2018 GLA:D™ Canada Implementation and Outcomes

Annual Report

GLA:D™ CANADA

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Executive Summary GLA:D™ Canada - 2018

GLA:D™ Canada, is a community-based education and exercise program for people with hip and knee osteoarthritis (OA) that has been implemented across Canada. Since its inception:

- 19 training courses for health care providers (HCPs) were conducted, and 154 sites were actively implementing the GLA:D® program, across 7 provinces and one territory, Nunavut.
- 1634 people with hip (n=473) and knee (n=1161) OA have provided their data to the GLA:D database following their participation in GLAD.

Improved Participant Outcomes at 3- and 12- Month Follow-up:

- Pain improved significantly from baseline to 3 months ($p<0.001$), and from baseline to 12 months ($p<0.001$) for both hip and knee groups across three pain outcome measures.
- Most participants reported a clinically meaningful improvement in pain from participating in the GLA:D® program (≥ 15% improvement in numeric pain rating (NPR):

Completed Surveys (n=1,132)	**3-month follow-up (n=878)**		**12-month follow-up (n=257)**	
	Hip (n=266)	**Knee (n=609)**	**Hip (n=87)**	**Knee (n=170)**
15% to 29% improvement in pain	15.8%	11.0%	10.3%	11.2%
≥30% improvement in pain and/or zero pain	41.0%	52.5%	43.7%	49.4%

***** *differences measured from baseline using the numeric pain rating (NPR)*

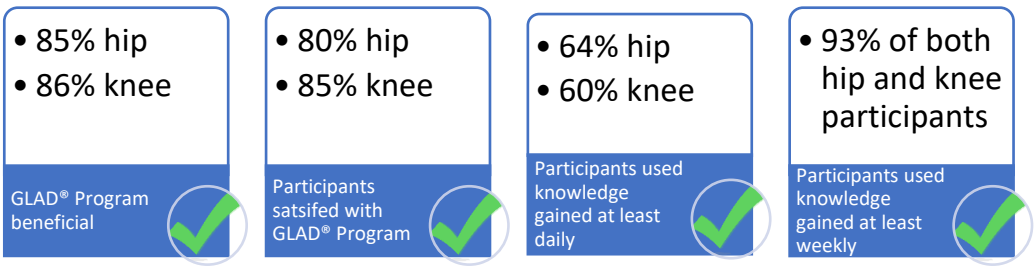
- Marked decreases were seen in the proportions of patients reporting that they were afraid of damaging their joint at the 3-month follow-up, with 47% and 50% reductions for hip and knee patients, respectively.
- Patients demonstrated significant improvements in the 30-second sit to stand test, and the 40-meter walk test ($p<0.001$).

High participation rates:

- Participation was high with 79% of participants attending 2+ education sessions; and 81% attended 11+ exercise sessions.

Participant benefits and satisfaction with the GLA:D® program

- Most participants found the GLA:D® program to be beneficial or very beneficial, and were satisfied or very satisfied with the program.



Based on program implementation by clinical sites and participant outcomes to date, the GLA:D® program is successfully supporting people with hip and knee OA to manage their symptoms, improve their function and advance their quality of life.


GLA:D

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What is GLA:D™ Canada?

Good**L**ife with osteo**A**rthritis in **D**enmark (GLA:D®)[1] is:

- an evidence-based education and personalized, targeted exercise program for people with symptomatic hip and or knee osteoarthritis (OA)
- a non-profit initiative developed at the University of Southern Denmark.
- introduced to Canada under the title GLA:D™ Canada in 2016 through an agreement with the Canadian Orthopaedic Foundation (COF).
- implemented by the COF under its knowledge translation division, Bone and Joint Canada (BJC).[2]
- adapted to the Canadian context through learnings facilitated from a feasibility study.[3]

The Key to Successfully Managing Osteoarthritis of the Hip and Knee

EDUCATION AND EXERCISE

- **EDUCATION** about osteoarthritis and managing pain through exercise improves knowledge and confidence in managing OA symptoms and functional challenges
- Reduced strength in the legs can increase osteoarthritis pain symptoms.
- Maintaining a level of physical activity through **EXERCISE** reduces pain and fear of movement, increases motivation to exercise, and improves one's quality of life.

Organizational Structure of GLA:D™ Canada

- GLA:D® activities are guided by leaders from each of the provinces where the program is implemented, as well as from organizations with a mandate for OA education and exercise.
- Within each province, a structure of the GLA:D® program developed to meet the needs of the provincial implementation strategy.
- The feasibility of the GLA:D® program was first evaluated and then implemented in the province of Ontario and is supported through funding from the Ontario Trillium Foundation (OTF).
- With interest from other provinces, sites implemented through other funding sources allowing GLA:D™ Canada to launch the program in the provinces/territories: Alberta, British Columbia, Manitoba, New Brunswick, Nova Scotia, Newfoundland and Nunavut.
- A full list of the funding sources and leaders from each province are provided in Appendix 1.

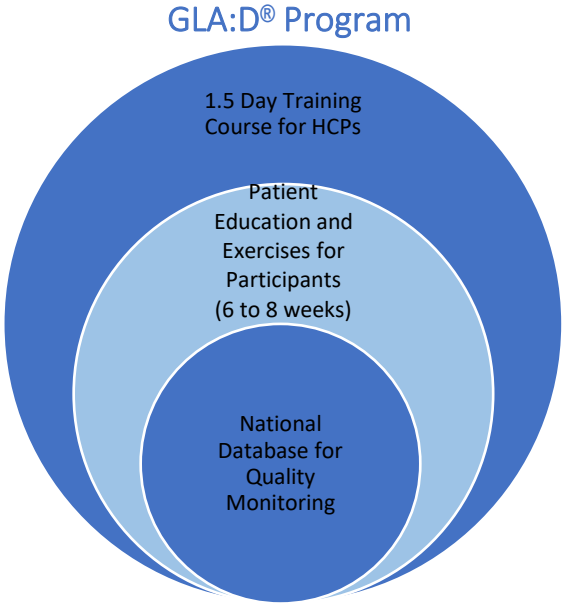
The Three Elements of the GLA:D® Program:

The Canadian program mirrors that in Denmark[1] and includes 3 components:

1. **A training course for health care providers (HCPs)**
   - HCPs participate in a 1.5-day course giving them the requisite skills to deliver the GLA:D® program.[4-6]
   - The training is appropriate for HCPs whose scope of practice includes clinical management of people with hip and knee OA through education and exercise (e.g. physiotherapists, chiropractors, kinesiologists, athletic therapists, exercise physiologists, personal trainers and nurses).

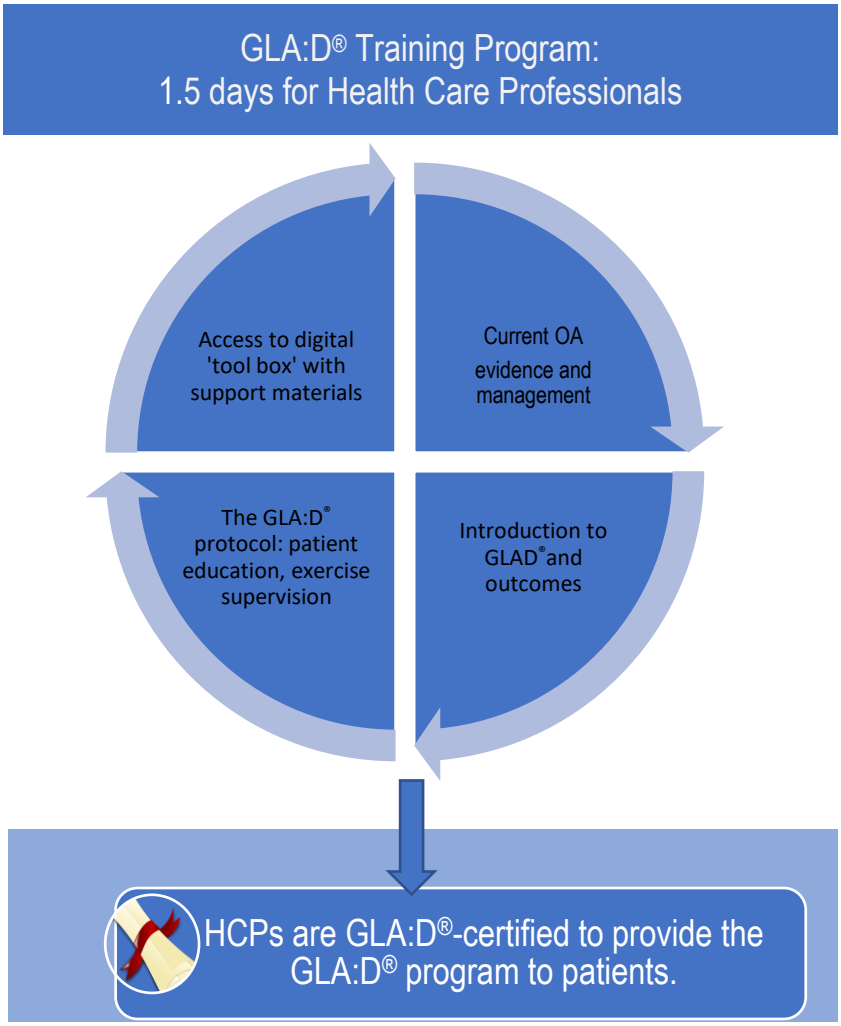
2. **Patient education and exercises**
   - Patients attending the GLA:D® program participate in 2 or 3 education sessions, and 12 sessions of supervised and individualized exercise.
   - Patients are strongly encouraged to participate in the group-based **NE**uro**M**uscular **EX**ercise program **(NEMEX)** for the 12 sessions as a group format enhances motivation and learning with peer-support.[7,8]
   - The patient education and exercise program is delivered over a 6-to-8 week period and the delivery processes are organized by each site optimizing logistics for the site and their patient population.

3. **The national (Canadian) database for quality monitoring**
   - Data from pre-program (baseline), 3- and 12-month follow-up are input into the national, electronic GLA:D® database.
   - Data include patient-reported, validated outcome measures and functional tests.
   - The database is designed to evaluate pain, function, quality of life as well as other outcomes at 3 and at 12-month follow-up.



Building Training Capacity Nationally

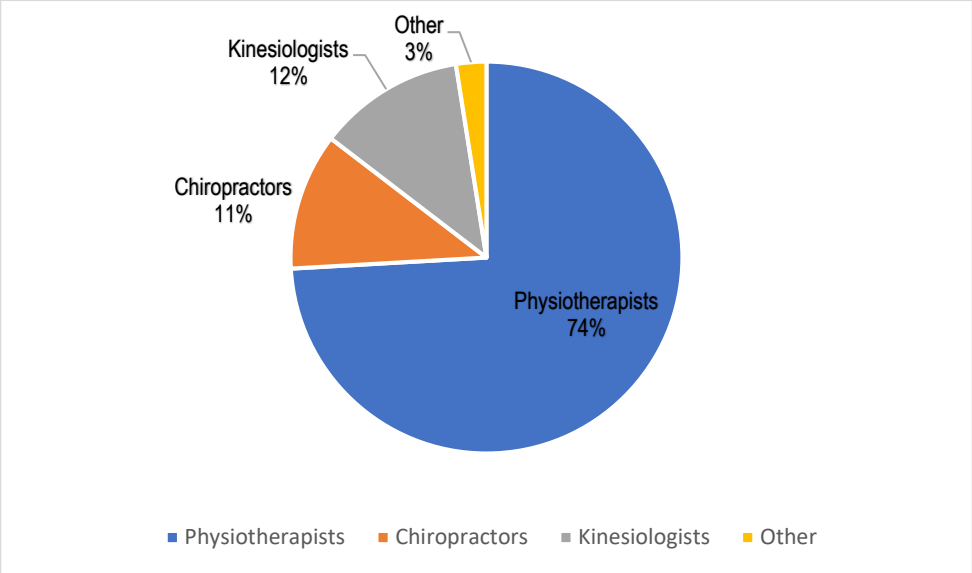
- There are now 4 researchers, 12 clinical staff who can teach HCPs to provide the GLA:D® program.
- Trainers include therapists who are knowledgeable of the evidence for OA management and therapists with expertise in exercise, neuromuscular exercise and delivery.
- The expertise of these trainers allows for a pairing of the scientists and clinical therapists for delivery of the course content.
- The trainers provide the 1.5-day GLA:D® training program to HCPs.
  The course includes:
  - current evidence on OA and its management
  - introduction to GLA:D® and overview of outcomes to date
  - instructions on the GLA:D® protocol, including delivering patient education, supervising and instructing exercise based on neuromuscular principles[7,8]
  - training on data entry into the electronic National GLA:D™ database
  - access to a digital 'tool box' with implementation support materials (e.g. Power Point presentations for use in patient education, etc.).
- HCPs who successfully complete the GLA:D® course are certified to provide the GLA:D® program to patients.



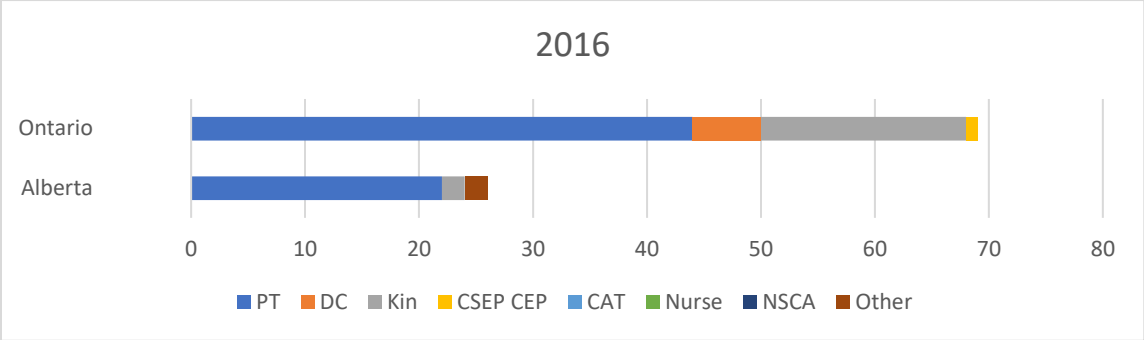
GLA:D® Program Implementation

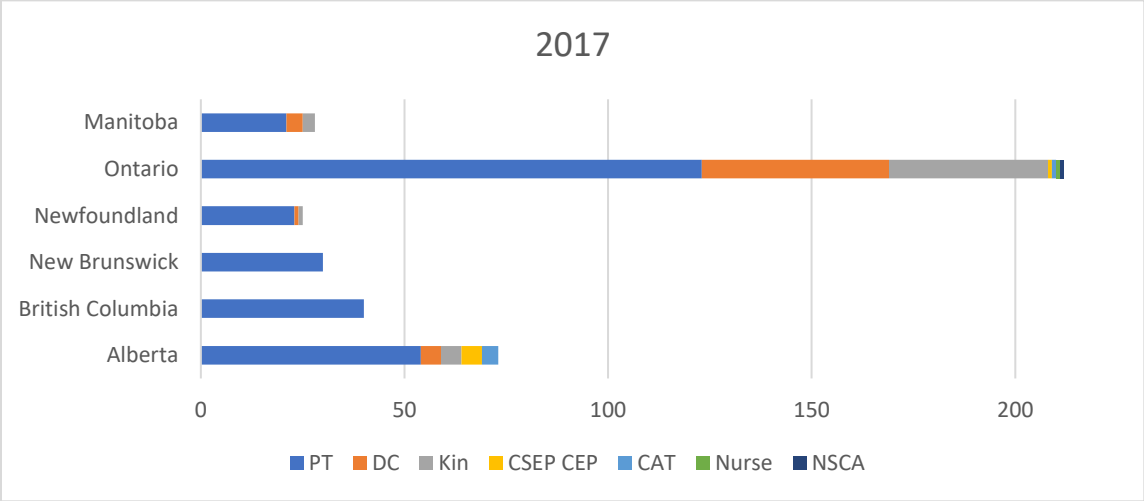
- To date, a total of 19 training courses were held through to the end of 2018 with 11 in Ontario, 2 in BC, 3 in Alberta, and 1 each in Manitoba, Nova Scotia, New Brunswick, and Newfoundland.
- In total, 760 health HCPs were trained in the GLA:D® program nationally.
- The majority were physiotherapists (74%); 11% were chiropractors and 12% were kinesiologists.
- Course evaluation data indicated that 93% of HCPs thought they were ready to deliver the GLA:D® program, 99% felt confident in providing instruction on alignment and exercise based on neuromuscular principles.
- 95% were confident in their ability to answer GLA:D® participants' questions.

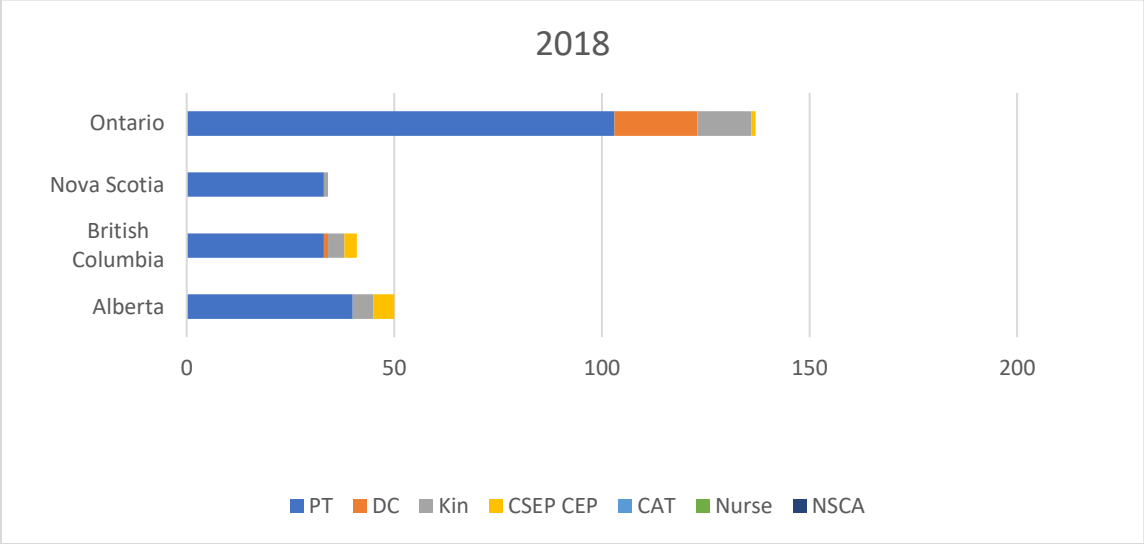
GLA:D™-Canada certified Health Care Providers Trained in Canada 2016-2018 (n=734)



Type of Health of Care Providers Completing GLA:D® Certification by Province 2016 to 2018





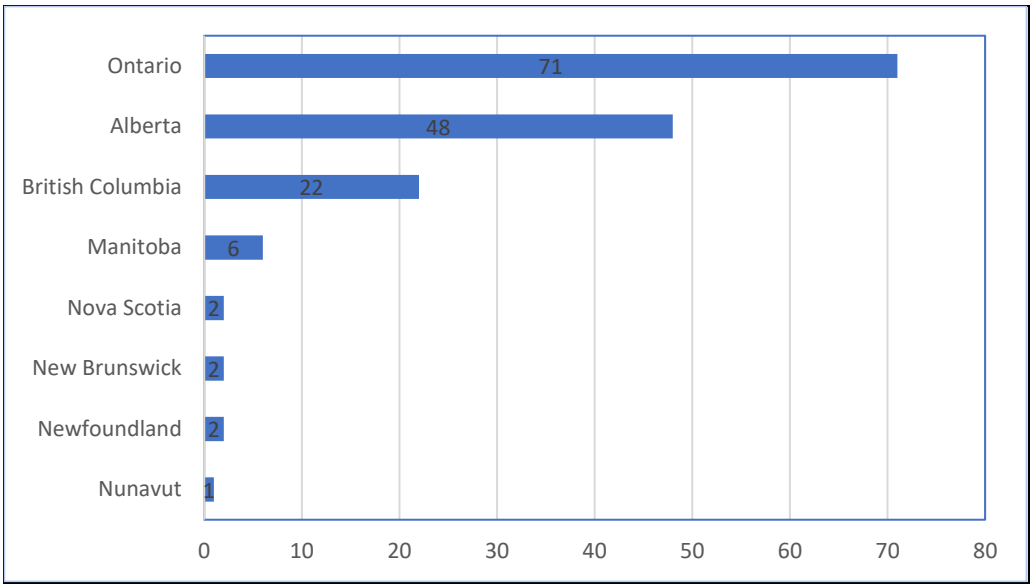


CAT=Certified Athletic Therapist; CSEP CEP=Canadian Society of Exercise Physiology – Certified Exercise Physiologist; DC=Chiropractor; Kin=Kinesiologist; NSCA= National Strength and Conditioning Association – Certified Personal Trainer; PT=Physiotherapist

GLA:D® Sites Launched

- By the end of 2018, 154 sites in 7 provinces and one territory had implemented the program.
- The majority of sites providing GLA:D™ Canada are in Ontario, Alberta and British Columbia.
- The launch requires the administrative processes to be undertaken by the site to add their facility and GLA:D®-certified HCPs into the database.
- GLA:D® sites are supported by the GLA:D™ Canada National team through email, phone calls and meetings with individuals who are in a management position and who have the authority and oversight of the HCPs.

The Number of GLA:D™ Canada Sites Across Canada (n=154)



Ensuring GLA:D® Program Quality

- Quality for the GLA:D® program is monitored on an ongoing basis and provides:
  - opportunity for patients to offer feedback through the website, and
  - input to GLA:D™ Canada team to ensure quality delivery of all program components

Three Key Components are Monitored and Evaluated in the GLA:D™ Canada Program

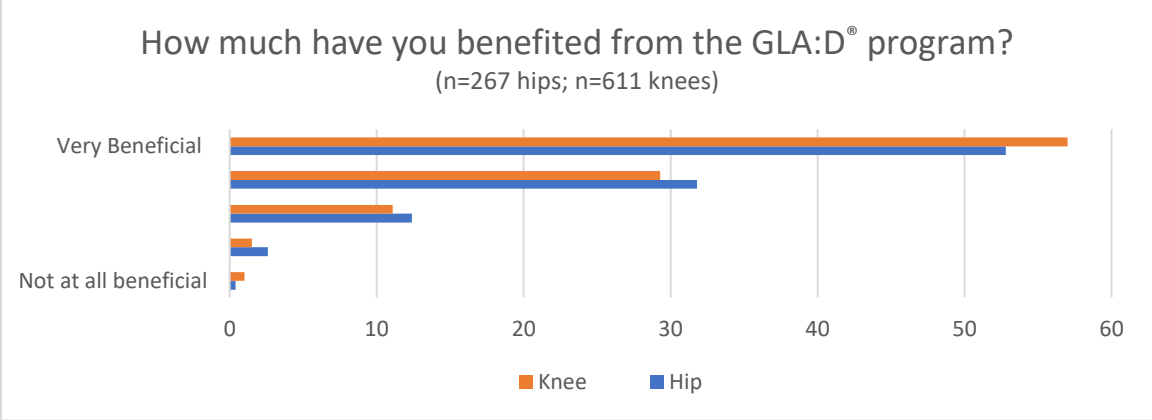
RESULTS WITH GLA:D®

1. Evaluating Patient Satisfaction

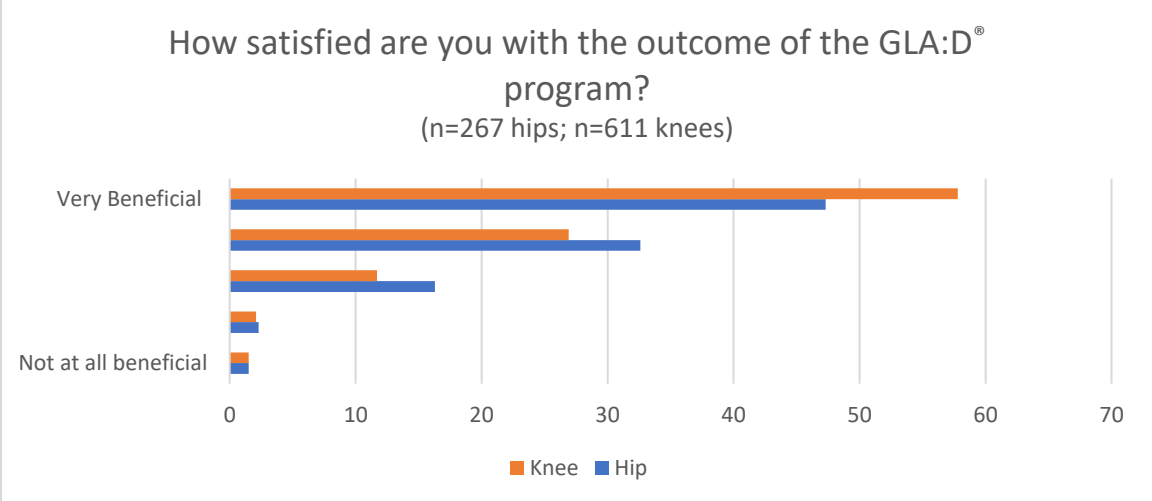
- Through 2018, a patient satisfaction survey was completed at the 3-month follow-up by 878 patients (267 hips and 611 knees).
- GLA:D ® program participation rates are high:
  - 3 education sessions: 79% attended 2+ sessions
  - 12 exercise sessions: 81% attended 11+ sessions
- Improvements described in levels of joint pain and strength after participation in the GLA:D® program.
- Other benefits reported by patients included improvements in balance, sleep quality, and energy levels.

At the 3-month point, the majority of participants reported feeling positively about the GLA:D® Program

- Overall, 85% hip participants and 86% of knee participants found the GLA:D® Program to be beneficial (based on a score of 4 or 5 points out of 5 on the Likert scale)



- Similarly, 80% hip participants and 85% of knee participants, were satisfied with the outcome of the GLA:D® Program (based on a score of 4 or 5 points out of 5 on the Likert scale)



Patient Complaints Process

- A complaints process was developed whereby patients are able to contact the GLA:D™ Canada team directly for any concerns that required immediate attention.
- In the 3 years of the OTF grant there has been one complaint by a GLA:D® participant.

2. Program Review

A system was developed to review the clinical sites to ensure they delivered the program as intended. A review was completed on sites in Ontario and Alberta that had treated more than 15 patients (3 sessions) through the program in 2018. The process developed ensured patient consent and the ability to complete the review using a remote connection, such as Skype or another remote technology, in order to maximize outreach and minimize costs.

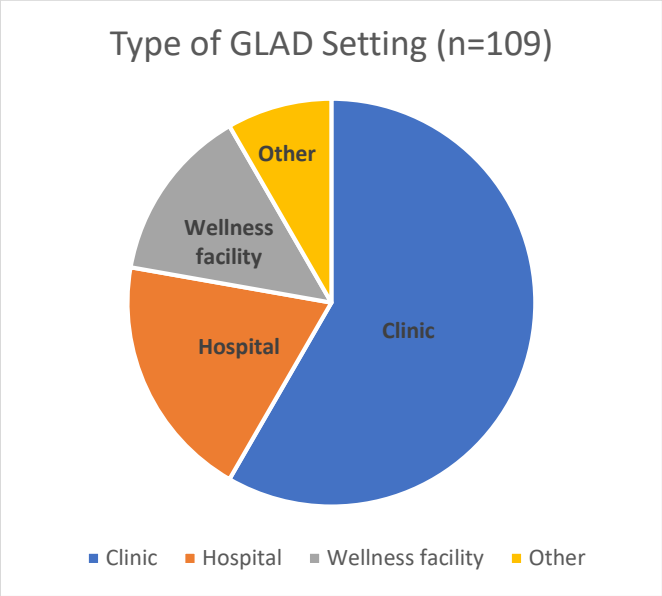
A review was completed at 6 sites in Ontario (4 on site and 2 remotely through Skype) and 4 sites in Alberta in 2018. All sites were providing the GLA:D® program as per the standard protocols.

3. Evaluation of the Communication Strategy

National Survey of GLA:D®-Certified Health Care Provider Survey

- The effectiveness of the communication strategy was evaluated with a survey of 252 GLA:D®-certified HCPs in December 2018.
- A total of 109 (43%) surveys were completed and returned.
- The survey consisted of 19 questions on the use of GLA:D® communication materials by HCPs and their preferred methods to promote the GLA:D® Program.
- The one-page GLA:D® education information sheet was the most used resource material for participants (79%). GLA:D® postcards, which provide information about the components of the program were the second most used communication material (54%).
- Word-of-mouth by participants in the GLA:D® program was the most commonly reported method of participant recruitment, highlighting the high level of patient satisfaction with the GLA:D® program.
- The documents developed for the GLA:D® program are updated annually. Most of the survey respondents (78%) reported accessing these updated documents annually.
- The GLA:D™ National Team develops a monthly GLA:D® newsletter with articles summarizing the latest OA research. This information was used and found helpful by 88% of survey respondents.

Survey Results:



Top 5 Communication Strategies used to Promote GLA:D® Program Enrollment

1. Word-of-mouth by GLA:D® participants
2. Distribution of standard GLA:D® materials
3. Adding GLA:D®-specific information to the setting's website
4. Advertising in doctor's offices
5. Providing GLA:D® materials to patients to take to their doctors

Survey Results Show that GLA:D® Program Communication Materials are Widely Used by HCPs.

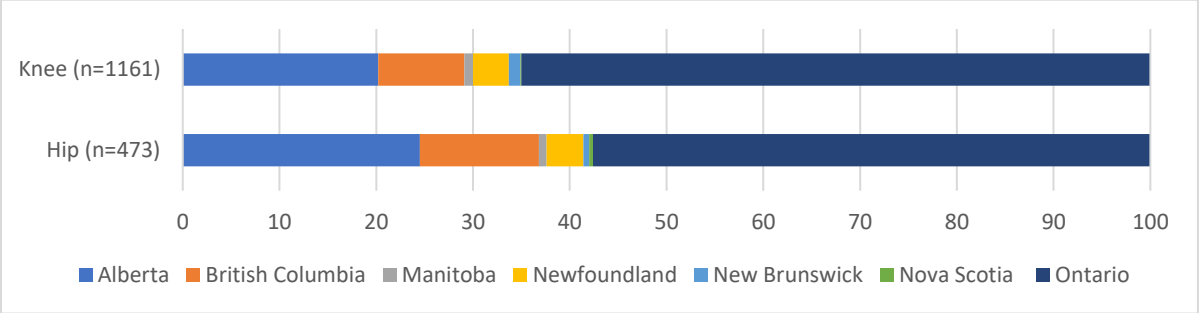
Participant Characteristics in the GLA:D® Program at Baseline Assessment

- By the end of December 2018, 1,634 participants enrolled in the GLAD™ Canada quality monitoring program and are analyzed from information entered into the national database by patients.

- These 1634 GLA:D® program participants are in 7 provinces: New Brunswick, Nova Scotia, Newfoundland, Manitoba, Ontario, Alberta, British Columbia.

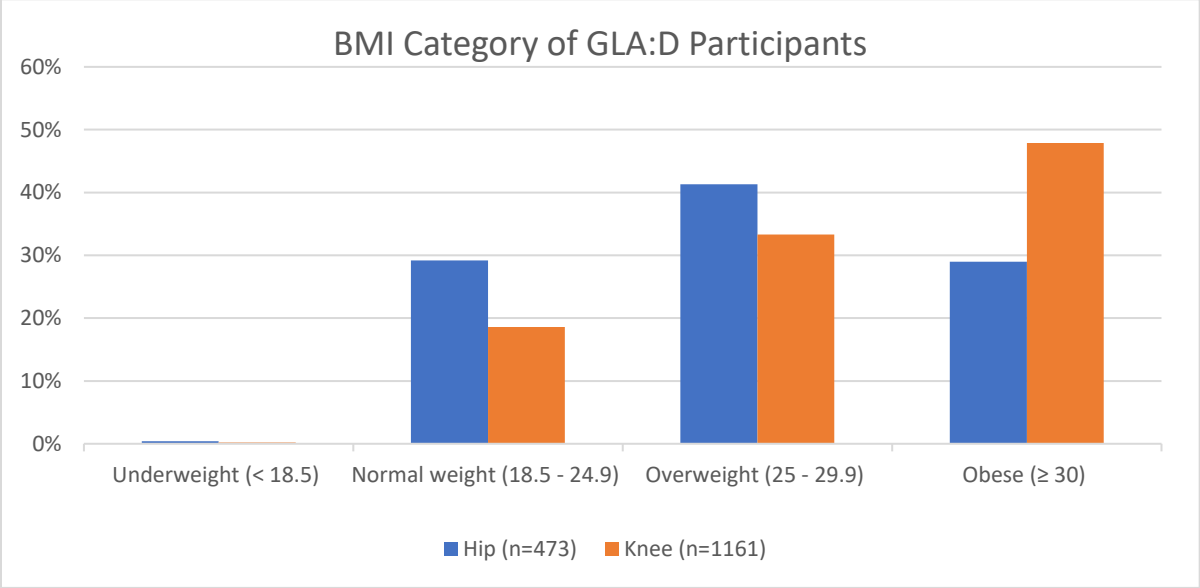
- Of note, additional patients may have registered but are not part of the quality monitoring program evaluated through the national database. A primary aim of GLA:D™ Canada was to offer the opportunity for patients to receive the specific type of comprehensive OA care offered by the GLA:D® program. Due to complexities in launching data collection between provinces, the GLA:D® program was launched at some sites to meet people's clinical needs, even where there is no data collection.

National Distribution of GLA:D® Program Participants from 2016 to 2018 (n=1634)



Participant Characteristics in the GLA:D® Program at Baseline Assessment - continued

- Appendix 2 summarizes the baseline characteristics of GLA:D® participants.
- Of the 1,634 participants providing data at baseline, 473 (29%) reported their hip was their most problematic joint, and 1,161 (71%) reported their knee was most problematic.
- Most participants were female in both groups (72% female vs. male 28.3% in the hip group, and 79% female vs. 21% male in the knee group).
- The mean age was similar in both the hip and knee groups: 65 (±8.6) years.
- Overall, in both the hip and knee groups, approximately 60% were retired and 3% were on leave receiving sick benefits.



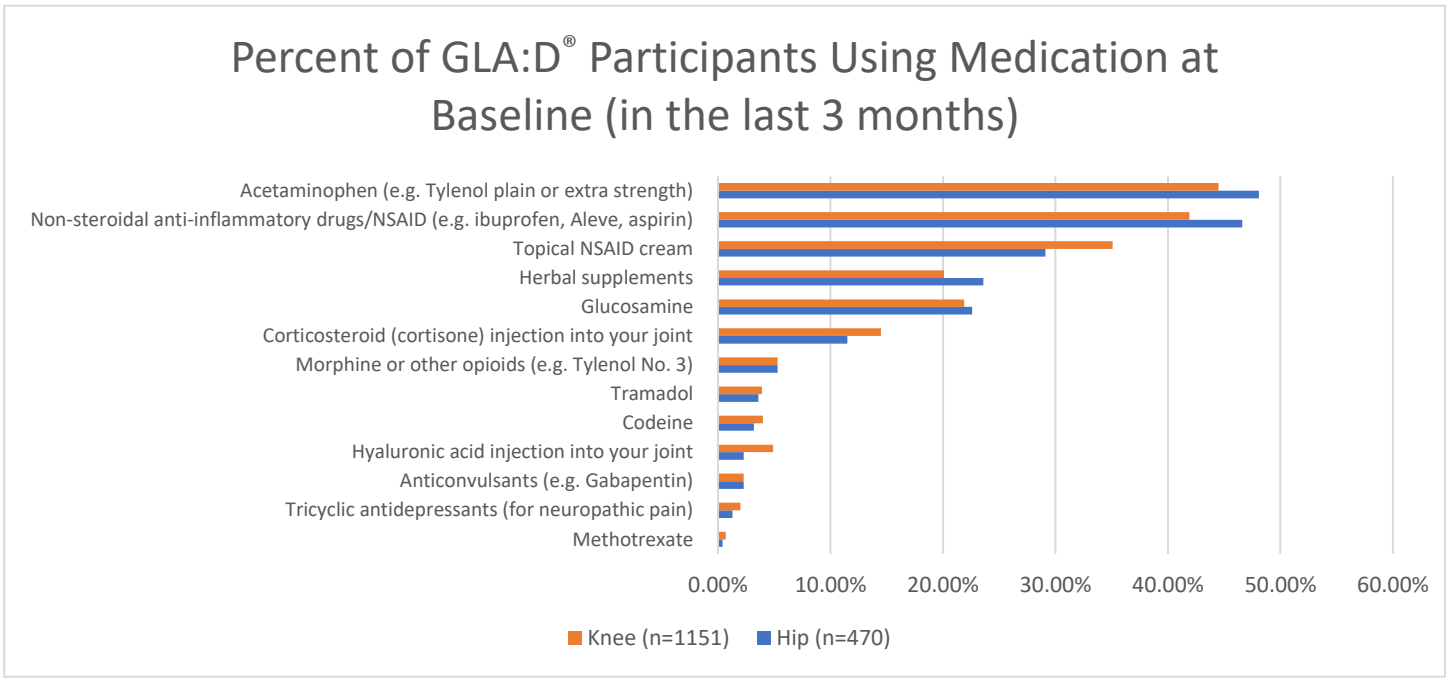
- The majority of participants were overweight or obese (70.5% in the hip group, and 81.2% in the knee group).
- Both groups had a mean BMI in the overweight category >25 kg/m^2. Hip patients on average had a BMI of 28.2 kg/m^2, whereas knee participants on average were overweight with a BMI of 30.8 kg/m^2.

Mean Duration of Symptoms in Affected Hip/Knee (years)

- Hip Group (n=467) = 4.8 years
- Knee Group (n=1,143) = 6.2 years

Medication Use at Baseline

- Acetaminophen was the most widely used medication at baseline assessment. Percent of GLA:D® participants using medication at baseline (in the last 3 months)



Reduced Pain at 3- and 12- Month Follow-up

- Patient-reported pain was assessed using:
    - The numeric pain rating scale (NPR)[9]
    - The Hip Disability and Osteoarthritis Outcome Score (HOOS)[10] – Pain Subscale
    - The Knee Injury and Osteoarthritis Outcome Score (KOOS)[11] – Pain Subscale

- Pain improved significantly from baseline to 3 months ($p<0.001$), and from baseline to 12 months ($p<0.001$) for both hip and knee groups across all three outcome measures.

Mean Percent Improvement in Pain

Measure	Group	Follow-up time	N	Mean percent improvement	p value (FDR-adjusted)
Numeric pain rating[1]	Hip	3 months	266	24.0%	<0.001 (<0.001)
		12 months	87	26.1%	<0.001 (0.001)
	Knee	3 months	609	31.4%	<0.001 (<0.001)
		12 months	170	28.8%	<0.001 (<0.001)
HOOS[2] - Pain subscale	Hip	3 months	265	10.2%	<0.001 (<0.001)
		12 months	87	17.2%	<0.001(<0.001)
KOOS[2] - Pain subscale	Knee	3 months	610	11.0%	<0.001(<0.001)
		12 months	169	14.6%	<0.001(<0.001)

[1]NPR: (0=no pain, 10=most extreme pain);
[2]HOOS/KOOS: (0=extreme symptoms, 100=no symptoms)
Paired hypothesis tests (paired t-test, McNemar's chi-square test, or paired Wilcoxon signed-rank test as appropriate) were used to compare initial versus outcome values. Given the large number of comparisons, p-values adjusted for false discovery rate are presented along with the actual p-values.
FDR= False discovery rate (p-value correction for multiple comparisons)

Proportion of GLA:D® Participants with Clinically Meaningful Improvement in Pain at the 3- and 12- Month Follow-up

- Most participants reported a clinically meaningful improvement in pain from participating in the GLA:D® program (≥ 15% improvement in NPR):

Completed Surveys (n=1,132)	3-month follow-up (n=878)		12-month follow-up (n=257)	
	Hip (n=266)	Knee (n=609)	Hip (n=87)	Knee (n=170)
15% to 29% improvement in pain	15.8%	11.0%	10.3%	11.2%
≥30% improvement in pain and/or zero pain	41.0%	52.5%	43.7%	49.4%

***** *differences measured from baseline using the numeric pain rating (NPR)*

Improved Quality of Life, Activities of Daily Living, and Sports/Recreation

- Patient-reported quality of life was assessed using the HOOS/KOOS subscales for Activities of Daily Living (ADL), Quality of Life, and Sports/Recreation.

Mean Percent Improvement

- All three HOOS/KOOS subscale outcomes showed improvements from baseline to 3 months ($p<0.01$), and from baseline to 12 months ($p<0.05$) for both hip and knee groups.

HOOS/KOOS Subscales	Group	Follow-up time	N	Mean percent improvement	p value (FDR-adjusted)
Quality of Life	Hip	3 months	264	15.2%	<0.001 (<0.001)
		12 months	86	22.8%	<0.001 (0.003)
	Knee	3 months	609	20.9%	<0.001 (<0.001)
		12 months	170	33.9%	<0.001 (<0.001)
Activities of Daily Living	Hip	3 months	266	6.2%	<0.001 (<0.001)
		12 months	87	10.0%	0.008 (0.026)
	Knee	3 months	609	8.7%	<0.001(<0.001)
		12 months	169	11.5%	<0.001(<0.001)
Sports/ Recreation	Hip	3 months	265	8.5%	0.001 (0.006)
		12 months	85	21.6%	0.004 (0.015)
	Knee	3 months	609	22.4%	<0.001(<0.001)
		12 months		35.1%	<0.001(<0.001)

Paired hypothesis tests (paired t-test, McNemar's chi-square test, or paired Wilcoxon signed-rank test as appropriate) were used to compare initial versus outcome values. Given the large number of comparisons, p-values adjusted for false discovery rate are presented along with the actual p-values.
FDR= False discovery rate (p-value correction for multiple comparisons)

Proportion of Patients Reporting Improvements in HOOS/KOOS Subscales at the 3- and 12- Month Follow-up.

- Most participants in the GLA:D® program reported modest or marked improvements in their activities of daily living, quality of life and sports and recreation activities at the 3-month and 12-month follow-up.

HOOS/KOOS Scores		Hip		Knee	
		3 months	12 months	3 months	12 months
Activities of Daily Living	No change or worsened	38.7% (103)	37.9% (33)	33.3% (203)	32.0% (54)
	Negligible improvement (0.1 - 4.9 pt)	19.2% (51)	12.6% (11)	16.7% (102)	12.4% (21)
	Modest improvement (5 - 9.9 pt)	12.8% (34)	11.5% (10)	15.8% (96)	11.8% (20)
	Marked improvement (≥ 10 pt and/or perfect score)	29.3% (78)	37.9% (33)	34.2% (208)	43.8% (74)
Quality of Life	No change or worsened	44.3% (117)	44.2% (38)	38.6% (235)	34.9% (59)
	Negligible improvement (0.1 - 4.9 pt)	0.0% (0)	0.0% (0)	0.7% (4)	0.0% (0)
	Modest improvement (5 - 9.9 pt)	17.4% (46)	10.5% (9)	16.9% (103)	13.6% (23)
	Marked improvement (≥ 10 pt and/or perfect score)	38.3% (101)	45.3% (39)	43.8% (267)	51.5% (87)
Sports/ recreation	No change or worsened	51.7% (137)	45.9% (39)	47.6% (290)	46.7% (79)
	Negligible improvement (0.1 - 4.9 pt)	0.4% (1)	0.0% (0)	0.2% (1)	0.0% (0)
	Modest improvement (5 - 9.9 pt)	14.7% (39)	8.2% (7)	12.5% (76)	5.9% (10)
	Marked improvement (≥ 10 pt and/or perfect score)	33.2% (88)	45.9% (39)	39.7% (242)	47.3% (80)

Pt=points

Improvements in Function

- Patients demonstrated significant improvements ($p<0.001$) from their first session to their last session in both the number of chair stands in 30 seconds and walking speed using the 40-meter walk test.
- Neither hip nor knee patients reported significant changes in the days they were physically active per week, either at 3 months or 12 months post follow-up.

Reduced Use of Pain Medication Among Participants in the Knee Group

- Hip participants reported no significant changes from baseline in use of any medications, either at 3 months or 12 months after enrollment.
- In contrast, 12 months after enrollment, knee participants were significantly less likely to report using any medications in the prior three months compared to their baseline use.
- Knee patients also reported significantly less use of injections in the prior three months at both 3- and 12-months post-enrollment, as compared to baseline.

Body Mass Index

- Hip participants reported significant decreases from baseline BMI at both the 3-month and 12-month follow-up; knee participants reported a significant decrease at 12 months but no significant change at 3 months.
- A significant decrease was observed in the proportion of knee participants who were obese 12 months after enrollment.

Osteoarthritis Knowledge and Arthritis Self-Efficacy

- Both hip and knee participants demonstrated significant improvement in OA knowledge and self-efficacy scores from baseline to 3 months.

Fear of Damaging Joint

- Marked decreases were seen in the proportions of patients reporting that they were afraid of damaging their joint at the 3-month follow-up, with 47% and 50% reductions for hip and knee patients, respectively.

Perceived Benefit of the GLAD® Program

- At the 3-month follow-up:
  - 85% of hip participants and 86% of knee participants reported that the program was beneficial.
  - 80% of hip participants and 85% of knee participants reported that they were satisfied with the program.
- The majority of participants reported that they were using knowledge gained from the program at least daily (64% of hip participants and 60% of knee participants).
- The vast majority of both groups reported using knowledge from the program at least weekly (93% of both hip and knee participants).
- More than one-fifth of respondents (22% of the hip group and 21% of the knee group) reported that they would be willing to pay at least $300 to participate in GLA:D Canada.

Towards Sustainability: Building Evidence and Supporting Spread

Throughout the 3-year GLA:D® project funded by the Ontario Trillium Foundation, building sustainability of the GLA:D® program was achieved by integrating it into the Canadian Health care system.

- The GLA:D® project has resulted in benefits beyond the original scope of the project including:
  - Implementation in 7 provinces and 1 territory.
  - Health Technologies Assessment that shows the program is of benefit to patients and cost effective to the Ontario health care system[12]
  - A pilot project of publicly funded implementation in 3 Local Health Integrated Networks in Ontario
  - Aligning implementation in 4 other countries to improve care for individuals with hip and knee OA

- A communication strategy was developed to promote information about the GLA:D™ Canada program to appropriate stakeholders. The initial focus was on HCPs who can implement the program to inform them of the program and allow them to better understand the needs of individuals experiencing OA. Broader communications are ongoing to build potential referral sources including orthopaedic surgeons, rheumatologists and primary care physicians across the provinces.

Summary: GLA:D™ Canada 2018

- By the end of 2018, a total of 760 HCPs from various professions had completed their GLA:D® training and 154 sites, in 7 provinces and one site in the territory of Nunavut, offered the GLA:D® program in both the public and private sectors.

- To December 2018, 1,634 participants were enrolled in the national database as part of the quality monitoring program.

- With the collection of three years of participant outcomes via a national database, several key findings are emerging. These include:

    - **Reduction in Pain:** On average participants with hip and knee OA reported a 30% improvement in pain.

    - **Improved Quality of Life:** Measures improved significantly from baseline to 3 months, and from baseline to 12 months for both hip and knee groups.

    - **Improved Function:** Patients reported significant improvements ($p<0.001$) from their first session to their last session in both number of chair stands and walking speed.

    - **Decreases in Body Mass Index:** Hip participants reported significant decreases from baseline BMI at both 3 months and 12 months. Of note, a significant proportion of knee participants changed from obese to non-obese 12 months after enrollment ($P=0.028$).

- The Canadian outcomes over three years continue to show improvements in pain, quality of life and functional tests and are reflective of the type and magnitude of the findings reported in Denmark.[1,13]

- Based on program implementation by clinical sites and participant outcomes to date, the GLA:D® program is successfully supporting people with hip and knee OA to manage their symptoms, improve their function and enhance their quality of life.

- As part of its quality evaluation initiative, the GLA:D™ Canada National team sent out a survey regarding communication strategies that were implemented by HCPs providing the GLA:D® program. Respondents reported high satisfaction with the support they were receiving through the communications materials provided, as well as a strong interest in receiving information via a monthly newsletter and updates on the latest research in OA.

- Word-of-mouth by participants in the GLA:D® program is the most commonly reported method of participant recruitment, highlighting the high level of patient satisfaction with the GLA:D® program.

Appendix 1:

GLA:D™ Canada Leadership Team (Ontario)

Aileen Davis	Senior Scientist and Division Head	Division of Health Care and Outcomes Research Krembil Research Institute University Health Network, and Professor, University of Toronto
Rhona McGlasson	Executive Director	Bone and Joint Canada
Isla Horvath	Executive Director and Chief Executive Officer	Canadian Orthopaedic Foundation
Michael Zywiel	Orthopaedic Surgeon and Assistant Professor of Surgery	Division of Orthopaedic Surgery, Arthritis Program, University Health Network Department of Surgery, University of Toronto Institute of Health Policy, Management and Evaluation, University of Toronto

GLA:D™ Canada Ontario Steering Committee

Aileen Davis	Senior Scientist and Division Head	Division of Health Care and Outcomes Research Krembil Research Institute University Health Network, and Professor, University of Toronto
Rhona McGlasson	Executive Director	Bone and Joint Canada
Isla Horvath	Executive Director and Chief Executive Officer	Canadian Orthopaedic Foundation
Ed Ziesmann	Vice President, Education, Programs & Services	The Arthritis Society
Deborah Kennedy	Manager Rehabilitation	Holland Arthritic and Orthopaedic Centre Sunnybrook Health Sciences Centre, Toronto
Krista McIntyre	National Director of Program	Lifemark
David Blevins	Patient Representative	
Amanda Smart	Director	Practice, Policy, Member Ontario Physiotherapy Association
Jennifer Nash	Community Outreach Coordinator	Ontario Chiropractic Association
Melanie Burgess	Director, Events & Sponsorship	The Arthritis Society
Rob Petrella	Professor School of Kinesiology and Western Centre for Public Health and Family Medicine	University of Western Ontario

GLA:D™ Canada National Steering Committee

Aileen Davis	Senior Scientist and Division Head	Division of Health Care and Outcomes Research Krembil Research Institute University Health Network, and Professor, University of Toronto, Toronto
Rhona McGlasson	Executive Director	Bone and Joint Canada
Jill Robert	Senior Provincial Director Surgery and Bone & Joint Health Strategic Clinical Networks	Alberta Health Services Alberta
Isla Horvath	Executive Director and Chief Executive Officer	Canadian Orthopaedic Foundation
Ed Ziesmann	Vice President, Education, Programs & Services	The Arthritis Society
Deborah Marshall	Health Technology Assessment and Research	University of Calgary, Department of Community Health Sciences
Cathy Hoyles	Regional Professional Practice Consultant, Physiotherapy	Eastern Health, St. John's, Newfoundland and Labrador
Nancy Cho	Practice Lead, Physiotherapy	Vancouver Coastal Health, British Columbia
Laurie Walus	Manager, Rehabilitation Clinic & Hip & Knee Resource Centre, Surgery Program & Director of Special Projects	Winnipeg Regional Health Authority, Manitoba
Mel Slomp	Executive Director Bone and Joint Health- Strategic Clinical Network	Alberta Health Services, Alberta
Deborah Kennedy	Manager Rehabilitation	Holland Arthritic and Orthopaedic Centre Sunnybrook Health Sciences Centre, Toronto
Ewa Roos	Professor and Head of Research Unit, Department of Sports Science and Clinical Biomechanics	University of Southern Denmark, Denmark

Appendix 2: Participant Characteristics and Outcomes

1. GLA:D Canada: Patient-Reported Participation and Satisfaction Measures at 3-Month Follow-up

Measure	Category	Hip N = 267	Knee N = 611
How much have you benefited from the GLA:D program?	1 - Not at all beneficial	0.4% (1)	1.0% (6)
	2	2.6% (7)	1.5% (9)
	3 - Neutral	12.4% (33)	11.1% (68)
	4	31.8% (85)	29.3% (179)
	5 - Very beneficial	52.8% (141)	57.0% (348)
	Not reported	— (0)	— (1)
How often do you use what you have learned from the GLA:D program in your daily life?	Never	1.9% (5)	2.0% (12)
	Every month	2.2% (6)	2.1% (13)
	Every week	29.2% (78)	32.4% (198)
	Every day	52.4% (140)	48.8% (298)
	Several times a day	11.2% (30)	11.3% (69)
	Don't know	3.0% (8)	3.4% (21)
How satisfied are you with the outcome of the GLA:D program?	1 - Not at all satisfied	1.5% (4)	1.5% (9)
	2	2.3% (6)	2.1% (13)
	3 - Neutral	16.3% (43)	11.7% (71)
	4	32.6% (86)	26.9% (163)
	5 - Very satisfied	47.3% (125)	57.8% (350)
	Not reported	— (3)	— (5)

Source: GLA:D™ Canada website

2. Type of Health of Care Providers Completing GLA:D® Certification by Province from 2016 to 2018

Year	Cities in Ontario	No. of HCPs Trained for GLA:D®	PT	DC	Kin	CSEP CEP	CAT	Nurse	NSCA	Other
2016	**Alberta**									
	Edmonton	26*	22	--	2	--	--	--	--	2
	Ontario									
	Brantford Jun 11-12, 2016	20	16	2	2	--	--	--	--	--
	London Nov 19-20, 2016	25	15	2	8	--	--	--	--	--
	Toronto Sept 19-20 2016	24	13	2	8	1	---	--	--	--
2017	**Alberta**									
	Calgary Sep 30-Oct 1, 2017	68	54	5	5	4	--	--	--	--
	British Columbia									
	Vancouver Feb 17-18, 2017	40	40	--	--	--	--	--	--	--
	New Brunswick									
	St. John Apr 22-23, 2017	30	30	--	--	--	--	--	--	--
	Newfoundland									
	St. John's Nov 18-19, 2017	25	23	1	1	--	--	--	--	--
	Ontario									
	Toronto Jan 28-29, 2017	48	37	1	9	--	--	--	1	--
	Ottawa Mar 4-5, 2017	32	23	7	1	--	--	1	--	--
	North Bay Apr 1-2, 2017	20	12	6	2	--	--	--	--	--
	Etobicoke May 27-28, 2017	39	18	16	3	1	1	--	--	--
	Waterloo Oct 21-22, 2017	73	33	16	24	--	--	--	--	--
	Manitoba									
	Winnipeg Jun 24-25, 2017	28	21	4	3	--	--	--	--	--
2018	**Alberta**									
	Edmonton Oct 13-14, 2018	50	40	--	5	5	--	--	--	--
	British Columbia									
	Richmond Mar 24-25, 2018	41	33	1	4	3	--	--	--	--
	Nova Scotia									
	Halifax Apr 14-18, 2018	34	33	--	1	--	--	--	--	--
	Ontario									
	Toronto Jan 27-28, 2018	70	53	11	6	--	--	--	--	--
	Thunder Bay May 26-27, 2018	18	13	2	3	--	--	--	--	--
	Ottawa Jun 9-10, 2018	49	37	7	4	1	--	--	--	--
	TOTALS	**760**	**566** (74%)	**83** (11%)	**91** (12%)	**15**	**1**	**1**	**1**	**2**
						(3%)				

CAT=Certified Athletic Therapist; CSEP CEP=Canadian Society of Exercise Physiology – Certified Exercise Physiologist; DC=Chiropractor; Kin=Kinesiologist; NSCA= National Strength and Conditioning Association – Certified Personal Trainer; PT=Physiotherapist;

**2 participants not practicing clinically attended the GLA:D program® in Edmonton*

3. Baseline Characteristics of GLA:D Participants from 2016 to 2018 (n=1634)

Measure	Category	Hip N = 473	Knee N = 1161
Demographics			
Province	Alberta	24.5% (116)	20.2% (235)
	British Columbia	12.3% (58)	8.9% (103)
	Manitoba	0.8% (4)	0.9% (11)
	New Brunswick	3.8% (18)	3.7% (43)
	Newfoundland	0.6% (3)	1.2% (14)
	Nova Scotia	0.4% (2)	0.1% (1)
	Ontario	57.5% (272)	64.9% (754)
Year of enrollment	2016	0.2% (1)	0.1% (1)
	2017	28.3% (134)	24.6% (286)
	2018	71.5% (338)	75.3% (874)
Gender	Female	71.7% (339)	78.8% (913)
	Male	28.3% (134)	21.2% (246)
	Not reported	— (0)	— (2)
Age (y)	—	65.1 ± 8.6 (N = 473)	64.7 ± 8.6 (N = 1158)
Age group	< 55	9.5% (45)	12.1% (140)
	55-64	37.4% (177)	36.5% (423)
	65-74	39.5% (187)	39.6% (458)
	≥ 75	13.5% (64)	11.8% (137)
	Not reported	— (0)	— (3)
Marital status	Single	7.4% (35)	10.1% (117)
	Married	68.0% (321)	61.9% (718)
	Common-law	3.8% (18)	5.1% (59)
	Living with partner	0.8% (4)	1.8% (21)
	Separated	1.5% (7)	3.1% (36)
	Divorced	9.3% (44)	8.7% (101)
	Widowed	9.1% (43)	9.3% (108)
	Not reported	— (1)	— (1)
Highest education obtained	Some or completed elementary school	0.2% (1)	1.1% (13)
	Some or completed high school	13.1% (62)	14.4% (167)
	Some or completed trade or community college program	25.6% (121)	26.4% (306)
	Some or completed university	54.4% (257)	50.0% (580)
	Other	6.6% (31)	8.2% (95)
	Not reported	— (1)	— (0)

Measure	Category	Hip N = 473	Knee N = 1161
Employment status	Working full-time	20.8% (97)	22.8% (262)
	Working part-time	9.4% (44)	9.6% (110)
	Not working, on benefits	2.8% (13)	3.1% (36)
	Not working, seeking work	1.1% (5)	1.5% (17)
	Retired	59.9% (279)	56.4% (649)
	Homemaker	3.2% (15)	3.0% (34)
	Other	2.8% (13)	3.7% (43)
	Not reported	— (7)	— (10)
Health factors			
Smoking status	No	96.0% (454)	95.9% (1112)
	Yes	4.0% (19)	4.1% (48)
	Not reported	— (0)	— (1)
Body-mass index (BMI, kg/m²)	—	28.2 ± 6.2 (N = 465)	30.8 ± 6.7 (N = 1140)
BMI category	Underweight (< 18.5)	0.4% (2)	0.2% (2)
	Normal weight (18.5 - 24.9)	29.2% (136)	18.6% (212)
	Overweight (25 - 29.9)	41.3% (192)	33.3% (380)
	Obese (≥ 30)	29.0% (135)	47.9% (546)
	Not reported	— (8)	— (21)
Number of comorbid conditions (excluding osteoarthritis)	None	23.7% (112)	21.5% (250)
	1	32.6% (154)	28.6% (332)
	2	20.9% (99)	22.4% (260)
	3	12.9% (61)	15.4% (179)
	4 or more	9.9% (47)	12.1% (140)
Congestive heart failure	Yes	1.9% (9)	0.9% (10)
	Not reported	— (4)	— (9)
Heart attack (myocardial infarction)	Yes	2.7% (13)	2.8% (32)
	Not reported	— (0)	— (5)
High blood pressure	Yes	35.2% (166)	40.4% (468)
	Not reported	— (1)	— (2)
High cholesterol	Yes	23.7% (112)	29.2% (338)
	Not reported	— (1)	— (4)
Stroke or cerebrovascular accident	Yes	2.1% (10)	2.3% (26)
	Not reported	— (0)	— (6)
Asthma or chronic lung disease	Yes	8.5% (40)	9.7% (113)
	Not reported	— (1)	— (1)
Diabetes	Yes	8.5% (40)	9.6% (112)
Kidney disease	Yes	1.1% (5)	1.1% (13)
	Not reported	— (0)	— (4)
Liver disease	Yes	0.4% (2)	1.0% (12)
	Not reported	— (2)	— (2)
Anaemia or other blood disease	Yes	2.1% (10)	3.2% (37)
	Not reported	— (1)	— (1)

Measure	Category	Hip N = 473	Knee N = 1161
Stomach/intestinal ulcers	Yes	1.5% (7)	2.9% (33)
	Not reported	— (1)	— (5)
Depression	Yes	11.0% (52)	14.7% (170)
	Not reported	— (0)	— (5)
Cancer (excluding skin cancer)	Yes	3.2% (15)	3.6% (42)
	Not reported	— (0)	— (2)
Lower back pain	Yes	27.1% (128)	20.6% (238)
	Not reported	— (1)	— (4)
History of hip/knee symptoms			
Duration of symptoms in affected hip/knee (years)	—	4.8 ± 6.9 (N = 467)	6.2 ± 7.3 (N = 1143)
Categorized duration of symptoms (years)	Less than 1	12.6% (59)	13.4% (153)
	1 to 1.9	18.6% (87)	12.2% (140)
	2 to 4.9	38.3% (179)	29.6% (338)
	5 to 9.9	16.1% (75)	19.6% (224)
	10 or more	14.3% (67)	25.2% (288)
	Not reported	— (6)	— (18)
Previous injury to affected hip/knee	No	86.9% (410)	55.8% (646)
	Yes	13.1% (62)	44.2% (512)
	Not reported	— (1)	— (3)
Are you so troubled by your hip/knee problems that you want surgery?	No	66.1% (310)	72.6% (833)
	Yes	33.9% (159)	27.4% (315)
	Not reported	— (4)	— (13)
Previous surgery on affected joint			
Have you had surgery on your hip/knee?	No	93.0% (438)	76.0% (875)
	Yes	7.0% (33)	24.0% (277)
	Not reported	— (2)	— (9)
Specify surgery type (all that apply):	Joint replacement	5.1% (24)	3.6% (41)
	Arthroscopic procedure	1.1% (5)	17.5% (202)
	Other surgery	1.9% (9)	6.9% (79)
	Not reported	— (2)	— (9)
Physical activity			
Are you afraid that your joints will be damaged from physical activity and exercise?	No	76.3% (360)	68.5% (788)
	Yes	23.7% (112)	31.5% (363)
	Not reported	— (1)	— (10)
In a typical week, how many days have you been physically active at least 30 minutes per day?	None	5.3% (25)	8.9% (103)
	1 to 3	33.4% (158)	30.7% (355)
	4 to 6	38.7% (183)	36.8% (426)
	7	22.6% (107)	23.7% (274)
	Not reported	— (0)	— (3)

Measure	Category	Hip N = 473	Knee N = 1161
Medications			
Have you taken any medications including herbal or dietary supplements for your hip/knee in the last 3 months?	No	27.0% (127)	30.1% (347)
	Yes	73.0% (343)	69.9% (804)
	Not reported	— (3)	— (10)
Specify medications (select all that apply):	Acetaminophen (e.g. Tylenol plain or extra strength)	48.1% (226)	44.5% (513)
	Non-steroidal anti-inflammatory drugs/NSAID (e.g. ibuprofen, Aleve, aspirin)	46.6% (219)	41.9% (483)
	Topical NSAID cream	29.1% (137)	35.1% (405)
	Glucosamine	22.6% (106)	21.9% (252)
	Hyaluronic acid injection into your joint	2.3% (11)	4.9% (57)
	Corticosteroid (cortisone) injection into your joint	11.5% (54)	14.5% (167)
	Morphine or other opioids (e.g. Tylenol No. 3)	5.3% (25)	5.3% (61)
	Tramadol	3.6% (17)	3.9% (45)
	Codeine	3.2% (15)	4.0% (46)
	Tricyclic antidepressants (for neuropathic pain)	1.3% (6)	2.0% (23)
	Anticonvulsants (e.g. Gabapentin)	2.3% (11)	2.3% (26)
	Methotrexate	0.4% (2)	0.7% (8)
	Herbal supplements	23.6% (111)	20.1% (232)
Patient-reported scales			
Numeric pain rating: hip/knee pain in the past month (0-10)	—	5.1 ± 2.2 (N = 473)	5.2 ± 2.1 (N = 1161)
EQ-5D utility score	—	0.7 ± 0.2 (N = 465)	0.7 ± 0.2 (N = 1153)
Arthritis Self-Efficacy Scale (1=lowest self-efficacy, 10=highest)	—	6.0 ± 1.8 (N = 473)	6.2 ± 1.8 (N = 1158)
HOOS/KOOS subscale (0=extreme symptoms, 100=no symptoms)	Activities of daily living (ADL)	61.9 ± 18.4 (N = 473)	64.2 ± 17.3 (N = 1161)
	Pain	56.2 ± 16.2 (N = 473)	56.3 ± 15.6 (N = 1161)
	Quality of life	40.8 ± 19.1 (N = 473)	36.9 ± 17.4 (N = 1161)
	Sports/recreation	36.9 ± 22.8 (N = 473)	24.5 ± 20.8 (N = 1161)

4. Medication Use at Baseline

Medications			
Medication use including herbal or dietary supplements for your hip/knee in the last 3 months.	No	27.0% (127)	30.1% (347)
	Yes	73.0% (343)	69.9% (804)
	Not reported	— (3)	— (10)
Specify medications (select all that apply):	Acetaminophen (e.g. Tylenol plain or extra strength)	48.1% (226)	44.5% (513)
	Non-steroidal anti-inflammatory drugs/NSAID (e.g. ibuprofen, Aleve, aspirin)	46.6% (219)	41.9% (483)
	Topical NSAID cream	29.1% (137)	35.1% (405)
	Glucosamine	22.6% (106)	21.9% (252)
	Hyaluronic acid injection into your joint	2.3% (11)	4.9% (57)
	Corticosteroid (cortisone) injection into your joint	11.5% (54)	14.5% (167)
	Morphine or other opioids (e.g. Tylenol No. 3)	5.3% (25)	5.3% (61)
	Tramadol	3.6% (17)	3.9% (45)
	Codeine	3.2% (15)	4.0% (46)
	Tricyclic antidepressants (for neuropathic pain)	1.3% (6)	2.0% (23)
	Anticonvulsants (e.g. Gabapentin)	2.3% (11)	2.3% (26)
	Methotrexate	0.4% (2)	0.7% (8)
	Herbal supplements	23.6% (111)	20.1% (232)

5. Categorized Changes in Continuous Outcome Measures, 3 and 12 Months After Enrollment

Measure	Outcome category	Hip		Knee	
		3 Months	12 Months	3 Months	12 Months
Numeric pain rating (0-10)	No change or worsened	37.6% (100)	44.8% (39)	32.7% (199)	35.3% (60)
	Negligible improvement (0.1 - 14.9%)	5.6% (15)	1.1% (1)	3.8% (23)	4.1% (7)
	Minimal clinically important change (MCIC)* (15 - 29.9%)	15.8% (42)	10.3% (9)	11.0% (67)	11.2% (19)
	Substantial clinical benefit (≥ 30% and/or zero pain)	41.0% (109)	43.7% (38)	52.5% (320)	49.4% (84)
HOOS/KOOS (0-100)					
Pain	No change or worsened	39.2% (104)	34.5% (30)	35.9% (219)	36.1% (61)
	Negligible improvement (0.1 - 4.9 pt)	8.7% (23)	8.0% (7)	8.4% (51)	7.7% (13)
	Possible improvement (5 - 9.9 pt)	14.0% (37)	6.9% (6)	19.2% (117)	12.4% (21)
	Clinically important improvement (≥ 10 pt and/or perfect score)	38.1% (101)	50.6% (44)	36.6% (223)	43.8% (74)

* *measured as at least a 15% reduction in pain from baseline the numeric pain rating (NPR)*

† *clinically important change defined as a change in score of ≥10 points/or a perfect score*

Reference List

1. Skou ST, Roos EM. Good Life with osteoArthritis in Denmark (GLA:D): evidence-based education and supervised neuromuscular exercise delivered by certified physiotherapists nationwide. BMC Musculoskelet Disord 2017;18:72.
2. Roos EM, Barton CJ, Davis AM, et al. GLA:D to have a high-value option for patients with knee and hip arthritis across four continents: Good Life with osteoArthritis from Denmark. British Journal of Sports Medicine 2018;52:1544-5.
3. Davis AM, Kennedy D, Wong R, et al. Cross-cultural adaptation and implementation of Good Life with osteoarthritis in Denmark (GLA:D™): group education and exercise for hip and knee osteoarthritis is feasible in Canada. Osteoarthritis Cartilage 2017.
4. Nelson AE, Allen KD, Golightly YM, Goode AP, Jordan JM. A systematic review of recommendations and guidelines for the management of osteoarthritis: The chronic osteoarthritis management initiative of the U.S. bone and joint initiative. Semin Arthritis Rheum 2014;43:701-12.
5. McAlindon TE, Bannuru RR, Sullivan MC, et al. OARSI guidelines for the non-surgical management of knee osteoarthritis. Osteoarthritis Cartilage 2014;22:363-88.
6. Fernandes L, Hagen KB, Bijlsma JW, et al. EULAR recommendations for the non-pharmacological core management of hip and knee osteoarthritis. Ann Rheum Dis 2013;72:1125-35.
7. Ageberg E, Nilsdotter A, Kosek E, Roos EM. Effects of neuromuscular training (NEMEX-TJR) on patient-reported outcomes and physical function in severe primary hip or knee osteoarthritis: a controlled before-and-after study. BMC Musculoskelet Disord 2013;14:232.
8. Ageberg E, Roos EM. Neuromuscular exercise as treatment of degenerative knee disease. Exerc Sport Sci Rev 2015;43:14-22.
9. Farrar JT, Young JP, Jr., LaMoreaux L, Werth JL, Poole RM. Clinical importance of changes in chronic pain intensity measured on an 11-point numerical pain rating scale. Pain 2001;94:149-58.
10. Nilsdotter AK, Lohmander LS, Klassbo M, Roos EM. Hip disability and osteoarthritis outcome score (HOOS)--validity and responsiveness in total hip replacement. BMC Musculoskelet Disord 2003;4:10.
11. Collins NJ, Prinsen CA, Christensen R, Bartels EM, Terwee CB, Roos EM. Knee Injury and Osteoarthritis Outcome Score (KOOS): systematic review and meta-analysis of measurement properties. Osteoarthritis Cartilage 2016;24:1317-29.
12. Structured education and neuromuscular exercise program for hip and/or knee osteoarthritis: Health Quality Ontario recommendation [Internet]. 2018 November. (Accessed 29 May 2019, at http://www.hqontario.ca/evidence-toimprove-care/recommendations-and-reports/OHTAC/structured-exercise)
13. Annual Report 2017 GLA:D® SDU. 2017. (Accessed 15 May 2019, at https://www.glaid.dk/pdf/Årsrapport_2017_eng.pdf.)

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