D®), a not for profit initiative hosted at University of Southern Denmark aimed at implementing clinical guidelines for osteoarthritis in clinical practice. STS has received grants from The Lundbeck Foundation, personal fees from Munksgaard and TrustMe-ED, all of which are outside the submitted work. The authors affirm that they have no financial affiliation (including research funding) or involvement with any commercial organization that has a direct financial interest in any matter included in this manuscript, except as disclosed in an attachment and cited in the manuscript.

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Authors contributions

CJB, KMC, JLK and NAL conceived the program evaluation design. ER and STS are the founders of GLA:D® and trained and supported CJB, JLK and JW to train Australian physiotherapists to implement GLA:D® in Australia. CJB, JLK and JW facilitated all physiotherapists training. CJB, MF and KD facilitated survey data collection from physiotherapists. KMC, JLK, CJB, MF, and KD established and managed the patient data registry. CJB and MP completed quantitative data analysis. CJB, KD and MP completed qualitative data analysis. All authors contributed to, read and approved the final manuscript.

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