Establishing a multi-sectoral community allied health service for type 2 diabetes: Logan Healthy Living

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Abstract

Background: Type 2 diabetes is the fastest growing chronic condition in Australia with higher prevalence in disadvantaged groups. Logan Healthy Living by UQ Health Care is a proof-of-concept, interprofessional allied health clinic focused on supporting people with and at risk of type 2 diabetes in Logan, a region in South-East Queensland, Australia with high levels of health inequity. Logan Healthy Living is supported by the Queensland Government through Health and Wellbeing Queensland and a broader multi-sectoral alliance including primary health care, tertiary hospital and health services, government, community and university sectors.

Objective: This paper describes the establishment of Logan Healthy Living and outlines the evaluation protocol for the service's type 2 diabetes lifestyle management program.

Methods: The context and setting of Logan are presented, and the process for establishing the multi-sectoral partnerships, development and governance of the service and the facility are described. The lifestyle management program is an 8-week, group-based program, which includes one hour of education and one hour of supervised, individually tailored exercise each week. The theoretical underpinnings and the program are described in detail. The RE-AIM framework will guide evaluation of the program and inform key questions regarding: Reach (number and characteristics of clients); Effectiveness (diabetes-related distress, health behaviours [physical activity and diet], quality-of-life, self-management self-efficacy, loneliness, community involvement, anthropometric measures, HbA1c, physical function and healthcare utilisation); Adoption (referral pathways); Implementation (fidelity, appropriateness, acceptability, costs); and, Maintenance (long term effectiveness). Data will be drawn from a purposefully embedded minimum dataset and Data Registry, with the process for designing and embedding data collection into practice (via surveys; in-person measures; client management software) described in detail.

Results: Ethics has been obtained for the Data Registry. Logan Healthy Living is a 4-year proof of concept, which concludes 31 December 2024, with findings expected to be reported from 2025. Interim bi-annual key performance indicators reports have informed iterative service developments, including structure of appointments, ongoing access to resources and increased social opportunities.

Conclusions: While multi-sectoral responses are needed for complex community health challenges, processes for achieving this are rarely documented and the description of the development of Logan Healthy Living has the potential to inform future partnerships. The findings from the evaluation will provide important new knowledge on the impact of a community-delivered type 2 diabetes program on individuals, the community, and the health system, in an area of high health inequity.

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Keywords: type 2 diabetes, lifestyle management, allied health

Introduction

Type 2 diabetes is a chronic condition where the body becomes resistant to the normal effects of insulin and gradually loses the capacity to produce enough insulin in the pancreas [1]. The onset of type 2 diabetes is associated with both non-modifiable (e.g., genetic) and modifiable (e.g., health and behavioural) risk factors [1]. Globally, in 2020, type 2 diabetes was the ninth leading cause of death, affecting 7% of the population, with prevalence rates only expected to increase [2]. In Australia, type 2 diabetes impacts an estimated 1.2 million Australians [1], with a further 2 million having pre-diabetes [2]. It is the fastest-growing chronic condition in Australia [1] with health system expenditure estimated at $3.4B per year [3]. Type 2 diabetes has a significant impact on individuals. Along with the symptoms of the disease itself, many people experience diabetes-related complications (e.g. retinopathy, peripheral vascular disease, ischemic heart disease) and are at

increased risk of multimorbidity (e.g., cardiometabolic, vascular, and mental health conditions), which collectively impact individual's quality of life, functional impairment and increase financial and economic burden [4]. Type 2 diabetes disproportionately affects disadvantaged groups. For example, people with low socioeconomic status, low levels of education [5], immigrants, and those from culturally and linguistically diverse backgrounds have increased risk of type 2 diabetes [6]. Further, the intersection of disadvantage is likely to magnify risk and burden of disease [7].

Management of type 2 diabetes is primarily focused on achieving glycaemic control through modification of health behaviours (typically physical activity and nutrition) and where required, medication. Evidence-based management of type 2 diabetes emphasises person-centred, team-based care with integrated long-term treatment approaches, as well as the involvement of social community support [8, 9]. Self-management, where the person with type 2 diabetes works in partnership with their social supports and health professionals to understand, manage and optimise their health, is the goal. Management of modifiable risk factors is a core component of self-management, with such strategies focused on building positive health behaviours, including physical activity and nutrition, and optimising psychological wellbeing [9, 10]. Multi-disciplinary, group-based approaches to lifestyle modification have consistently been shown to positively impact a range of health and well-being outcomes for people living with type 2 diabetes [11]. To support this in practice, the Australian National Diabetes Strategy (2021-2030) has called for a multi-sectoral responses by government and communities to provide the integrated care required [12].

UQ Health Care (a not-for-profit healthcare wholly owned enterprise of The University of Queensland) has established Logan Healthy Living as a specialist clinic designed to respond to this need [13]. Purposefully established in South East Queensland in the City of Logan, an area of

Queensland with high burden of type 2 diabetes and intersectional disadvantage, Logan Healthy Living was designed with the aim to reduce the burden of disease on individuals, the community and the health system [13]. The core service of Logan Healthy Living is a group-based lifestyle management program delivered by an interprofessional allied health team, focusing on supporting people living with and at risk of type 2 diabetes in Logan. The program has three main foci; physical activity, healthy eating and wellbeing [14]. Logan Healthy Living is a four-year proof-of-concept, delivered by a Queensland-first alliance between primary health care, tertiary hospital and health services, government, community and university sectors.

A key feature of the establishment of Logan Healthy Living was the integration of an outcomes-based funding model — a model that prioritises value-based care, patient-centred outcomes and leverages multi-sectoral partnerships. Critical to values-based care models is the collection and use of data to continually evaluate the impact of the service on the participants as well as the health system, more broadly [15]. Moreover, leveraging this approach for practice-based evidence generated in 'real world' settings can add to the currently limited evidence on community-based self-management programs for people living with or at risk of type 2 diabetes [16]. With dimensions at both the individual level and multiple ecologic levels, the RE-AIM (reach, effectiveness, adoption, implementation, maintenance) framework [17, 18] offers a balanced and pragmatic approach to the evaluation of applied community-delivered programs, taking into account factors such as the characteristics of the participants who take up the program (reach) and participant satisfaction (implementation). The RE-AIM framework has been applied across multiple evaluations, including diabetes health coaching [19], diabetes prevention programs [20] and telephone-delivered type 2 diabetes support [21]. To simultaneously support reporting for the outcomes-based funding model, and to evaluate the real-world impact of a routinely delivered community program, a comprehensive continuous evaluation protocol, informed by the RE-AIM

framework, was developed.

The purpose of this paper is to describe the establishment of Logan Healthy Living and the allied health care service it provides, including the context, partnerships and governance, participants, recruitment channels, and the protocol for program evaluation.

Methods

Context and Setting

Logan Healthy Living by UQ Health Care is in the City of Logan in South-East Queensland, Australia. With an estimated population size of 345,098 [22], the City of Logan is identified as one of the most culturally and linguistically diverse and socioeconomically disadvantaged areas in Australia. The proportions of the population speaking a language other than English at home, being born overseas, identifying as Aboriginal or Torres Strait Islander, Māori or Samoan, being unemployed, and having one or more chronic health conditions are above South-East Queensland averages [22]. The region has also experienced rapid population growth and has an aging population [23]. The City of Logan has a strong focus on community services and fostering connection, with a wide range of no- and low-cost community social programs, including Logan City Council Libraries, arts, culture, and heritage initiatives, sport and recreation facilities (including the Active & Healthy program offering >100 weekly free and low-cost health and wellbeing activities), and parks and community gardens. Logan also has a diverse range of cultural groups and grass-root networks supporting community connection [24].

In Logan, estimates of the prevalence of type 2 diabetes and associated indicators of burden of disease are consistently higher than state-based estimates for Queensland. Almost 20% (18.5%) of people aged 75 years and over living in Logan have type 2 diabetes (12.4% for 55-74 years and 1.7%

for 18-54 years) [25], with the third highest rate of insulin treated type 2 diabetes in Australia (an indicator of advanced, or non-responsive progression of disease) [23]. Type 2 diabetes accounts for 31% of potentially preventable hospitalisations in Logan, making it the leading cause of potentially preventable hospitalisations [23]. Those living with type 2 diabetes in the area are also disproportionately likely to die from diabetes related causes, with the average diabetes-specific mortality rate in Logan being 32% higher than in Queensland [23].

Development of Logan Healthy Living

The concept of a multi-sectoral, allied health delivered lifestyle management program for people living with type 2 diabetes in Logan emerged from an existing partnership between UQ Health Care and Metro South Hospital and Health Service (HHS; the region's public health care provider) [26]. In 2014, Metro South HHS and UQ Health Care established an innovative, integrated primary-specialist model of care for the medical management of people with complex diabetes, the 'Beacon' model [27]. The Beacon model saw complex diabetes management provided within a community practice by a multi-disciplinary team consisting of an endocrinologist from Logan Hospital, two to three general practitioners with a special interest in diabetes (GPwSI) from UQ Health Care, and a diabetes nurse educator from the Metro South HHS Community team. The aim of the Beacon model was to build capacity in primary care for managing complex diabetes through advanced management plans, and subsequently diverting people with type 2 diabetes from tertiary care. While the Beacon model demonstrated favourable outcomes in changes in HbA1c concentration and the percentage of patients meeting combined clinical targets of HbA1c concentration, blood pressure and LDL cholesterol [28], key stakeholders acknowledged that the Beacon model alone was not sufficient to address the rising community need. Moreover, it lacked a health behaviour change program focused on self-management — a critical component to management of type 2 diabetes [11].

To address these needs, in approximately 2019, what would eventually be known as ‘Logan Healthy Living’ was envisioned, expanding on the existing partnership between Metro South HHS and UQ Health Care and integrating learnings from the Beacon model and UQ Health Care’s experience in delivering interprofessional, allied health services at other sites. The first phase of service development was establishing an alliance of partners underpinned by a commitment to prevent chronic disease and keep people well and out of hospital in Logan. UQ Health Care and Metro South HHS led the establishment of the alliance, which in turn also included the Brisbane South Primary Health Network, The University of Queensland, and Griffith University. By early 2020, the alliance had established a proof-of-concept model for a comprehensive lifestyle management program, delivered by an interprofessional team of allied health professionals and infused with a student allied health workforce.

Concurrently, in 2019, the Queensland Government established the state’s first prevention agency, Health and Wellbeing Queensland [29]. The concept of Logan Healthy Living, a service delivering comprehensive lifestyle management programs to support behaviour change and self-management, was put to the Board of Health and Wellbeing Queensland by UQ Health Care and Metro South HHS on behalf of the alliance. The proposal was strongly aligned with the vision and strategic plan of the newly-formed Health and Wellbeing Queensland, which included developing and trialling new models of care for the prevention and management of chronic disease. Here, the intention was to reduce pressure on the tertiary health care system, address health inequities, and build multi-sectoral partnerships that drive system-level change for improved health and wellbeing outcomes. In 2021, Health and Wellbeing Queensland joined the alliance, with UQ Health Care and Health and Wellbeing Queensland entering into a four-year agreement (2021-2024) to support delivery of a tailored lifestyle management program. UQ Health Care secured additional revenue agreements and

financial contributors to deliver on the commitment to reduce financial barriers for participants. The UQ Health Care and Health and Wellbeing Queensland service level agreement outlines a comprehensive suite of deliverables and bi-annual key performance reporting indicators. These key performance reporting indicators were designed to evaluate the program according to the RE-AIM indicators (reach, effectiveness, adoption, implementation and maintenance) across the three priorities identified above (reduce the burden of disease on individuals, the community and the health system). Examples of agreed Key Performance Indicators are summarised in Table 1.

Table 1. Examples of Key Performance Indicators for Logan Healthy Living

Evaluation Domain	**Key performance indicator**
Reach	• Participant's type 2 diabetes status (at risk, newly diagnosed, complex or chronic) • Participant's demographic characteristics • Participant retention • Participant attrition
Effectiveness	• Participant's knowledge, health literacy, and intention to change • Participant's healthy behaviour action (health behaviour change and anthropometric measures) • Health system impact
Adoption	• Referral pathways
Implementation	• Participant satisfaction • Staff satisfaction • Participant safety (adverse events) • Student training
Maintenance	• Participant sustained healthy behaviour • Sustainable funding

The development and design of the service was community-led and iteratively co-designed with key stakeholders including consumers. Activities included: participant journey mapping to inform program and resource development; consultation with student placement providers; and learning needs assessments for local GPs. A key event for consumer and stakeholder engagement was a half day "design-jam" led by UQ Ventures and held on campus at Griffith University in Meadowbrook, where approximately 60 end-users, delivery providers, academics, clinicians, community leaders, and representatives from other key stakeholders (e.g. Metro South HHS, Brisbane South Primary

Health Network [PHN], Aboriginal and Torres Strait Islander Community Health Service) came together to progress their combined vision and implementation plan for the service. Subsequent planning days have also been hosted, which have similarly included Logan Healthy Living staff, key stakeholders and consumers.

Simultaneously, the plan for routine collection of reporting and evaluation data was co-designed by key stakeholders including the Logan Healthy Living manager, administration team and clinicians, researchers from The University of Queensland, and relevant content experts. Key to successfully collecting the range and breadth of data required was the intent to embed data collection into routine service delivery. Led by a researcher employed by the Health and Wellbeing Centre for Research Innovation (a jointly funded research centre by The University of Queensland and Health and Wellbeing Queensland; SG), along with a senior academic experienced in evaluation (GH) and a data analyst (EW), a pragmatic data collection and consent process was co-designed and embedded into daily operations. Data are collected by both practice management software (GenSolv) and clinical trial software (REDCap) and facilitated day-to-day by the Logan Healthy Living clinical team, with technical and content support on an as needs basis by The University of Queensland. Implementation of the data collection process was supported by on-site training sessions and a comprehensive manual developed by the data analyst. The Clinic and Operations Managers have been essential in establishing and building a culture for collaboration and prioritisation of data collection.

Facilities

Logan Healthy Living went live for operations in July 2021. The service initially operated from Griffith University Logan Healthcare Centre, where it was intentionally co-located with the Beacon Clinic and Metro South HHS Community Chronic Disease Service (which included Diabetes Educators, Nurse Practitioners and a Podiatry service). In February 2023, Logan Healthy

Living moved into its permanent, purpose-built location in a dedicated health and medical clinic, Meadowbrook Medical Centre, co-located with the UQ Health Care Meadowbrook GP clinic and the Logan Hospital endocrinology outpatient services (Logan Endocrine and Diabetes Service [LEADS]). The Meadowbrook Medical Centre is centrally located in the City of Logan, and positioned within the community's transport and retail hub, Logan Hospital and the Logan Healthy Kids Club and Good Start programs, operated by Children's Health Queensland. The site is also set to become part of a larger health precinct, with a planned staged expansion of Logan Hospital and an additional two private hospitals.

Logan Healthy Living occupies 400m^2 at Meadowbrook Medical Centre and includes a gym floor, five curtained consultation spaces, two individual consultation rooms, two large private rooms (utilised for staff/student rooms or for group education sessions) and an integrated open space dedicated to delivering group education. The open gym includes a range of exercise equipment, including cardiovascular training equipment (treadmill, stationary bike), parallel bars, steps and stairs, resistance and balance training equipment. UQ Health Care invested in state-of-the-art resistance training machines by HUR Australia [30] that use air resistance and SmartTouch software for automatically programming and tracking load and equipment position (e.g., seat heights) with participants tapping on and off the equipment with a personalised radio frequency identification (RFID) wristband. HUR equipment was selected to reduce the barriers and to improve safety with resistance training for older adults and new exercisers; the HUR equipment is fully automated and applies smooth and consistent resistance across the range of motion.

The clinic is staffed by a range of allied health professionals, including physiotherapy, exercise physiology, dietetics, diabetes education and health psychology. With its student-infused model, the service also provides clinical education and placements for students from Griffith University

and The University of Queensland. These include clinical placements for physiotherapy, exercise physiology, dietetics and psychology students (ranging from four weeks to 20 weeks in length) and project placements in a wide range of health disciplines such as nutrition and dietetics, pharmacy, social work and health services management. Students from the range of disciplines work together to provide an interprofessional model of care. Beyond providing health care services, Logan Healthy Living is also further embedding itself into the community by contributing to the development and career selection of a locally based workforce, with the aim to promote workforce sustainability in the region. Examples of these activities include facility tours with question-and-answer sessions, and opportunities for work experience with the Logan Healthy Living team for local high school students with interests in health careers.

Governance

Logan Healthy Living is governed by a multi-sectoral Steering Committee that is co-chaired by UQ Health Care and Health and Wellbeing Queensland. Beyond UQ Health Care and Health and Wellbeing Queensland, the Steering Committee includes representatives from The University of Queensland, Griffith University, Metro South HHS, Logan Hospital, Brisbane South Primary Health Network and Logan Healthy Living participants. Members of the Steering Committee are responsible for providing program leadership and direction (e.g. understand strategic implications and outcomes; accept responsibility for program strategy and overall benefit realisation), program governance (e.g. risk identification and mitigation; stakeholder management; monitoring of progress), and maximising program benefits (e.g. monitor program outputs; monitor implementation and evaluation). Additional stakeholders are also consulted by the Steering Committee, such as broader consumer groups, Aboriginal and Torres Strait Islander Community Health Service, Children's Health Queensland and Diabetes Australia.

Logan Healthy Living is connected to the broader community governance of the Logan region through the Meadowbrook Partnership Group. Established in 2018, the group is comprised of representatives from key organisations who are positioned to influence integration and impact in Logan. Membership includes Brisbane South Primary Health Network, Logan City Council, Metro South HHS, Economic Development Queensland, Loganlea State High School, The University of Queensland, Griffith University and the Department of State Development, Infrastructure, Local Government and Planning. Collectively, the membership represents State, Federal, Primary Care, Education and Local Government Stakeholders. All members have strong community relationships and understanding of local issues. Logan Healthy Living (Clinical and Operations Manager) and UQ Health Care (Chief Executive Officer [CEO]) are members of the Meadowbrook Partnership Group.

Program cost, participants, referral pathways and intake process

Logan Healthy Living delivers services at no cost to participants. Where possible, reimbursement for the lifestyle management program is sought through the Medicare Benefits Schedule (Group Allied Health Service for Type 2 Diabetes) which funds one intake assessment ($74.80) and eight group sessions ($18.65 per session, per person) per calendar year [31]. In order to claim Medicare benefits, the group sessions must include between 2-12 people, last at least 60 minutes in duration and be delivered by a credentialed diabetes educator, accredited exercise physiologists or accredited practising dietitian [31]. While the lifestyle management program is the primary service, participants are also able to access 1:1 consultation with health professionals on an as needs basis.

To be eligible for the Logan Healthy Living lifestyle management program, participants must have a diagnosis of type 2 diabetes and be aged 16 years or over. While the program is intended for people living in the Logan region, no one is excluded from the service based on their geographical address.

Participants may be excluded if it is identified by the clinical team that a group program may not be a feasible method of service delivery (i.e., requiring 1:1 education support). At Logan Healthy Living, services are currently delivered in English and there is no access to free interpreter services (e.g., through state or national government programs). However, clinical services have been delivered to participants who do not speak English when supported by a carer/support person.

Participants are primarily referred to the program by General Practitioners, using a referral form for Group Allied Health Services under Medicare for patients with type 2 diabetes. Participants are also able to self-refer through an Expression of Interest form on the service's website. Word of mouth and marketing activities support self-referrals, such as the service's website and newsletter, referrals from specialists (e.g., the Logan Endocrine and Diabetes Service), local advertising (e.g., booths at local shopping centres, open days and notice boards). Self-referrals may also be driven more broadly through the activities and promotion of the service by members of the alliance (e.g., Metro South HHS, Health and Wellbeing Queensland, Brisbane South Primary Health Network, UQ Health Care, Griffith University and The University of Queensland). Where participants self-refer and do not have a General Practitioner referral, they are encouraged to obtain one; however, where there are barriers (e.g., financial), this does not preclude admission into the lifestyle management program. Participants can re-enrol in the program once per calendar year.

Upon presenting to Logan Healthy Living, participants are booked for an intake assessment which is arranged over two appointments (Appointment 1.1 and 1.2, respectively). The first appointment (1.1) is focused on medical history screening (utilising referral information where possible) and physical assessments. If it is identified at this first appointment that more information is required to safely prescribe exercise, the team may place the participant's referral on hold until medical authorisation to exercise is provided by the referring general practitioner or (if self-referred) the participants usual

general practitioner. The second appointment is focused on identifying barriers for participation in the lifestyle management program, goal setting and an introduction to the exercise program. In-between the two appointments, participants complete online self-report surveys and are invited to indicate whether they agree or disagree to providing written-informed consent for their data to be included in a research Data Registry (further details on the ethics is described in the evaluation protocol). Screening for completion of surveys and consents forms is conducted by the reception team with face-to-face support for completion provided by the clinicians at the second appointment if required. After completion of the intake assessment, participants are allocated to the next available group according to the support needs of the patient and whether the participant is most appropriate for a 'recently' diagnosed or 'chronic' group allocation based on time since diagnosis.

Logan Healthy Living Lifestyle Management Program

The lifestyle management program is the primary service delivered by Logan Healthy Living. The program was developed and is delivered in line with the American Diabetes Association Standards of Care in Diabetes [32], which outlines recommendations for a range of factors related to the management of people with type 2 diabetes. In particular, the Logan Healthy Living lifestyle management program follows the key recommendations for diabetes self-management education and support, medical nutrition therapy, routine physical activity, health behaviour counselling and psychosocial care. The program incorporates a range of behaviour change strategies (as described in the Behaviour Change Technique Taxonomy described by Michie et al[33]), including goals and planning (e.g., goal setting and action planning), feedback and monitoring (e.g., biofeedback), social support (e.g., unspecified, emotional and practical), shaping knowledge (e.g., instruction on how to perform the behaviour), comparison of behaviour (e.g., demonstration of the behaviour), repetition and substitution (e.g., graded tasks), comparison and outcomes (e.g., credible source), identity (e.g., framing/reframing) and self-belief (e.g., verbal persuasion about capability) [33].

Program structure

The lifestyle management program is delivered face-to-face in groups over 8 weeks using an interprofessional model of care. Each week includes one two-hour session that is comprised of a 60-minute education workshop and a 60-minute supervised exercise ('movement') session. Each group has a maximum of 10 participants and is assigned an education workshop and an exercise lead (either Health Psychology and Exercise Physiology, or Diabetes Educator and Physiotherapy, respectively) who supports and provides service to the group through the eight weeks. 'Recharge' sessions are offered at 1-, 3-, 6-, 9- and 12-months following completion of the 8-week program to provide an opportunity for participants to re-connect with their health care team, review their goals, and participate in follow-up assessment before being discharged at 12-months. The 1-month Recharge is conducted face-to-face, with the remaining sessions conducted by telephone. The education workshops and supervised movement sessions are conducted on site at Logan Healthy Living, with movement sessions conducted in the fully equipped, on-site gym.

Program content

A week-by-week overview of the topics, key concepts, and resources provided in the education workshops is detailed in Table 2. The education workshops have been designed to be patient-centered and focus on diabetes self-management education with the clinical support needed to facilitate the knowledge, decision-making, and skills mastery necessary for diabetes self-care. Education workshop topics are integrated with social prescribing, where opportunities for community engagement related to that week's content are signposted to support longer-term behaviour change and to address the broader social determinants of health. In addition to local programs, participants are also signposted to Health and Wellbeing Queensland's suite of prevention programs, including 10,000 Steps and Deadly Choices [29]. The supervised movement session is

comprised of an individually prescribed exercise program targeting combinations of cardiovascular fitness, strength and/or flexibility, depending on participant presentations. All participants are provided with the opportunity to have an individually prescribed home exercise program and/or access to Physitrack [34], an App that supports home exercise prescription and monitoring.

Table 2. Overview of the Education Workshop topics for the Logan Healthy Living Lifestyle Management Program

Week	Description	Key concepts	Hand outs
1	Welcome & Orientation	• Acknowledgment of Country* • Overview of the allied health team • Overview of program structure • Instructions and rationale for pre-exercise checks • Group introductions • Group Activity: What health behaviours impact my diabetes?	• Pre-exercise checklist • Lifestyle Management Program journey plan • Opportunities for community engagement
2	Diabetes Education	• What is type 2 diabetes • The role of insulin, insulin sensitivity and insulin resistance • Key management strategies • Blood glucose testing, HbA1c, understanding your 'normal', hypo and hyperglycaemia and management strategies • Effects and complications of type 2 diabetes • Understanding the annual cycle of care • Identifying other support (family, friends, community) • Introduction to self-management • Important services to connect with	• What is type 2 diabetes • Key management strategies • Instructions for blood glucose testing • Team of support and recommended review time frames • Services to find out more about type 2 diabetes – National Diabetes Services Scheme, Diabetes Education and Self-Management for Ongoing and Newly Diagnosed (DESMOND) Australia, Diabetes Connect – by Diabetes Australia, Logan Healthy Living Facebook
3	Nutrition Part 1	• Carbohydrates, and how different types affect blood sugar • Healthy eating guidelines • Understanding what a diet looks like living with type 2 diabetes (five main food groups) • Hydration • Healthy eating for diabetes • Meal timing and consistency	• A guide to a nourishing lifestyle – a breakdown of the five main food groups • How to build a healthy plate • Recommended meal timing • Tips for staying hydrated • Local services providing nutrition support
4	Nutrition Part 2	• Understanding food labels • How food labels can help with diabetes management • Grocery shopping efficiently (saving money) • Modifying favourite meals to make them healthier	• Tips for reading food labels • Tips for enjoying home cooking and putting nutrition advice • Local services providing food banks
5	Movement Medicine	• Importance of enjoying movement • What is physical activity and exercise	• Benefits of exercise • Pre-exercise checklist

		• What are the benefits of exercise • Importance of exercise for type 2 diabetes • Physical activity guidelines • Safely exercising with type 2 diabetes • Group activity: Where can you find the motivation and inspiration to exercise	• Types of movement (aerobic, balance, flexibility, resistance training) • Making exercise work for you • Exercise and blood glucose levels • Local services providing opportunities for movement
6	Stress Management	• Understanding stress and what happens to your body when you are stressed • Understand how stress impacts type 2 diabetes • Importance of social support • Group activity: Managing Stress - Stress bucket analogy and brainstorming ways to manage stress	• What is stress • Identifying stressors • Sources of support • Local services providing wellbeing activities
7	Healthy Habits	• Understanding how to set goals effectively • Review of goals and progress • Planning for life after the program • Creating and sustaining healthy habits • Planning for future success and overcoming barriers • Group activity: Building healthy habits (understanding prompts, habits and rewards) • Group activity: Identifying barriers and 'helpers'	• Tips for changing behaviour and the habit cycle • Ideas for goal setting related to type 2 diabetes • Planning for the future activity – identifying what does success look like, what support systems are needed, planning for health habits and what has worked so far • Local services offering a range of services (e.g. community centres, libraries) • Active and Healthy Booklet by City of Logan (free and low-cost activities in the area)
8	Wrap up - Review & Future Planning	• Review of educational workshops • Review of action plans (movement, community connection, nutrition, support networks, rewards/motivations) • Group activity: Bingo (revision of each topic)	• Summary of key takeaways for each topic • How to stay connected with Logan Healthy Living (Recharge session schedule, gym memberships, meet ups, Facebook, blogs, allied health consultations)

Note: LHL = Logan Healthy Living; LMP = lifestyle management program; * = An Acknowledgement of Country is delivered at the beginning of each week.

Evaluation Protocol for the Logan Healthy Living Lifestyle Management Program

Guided by the RE-AIM framework, the evaluation protocol was developed in partnership with the Health and Wellbeing Centre for Research Innovation at The University of Queensland and the other members of Steering Committee, and was designed to inform the service level

agreement, and key questions regarding the uptake, effectiveness, costs and sustainability of the program.

Study design

The evaluation is a single arm intervention design where participants are evaluated at intake to the service (pre-program), at the end of the supervised program (8-weeks;), as well as at approximately 1-, 3-, 6-, 9- and 12-months after the end of the supervised program. For participants who do not re-enrol in the program, annual follow ups are conducted at 2-, 3- and 4-years.

Measures

A summary of measures that are being collected from participants to describe contextual information, program effectiveness and acceptability are outlined in Table 3, with further details and outcomes from other data sources described below. All self-report surveys are administered using REDCap, service level data are extracted from practice management software, and physical measures administered by clinicians on-site.

Table 3. Outline of participant self-report measures and timing of assessments

	Structured program		**Extended follow-ups**				
Measures	**Intake**	**8W**	**1M**	**3M**	**6M**	**9M**	**12M***
Contextual information							
Sociodemographic	•						
Smoking / smoking changes	•	•					•
Digital health use	•	•					•

Community involvement	•	•		•	•	•	•
Program effectiveness							
Diabetes related distress	•	•		•			•
Health behaviours (physical activity, sitting, and nutrition)	•	•		•	•	•	•
Quality of life	•	•		•	•	•	•
Self-management self-efficacy	•	•		•			•
Loneliness	•	•		•			•
Anthropometry	•	•	•				
Physical function	•	•					
HbA1c	•		•				
Self-report health care utilisation	•						•
Acceptability							
Satisfaction		•					

Note: W=weeks after start of structured program; M=months after end of structured program. Smoking status is assessed at intake and change in smoking status is assessed 8W and 12M. All self-report 12M assessments (except smoking) are repeated annually at 2-, 3- and 4- year follow up.

Reach Outcomes

Program Uptake

Program uptake will be described by reporting the number of participants who enrol in and commence the lifestyle management program, compared to those considered ineligible. These outcomes will be tracked using appointment data from practice management software, Gensolv. Withdrawals from the program, and reason for withdrawal, will be tracked by clinicians using REDCap.

Sociodemographic and other contextual characteristics

Demographic data are collected at intake regarding time since diagnosis of type 2 diabetes, age, sex assigned at birth, gender, postcode, First Nations status, country of birth, language spoken at home, highest level of education, occupation, and employment status. Other contextual information is collected at intake and tracked throughout the program. Smoking status is assessed at intake, and smoking changes are collected at 8-weeks and 12-month follow up. Use of digital health technologies (e.g., Apps, wearables, and telehealth) is collected at intake 8 weeks, 12 months, and then annually. Community involvement is collected at each of the assessments except for 1 month by asking participants to report whether or not they participate in the following activities outside the home: social based groups; exercise-based groups; combined social and exercise groups; and, art/craft based activities.

Effectiveness Outcomes

Diabetes-related distress

The primary effectiveness outcome for the evaluation is diabetes related distress. Diabetes-related distress will be assessed using the “Problem-Areas-In-Diabetes (PAID) Scale” questionnaire [36]. The PAID scale is a self-report, validated questionnaire that comprises 20 items assessing diabetes-related problems with participants asked to indicate whether each item is ‘not a problem’, ‘a small problem’, a ‘moderate problem’, ‘somewhat serious problem’. Scores >= to 40 are considered ‘severe distress’, distress on specific items is considered when the total is not >=40 but one or more items are >=3. Participants have ‘no evidence of distress’ when both the previous definitions are not met.

Health behaviours

Physical activity will be assessed using the validated self-report measure “The Active Australia Survey” [37]. The Active Australia Survey is designed to measure participation in leisure-time physical activity. It offers a short and reliable set of questions that can be easily administered via self-report or interview. Sitting time will be measured using an adapted version of the AusDiab multi-context sitting questionnaire, which asks participants to recall week and weekend day sitting time over the last seven days [38].

Nutrition-related behaviours will be assessed using 14 self-report items sourced from O’Reilly et al’s 13-item Diet Quality Tool [39] and 4 items from the evaluation of the Get Healthy Service [40], with redundant items removed. The Dietary Quality Tool [39] has been validated in an Australian clinical population and reflects overall dietary quality relative to national recommendations. The NSW Get Healthy Service items, derived from population surveys – daily servings of fruit and vegetables as per the National Nutrition Survey [41], as well as daily servings of sweetened drinks per day, and takeaway meals per week from the NSW Population Health Survey [42] – are useful standalone items for comparing results to other interventions such as the Get Healthy Service.

Alcohol consumption will be assessed using the brief 3-item version of the Alcohol Use Disorders Identification Test (AUDIT-C). The AUDIT-C provides both a continuous score that correlates with alcohol consumption and adverse drinking consequences, and a valid screening tool for detecting alcohol use disorders and risky drinking with validity in numerous populations including primary care samples [43].

Quality of life

Quality of life will be assessed via self-report at all time points using the EuroQol- 5 Dimension (EQ-5D-5L). The EQ-5D is a widely used and validated tool to measure health-related quality of life [44]. The questionnaire comprises five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression and participants are asked to report level of difficulty with each dimension: no problems, slight problems, moderate problems, severe problems, and extreme problems.

Self-Management self-efficacy

Self-management self-efficacy will be measured by self-report using the Patient Motivation Questionnaire (PMQ) [45]. The PMQ is comprised of 10 statements related to their understanding and confidence in self-management of their condition. The score is calculated as a total out of 10, with 8 items required to be completed.

Loneliness

Loneliness will be assessed via self-report using a valid and reliable scale that asks four questions to capture different aspects of loneliness [46]. The first three questions are from the University of California, Los Angeles (UCLA) three-item loneliness scale. Scores from the three items are used to determine whether the participants are lonely (scores 6-9) or not lonely (scores 3-5). The final question is a direct question about how

often the respondent feels lonely.

Anthropometric measures

A combination of directly measured and self-report methods will be used to assess weight (kg) and waist circumference (cm). Directly measured weight will be assessed during the 1.1 intake appointment, the 8-week group appointment and any subsequent face-to-face recharge appointments (not including 1-month). Where participants do not attend face-to -face follow up appointments for direct measures, participants will be asked to self-report their weight and waist circumference. Instructional videos will be provided on how participants can best self-administer these measures. The combination of self-report and direct measures is standard practice at the clinic to allow flexibility in collecting the data in a timely way with respect to the measurement time points, while also allowing participants to have measures directly taken if they are at the clinic at the time of their follow up.

HbA1c

HbA1c will be collected using a combination of approaches. For all participants, data will be collected by state pathology labs, with the tests conducted closest to intake and 1-month following the supervised program (i.e., ≈3-months post baseline), will be requested from relevant data custodians. A subsample of participants will have HbA1c collected via finger prick at intake and at the 1-month follow up, with the point of care protocol introduced in January 2024 due to availability of resources.

Physical function measures

The 2-minute step test [47], time to complete 5 sit-to-stands [48] and grip strength [49], will be assessed at intake and at 8-weeks to evaluate physical function.

Healthcare utilisation

Health care utilisation is assessed using a self-report measure of usage of GP, hospital, and emergency services at baseline and 12-month follow-up, based on questions adapted from those used in the Household, Income and Labor Dynamics in Australia (HILDA) Survey [50, 51]. Additionally, Queensland Health records will be used to quantify emergency department presentations, hospital admissions, length of stay and potentially preventable hospital admissions related to type 2 diabetes (according to the Queensland Health Key Performance Indicator [KPI] attribute sheets for diabetes related potentially preventable hospital (PPH) admissions).

Adoption

Adoption will be described by estimating the number of referrals, and their referral sources.

Implementation outcomes

Fidelity

Fidelity will be assessed using adherence to the program, where adherence is the number of sessions attended. These data will be drawn from practice management software.

Appropriateness

Appropriateness of the program will be assessed by continuing to monitor program adaptations. These will be tracked using a log similar to Table 3.

Acceptability

Acceptability will be determined by assessing participant satisfaction. Participant satisfaction will be assessed using a 4-point Likert scale at the end of the supervised group component of the program (8-weeks), where 1=not at all satisfied, 2=somewhat satisfied, 3= satisfied and 4=highly satisfied. Participants will be asked to rate their overall service satisfaction, their satisfaction of the quality of services, satisfaction with first appointment being scheduled within a reasonable period, satisfaction with the staff providing the service, and satisfaction with written information.

Costs

Cost of delivery will be assessed using appointment data collected using practice management software.

Maintenance outcomes

Primarily, participant maintenance will be considered by their longer-term outcomes collected at approximately 12-months after the 8-week structured program. Additional perspective will be provided by the extent of re-enrolment after 12 months (or as early as 9 months if clinically indicated), as well as the long-term outcomes at 2-, 3- and 4-year follow ups among those who do not re-enrol in the program.

Sample size

The numbers of participants receiving treatment is not connected to an *a priori* sample size requirement as it would be in a traditional intervention study. Nonetheless, it is useful to consider how much evaluation data provides an adequate degree of power to detect changes in outcomes. These approximate requirements, based on simple bivariate tests, presented in Table 4, show that even a brief evaluation with few participants should be adequate for some outcomes (such as physical activity) while a long-running evaluation with many participants might be required to detect the expected changes in sitting time, or potentially clinically meaningful changes in quality of life based on the EQoL 5-D Visual analogue scale.

Table 4. Approximate number of evaluated participants required to detect 0-8W changes in effectiveness outcomes with 80-90% power and 5%

two-tailed significance

Measure	Effect size	Assumed values		Required n *	
		r	SD	80% power	90% power
Diabetes Distress					
PAID-20 Score	MCID = 5	0.65	15	52	69
Health behaviours					
Active Australia MVPA, min/week	Moderate effect (0.5 SD)	0.4	-	40	53
Sitting time, min/day	Expected effect =30	0.4	340	1212	1622
Fruit, serves/day	Small effect (0.2 SD)	0.5	-	199	265
Vegetables, serves/day	Small effect (0.2 SD)	0.5	-	199	265
Sweet drinks, cups/day	Small effect (0.2 SD)	0.5	-	199	265
Takeaways, times/week	Small effect (0.2 SD)	0.5	-	199	265
Quality of Life					
EQoL-5D-5L Visual analogue scale (0-100)	MCID = 6	0.6	65	739	989
EQoL-5D-5L Index Score	MCID = 0.262	0.75	0.2	5	6
EQoL-5D-5L Visual analogue scale (0-100)	Small effect (0.2 SD)	0.6	-	159	213
EQoL-5D-5L Index Score	Small effect (0.2 SD)	0.75	-	101	134
Self-management Self-efficacy					
Patient Motivation Questionnaire Score	Small effect (0.2 SD)	0.5	-	34	44
Loneliness					
UCLA Loneliness Score	Small effect (0.2 SD)	0.75	-	101	134
Anthropometry					
Weight, kg	Very small change = 1	0.99	26	427	571
Waist, cm	Expected effect = 2	0.97	17	36	48

Physical function					
2-min step test, steps	MCID = 11	0.65	25	31	40
Sit-to-stand test, s	MCID = 2.3	0.65	5.5	34	45
Grip strength (Left), kg	Expected effect = 1.5 kg	0.9	11	87	115
Grip strength (Right), kg	Expected effect = 1.5 kg	0.9	11	87	115
HbA1c					
HbA1c, %	MCID = 0.5%	0.7	1	21	28
Health care utilisation					
General practitioner visits, n	Small effect (0.2 SD)	0.5	-	199	265
Emergency presentations, n	Small effect (0.2 SD)	0.5	-	199	265
Hospital visits, n	Small effect (0.2 SD)	0.5	-	199	265

Note: MCID = Minimum Clinically Important difference. *n participants with pre- and post-evaluation data collected.

Data analysis

Reach, adoption and implementation outcomes will be reported using descriptive statistics. The effectiveness of the lifestyle management program on effectiveness outcomes (all continuous) will be assessed by examining changes over time in linear mixed models, accounting for repeated measures. Missing data in these mixed models will be handled by evaluable case analysis, with adjusted models including any characteristics that may differ between those providing data at different timepoints. Sensitivity of conclusions to missing data handling will be evaluated using multiple imputation. All relevant timepoints will be reported, with the primary endpoint for effectiveness being 8 weeks (except for HbA1c and GP visits), and the primary endpoint for maintenance being approximately 12 months. The main evaluation will focus on all participants enrolled in the program, and a further per-protocol evaluation will consider outcomes for adherent participants only. Health care

utilisation in the 12-months before and the 12-months following enrolment in Logan Healthy Living will be compared using t-tests for continuous variables and Wilcox rank sum for tests for categorical variables, with costs estimated where possible. Sensitivity analyses will be conducted to explore whether healthcare utilisation differs by a range of factors including demographic and clinical characteristics.

Results

Ethics

The Data Registry has ethical approval from Metro South Human Research Ethics Committee (Project ID 84062) and has received ratification from The University of Queensland Human Research Ethics Committee (2022/HE001421). Hospital utilisation data will be drawn from centrally held medical records and obtained on request from relevant data custodians.

Iterative adaptations to the program

Since the opening of Logan Healthy Living, in July 2021, several iterative adaptations have been made to the service delivery model to better meet the needs of the participants and the clinical team. Adaptations have been informed by stakeholder feedback (clinicians, students, consumers) and bi-annual key performance indicator reports. Clinician and student reflections and feedback are discussed in regular team meetings and participant feedback is openly encouraged through all interactions with Logan Healthy Living. Feedback from participants was sought more formally through qualitative focus groups conducted in the first years of operation that aimed to identify barriers and facilitators to

maintaining behaviour change following the lifestyle management program [35]. In addition to identifying barriers that resulted in service changes (e.g., ongoing access to resources such as Physitrack and the gym), participants also reported that there was a sense of belonging and safety within the program, which facilitates an open dialogue for feedback on services. Key changes in response to consumer feedback are communicated to participants using a range of mechanisms, including “You said…we listened…” posters that outline feedback and corresponding changes to service delivery, which are displayed around the service, and via clinic newsletters and social media posts. A summary of key service delivery model adaptations is provided in Table 5.

Table 5. Summary of key service delivery model modifications

Year	Feedback or Challenge	Modification
2022	Initially conducted as one appointment, the intake assessment took approximately 3 hours and participants were reporting fatigue.	The intake assessment was split into two appointments (1.1 and 1.2).
2023	Participants wanted the opportunity to continue to attend Logan Healthy Living to exercise.	‘Open’ gym time was timetabled, where participants could independently use exercise equipment once they had finished the lifestyle management program.
2023	Participants had access to Physitrack during the lifestyle management program and for 3-months following, and feedback indicated that they wanted access for longer.	Participants are provided with access to Physitrack for up to 12 months after the lifestyle management program.
2024	Demand for access to gym was increasing and access times were unsuitable for a large number of participants.	‘Open’ gym concept was expanded to a full, low-cost, Gym Membership model with expanded open times.
2024	Recharge sessions were scheduled as a group	To improve attendance, Recharge

	and attendance was poor.	sessions are individually scheduled and delivered face-to-face at 1-month, and via telehealth (telephone) for 3-, 6-, 9- and 12-months.
2024	Participants expressed a desire to have ways to continue to connect socially with their peers after completion of the lifestyle management program.	A community engagement social group was started. This included a bi-monthly scheduled opportunity for participants to engage with each other socially and to inform them of local community engagement activities. This activity is jointly supported by the Community Development team of Logan City Council.
2024	Time between referral and commencing the lifestyle management program to complete intake assessment was resulting in high attrition and low rates of uptake into the program.	Intake process was streamlined so that appointments were booked concurrently (1.1 and 1.2) to minimise time between referral and commencing the program.
Ongoing	Feedback is continually sought on the program materials and resources from all stakeholders (participants, students and clinicians).	Program materials and resources are iteratively adapted to respond to feedback and to ensure they are up to date (e.g., local services are current and still operating).

Data collection and reporting timeline

The 4-year proof of concept concludes on 31 December 2024, with reporting of results anticipated in 2025.

Discussion

This paper describes the development and evaluation protocol for Logan Healthy Living, an interprofessional, community delivered allied health

service for people living with or at risk of type 2 diabetes in Logan, a region in South East Queensland, Australia. Delivered by a multi-sectoral alliance including primary and tertiary healthcare, government and university partners, Logan Healthy Living is a proof-of-concept service that will be comprehensively evaluated using the RE-AIM framework and drawing from data at the level of the participants, service- and health-system.

In this project, the evaluation outcomes are continuously monitored and collected in partnership between researchers and clinicians, with data collection embedded into usual practice. This is driven simultaneously by a values-based funding model and the opportunity for evidence generating practice, with the establishment of agreed service key performance indicators a pivotal influence in the buy-in required to embed this into practice. While the benefit for research is obvious, what has also emerged is the potential of continuous monitoring to inform iterative adaptations to the program, with the ability to respond in real time to optimise the healthcare service to suit participant and health system needs. Ongoing findings have also been used to inform collaborative strategic planning between partners to drive further development and expansion of the program and services. Detailed tracking of these ‘ripple effects’, such as establishing new networks, partnerships, and services to meet the needs of these adaptations, will be monitored and reported, in an attempt to capture the non-traditional impacts of the program on the community.

While there is a call for multi-sectoral responses to complex health system challenges [12], including chronic disease and type 2 diabetes,

responses to these calls are rarely documented in detail and the learnings from these processes are potentially lost. The detailed description of the alliance, establishment of the service, and the protocol for the evaluation have the potential to inform future multi-sectoral partnerships and the development of community delivered models of care for type 2 diabetes prevention and management, as well as chronic disease more broadly. Implementation and evaluation of a community program within a culturally diverse, low socioeconomic region with rising rates of type 2 diabetes also provides an opportunity to further understand the interplay of social determinants of health and chronic disease and the impact that a purposefully designed service can have on reducing the burden on the participant, the community and the healthcare system. The outcomes of the evaluation will provide valuable insights into the impact of this model of care in practice, with the findings expected to inform potential scale up through local, state, and national partnerships.

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Competing Interests

DG and WW are employed by UQ Health Care Ltd, who deliver and operate Logan Healthy Living. JC, JM and RL are employed by Health and Wellbeing Queensland, who provide a financial and governing contribution to Logan Healthy Living. All other authors declare that they have no competing interests.

Abbreviations

AIHW – Australian Institute of Health and Welfare

AUDIT-C – Alcohol Use Disorders Identification Test

CEO – Chief Executive Officer

EQ-5D – EuroQol-5 Dimension

GP – General Practitioner

GPwSI – General Practitioner with Special Interest

HbA1c - Haemoglobin A1c

HHS – Hospital and Health Service

HILDA - Household, Income and Labor Dynamics in Australia

KPI – Key Performance Indicator

LDL – Low-density lipoproteins

LEADS – Logan Endocrine and Diabetes Service

PAID – Problem Areas in Diabetes

PHN – Primary health network

PMQ – Patient Motivation Questionnaire

PPH – Potentially Preventable Hospital

RE-AIM – Reach, effectiveness, adoption, implementation, maintenance

RFID – Radio frequency identification

UCLA – University of California

UQ – The University of Queensland

Data availability

Not applicable.

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