Best Practice Pathways for Knee Osteoarthritis

Project Report

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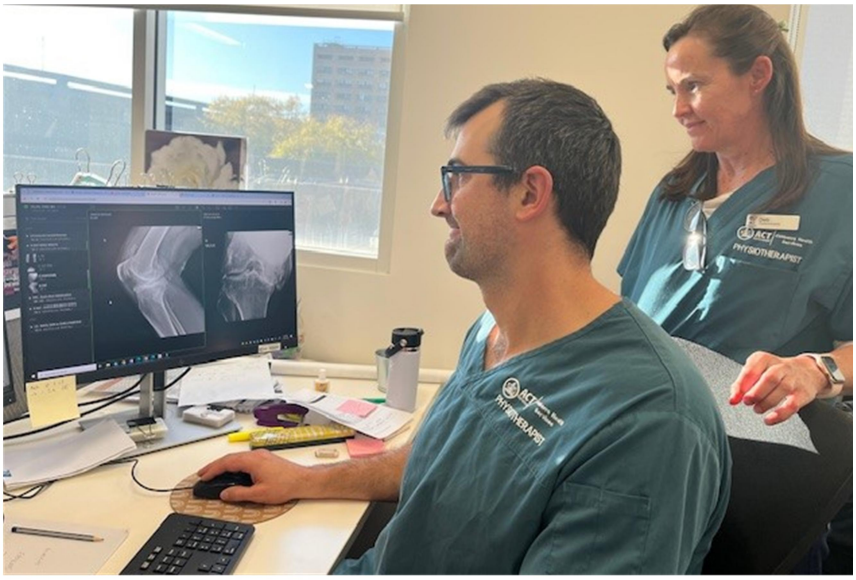

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LaRouche, E. (2022, 5 December). UC and Canberra Health Services lead development of new Canberra Hospital clinic for knee osteoarthritis patients. *University of Canberra News.* https://www.canberra.edu.au/about-uc/media/newsroom/2022/december/uc-and-canberra-health-services-lead-development-of-new-canberra-hospital-clinic-for-knee-osteoarthritis-patients

Canberra Doctor. (2023). New project to tackle orthopaedic waiting list. *Canberra Doctor*, *35*(1), 12. https://www.ama.com.au/ama.com.au/act/publications-and-resources/canberra-doctor/issue-1-2023

Gilfillan, D., McCrum, C., Fearon, A., Stewart, T., Morris, J., & Scarvell, J. (2023, May). What is Implementation Science and how does it relate to best practice? In *Allied Health Symposium*, Canberra.

Scarvell, J., Niyonsenga, T., Lynch, J., & Gilfillan, D. (2023, June). Best practice pathway for knee osteoarthritis [presentation]. *University of Canberra Research Festival*, University of Canberra.

Gilfillan, D., Niyonsenga, T., Stewart, T., McCrum, C., Lynch, J., & Scarvell, J. (2023, August). Best practice for knee osteoarthritis [presentation]. *Australian Physiotherapy Association, ACT Branch conference*, Canberra.

Gilfillan, D., Niyonsenga, T., Fearon, A., Stewart, T., McCrum, C., Douglas, K., Lynch, J., Ward, T., Morris, J., & Scarvell, J. (2024, October). Best practice for knee osteoarthritis – HCF Foundation–funded translation project [presentation]. *Physiolink*, Canberra.

Gilfillan, D. (2023, November). An example of qualitative methods. What do patients with knee osteoarthritis thinks works well and what could we do better? [presentation]. *Clinicians to Clinicians Allied Health Research Network, CHS*.

Scarvell, J., Gilfillan, D., Fearon, A., & Stewart, T. (2023, December). Viewpoints on our orthopaedic elective surgery. What is working and what is not [presentation]. *AOA ACT Scientific meeting*, Canberra

Gilfillan, D., Lynch, J., Niyonsenga, T., McCrum, C., Stewart, T., & Scarvell, J. (2023, December). Waiting to see a consultant for knee osteoarthritis, after Covid and DHR. Is the legend of the long wait to see a surgeon still a thing in 2023? [presentation]. *Australian Orthopaedic Association ACT Scientific meeting*, Canberra.

Data findings and analysis 2023: Knee osteoarthritis patient waiting times and care pathways. (2024, February). Project report presented to CHS Health Executive and leadership.

Jeong, B. (2024, 18 June). A growing number of Aussies are avoiding going under the knife for knee replacement surgery. *WIN News* [TV news segment].

Gilfillan, D., Niyonsenga, T., Stewart, T., McCrum, C., Lynch, J., Ward, T., & Scarvell, J. (2024, June). Best practice pathway for knee osteoarthritis (OA): Wait times to see surgeons are shortened when advanced practice physiotherapy (AP) screening is implemented [presentation]. *Canberra Health Annual Research Meeting,* Canberra.

Scarvell, J., Fearon, A., Gilfillan, D., & Stewart, T. (2024, June). Best practice for knee osteoarthritis Viewpoints on our orthopaedic elective surgery. What is working and what is not? [presentation]. *Canberra Health Annual Research Meeting*, Canberra.

Mitchell, M. (2024, 1 July). New direction for knee OA care pathway. *In Motion, Australian Physiotherapy Association*. https://australian.physio/inmotion/new-direction-knee-oa-care-pathway

Mitchell, M. (2024, 30 July). Research examines the painful truth about knee OA. *In Motion, Australian Physiotherapy Association*. https://australian.physio/inmotion/research-examines-painful-truth-about-knee-oa.

Ward, T., Smith, P. N., Gillfillan, D., Lynch, J., McCrum, C., Niyonsenga, T., Stewart, T., & Scarvell, J. (2024, October). Best practice pathway for knee osteoarthritis (OA): Efficiencies for patients and surgeons when advanced practice physiotherapy screening is implemented [presentation]. *Australian Orthopaedic Association Conference,* Brisbane.

Gillfillan, D., Lynch, J., McCrum, C., & Scarvell, J. (2024, December). Screening by advanced practice physiotherapists improves efficient use of specialist consultations and reduces wait times for knee osteoarthritis patients [presentation]. *CHS Clinicians to Clinicians*, Canberra.

Townsend, P., Gillfillan, D., Lynch, J., Niyonsenga, T., Stewart, T., Bousie, J., Ward, T., & Scarvell, J. (2024, December). Advanced practice physiotherapy screening for knee osteoarthritis – economic gains for patients and the healthcare system [presentation]. *Australian Orthopaedic Association (AOA) ACT Branch Conference,* Canberra.

Gillfillan, D., Lynch, J., McCrum, C., Niyonsenga, T., Stewart, T., Bousie, J., Ward, T., & Scarvell, J. (2024, December). Screening by advanced practice physiotherapists improves efficient use of specialist consultations and reduces wait times for knee osteoarthritis patients [presentation]. *Australian Orthopaedic Association (AOA) ACT Branch Conference*, Canberra.

Fearon, A., Gilfillan, D., Niyonsenga, T., Stewart, T., Morris, J., Barton, C., McCrum, C., Ward, T., Smith, P., & Scarvell, J. (2025, May). Advanced practice physiotherapists reduce wait time to see a surgeon and improve efficiencies in orthopaedic knee OA clinics [presentation]. *World Physiotherapy Congress,* Tokyo.

Fearon, A., Gilfillan, D., Stewart, T., & Scarvell, J. (2025, May). Untangle barriers and facilitators to the implementation of a multidisciplinary screening clinic for people with knee OA: A qualitative study [presentation]. *World Physiotherapy Congress*, Tokyo.

Scarvell, J., Fearon, A., Gilfillan, D., Stewart, T., McCrum, C., Townsend, P., & Niyonsenga, T. (2025, June). Best practice pathway for knee osteoarthritis (OA): Impact of advanced practice physiotherapy (AP) screening in orthopaedic clinics 2022–2024 [presentation]. *Canberra Health Annual Research Meeting*, Canberra.

Morris, J., Ward, T., Gilfillan, D., & Scarvell, J. (2025, 25 June). Advanced physiotherapy practitioners can provide efficient access to care in orthopaedics. A knowledge translation project, HCF Webinar.

Gilfillan, D., Scarvell, J., and team. (2025, November). Advanced allied health practitioners can help solve the problem of long waiting lists to see specialists. A knowledge translation project [presentation]. *British Medical Journal Health Services Research Conference,* Canberra.

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Particular thanks go to the advanced practice physiotherapists who have been deeply involved in the project and generously shared ideas, experiences and vision for a better future: Nick Dennett, Deborah O'Kane and Alison Smith. Thank you to George Eversons for designing the beautiful spreadsheet for data collection and collation for the out-of-pocket costs to patients study in Paper 4. Thank you to the media teams at Canberra Health Services, especially Pia Rowe, and University of Canberra, especially Emma La Rouche.

Enduring thanks to all the participants in the project who participated in interviews and in costs gathering. This project is for you.

Executive summary

Background

Waiting time between GP referral and consultation by a specialist (known as ‘Wait 2’ time) has not previously been reported in the Australian Capital Territory (ACT), but in other states it can be prolonged. A Canberra Health Service (CHS) internal review in 2020, The Reboot Project, found 1,590 patients awaiting orthopaedic consultation at Canberra Hospital; after 2 years only 38% had been seen, with a mean wait time of 3.6 years. Yet there is excellent evidence, from the ACT and internationally, that advanced practice physiotherapists (APP) can provide an efficient and accurate diagnostic and screening service. This project was developed in collaboration between University of Canberra (UC), CHS and local and national stakeholders to translate the best evidence from research into clinical practice. In our project, we investigated how implementing strategies aligned with best practice care of knee osteoarthritis could impact the care pathways and wait time for patients referred to see an orthopaedic surgeon in the ACT public health system.

The aim of this project was to sustainably eradicate Wait 2 and ensure that public patients have access to best practice care, including shared decision-making and non-surgical interventions. To unravel and remove access barriers to best practice interventions, we needed to:

1. Use a systems approach to implement an expert review that was responsive, cost-effective and followed best practice interventions.
2. Establish strong collaboration between consumers, primary health care, public orthopaedic triage and surgeons, and across public and private sectors.
3. Develop pathways to ensure patients have knee replacement surgery at the right time.

Method

A knowledge translation approach was taken, including qualitative, quantitative and economic analyses. We gathered evidence to determine best practice and used collaborative strategies for decision-making guided by deliberative democratic principles. The governance model of this project included the project executive, whole of team meetings (investigators, project manager and Trauma and Orthopaedic Research Unit staff), a steering committee (including stakeholders and consumers) and working parties, variously including academic team members, CHS members, health professionals, stakeholders and consumers. Evaluation for the knowledge translation approach included quantitative, qualitative and economic analyses.

We gathered baseline data on waiting times and patient and stakeholder experiences to identify issues, barriers and enablers to implementation of best practice in March 2023. Waiting times were measured for patients with a new referral for knee osteoarthritis and those already waiting for a consultation between 1 March and 30 September for baseline capture in 2022, then each year’s cohort in 2023 and 2024. Characteristics of the cohorts, wait time and pathways – either seen by an APP, a surgeon or both – and the outcome of those visits were analysed for predictive factors.

Interviews, conducted by UC academic members Angie Fearon and Jennie Scarvell, were recorded, transcribed and de-identified. Member checking of emerging themes and quotes resulted in some requests for revision or redaction by participants. Four investigators used thematic analysis, based in phenomenology, against a framework to organise the findings based on the aims of the project: to understand what is working well, what needs improvement, what a model of care would look like, and the barriers and enablers to implementation of that model of care. Participants were drawn through purposive sampling, and included patients (*n* = 6), primary care practitioners in general practice (GPs) (*n* = 4) and other primary care (*n* = 3), surgeons and registrars (*n* = 6), physiotherapists in the community, acute service and private care (*n* = 5), and the CHS Executive (*n* = 5).

Changes to the healthcare service during the period included those implemented by CHS as part of the implementation working party discussions and those serendipitously occurring as part of IT improvements in CHS. Acute care physiotherapy increased resources to the APP clinic so that more patients with knee osteoarthritis could be seen (from 0.8 to 1.5 FTE), connections with community osteoarthritis and obesity programs were streamlined, CHS Community Care expanded the availability of the hip and knee osteoarthritis education and exercise program GLA:D (Good Living with osteoArthritis: Denmark) (Barton et al., 2021; Roos et al., 2018) and several stakeholder engagement activities were conducted. Serendipitously, EPIC Digital Health Record (DHR) was established in November 2022, the HealthLink e-referral system was upgraded, and CHS Quality and Safety initiated the Osteoarthritis of the Knee Clinical Care Standard for knee osteoarthritis.

We evaluated the wait times measured for the 2023 and 2024 cohorts and the pathways for patients. To evaluate project impact, we held further interviews and focus groups in 2023 and 2024. Participants were invited from patient (*n* = 9), GP (*n* = 4), physiotherapy (*n* = 5), surgeon and registrar (*n* = 5) and health executive groups (*n* = 5). Three researchers used thematic analysis, based in phenomenology, to derive themes against the questions outlined above, with the addition of ‘what changes have you noticed?’

To assess the economic impact of waiting, and the economic considerations and decisions that influence current and future decisions, we conducted three tasks:

1. To calculate the costs to patients of living with osteoarthritis, using the Canadian Cost to Patients Questionnaire, 16 participants collected data for 6 or 12 months on out-of-pocket costs incurred.
2. To evaluate the costs of the three different patient pathways and outcomes, we modelled them using a Markov chain. Patients could either be seen in the APP clinic; be seen in APP clinic and then referred to a surgeon; or wait to see a surgeon. Their outcomes could be discharge; referral to community programs; or total knee replacement. Costs and the likelihood of successful outcomes were built into the model.
3. To describe optimal pathways and decisions and to inform policy, we fed information from the Markov model and from GLA:D outcomes data into a general algebraic model of optimising pathways and decisions. This work will be reported at the end of 2025.

Key findings

Compared to 2022, wait times to see a surgeon were 0.14 times shorter in 2023 and 0.10 times shorter in 2024. The waiting time improved from 50% of patients seen within 114 days in 2022 to within 45 and 46 days in 2023 and 2024 respectively, and from 90% seen within 1,248 days to within 91 and 84 days respectively. The proportion of patients seen in the APP clinic increased from 20% in 2022 to 81% in 2023 and 76% in 2024. Patients seen in the APP clinic risked fewer delays than those seen only in the surgical clinic (APP clinic incidence rate ratio [IRR]: 0.55; 95%CI: 0.43, 0.72; and if seen in both APP and surgical clinics IRR: 0.54; 95%CI:0.41, 0.70). Patients in 2023 and 2024 had reduced risk of extended wait times to see a surgeon (adjusted odds ratio [AOR]: 0.11; 95% CI: 0.04, 0.31; AOR: 0.02; 95% CI: 0.004, 0.09). The number of patients referred to orthopaedics and listed for surgery fell from 46% in 2022 to 38% in 2023 and then to 35% in 2024. There was no difference between the year cohorts for people referred back to see a surgeon by their GP after APP consultation. The surgeons saw more patients ready for surgery, in that patients referred in 2023–2024 were 1.9 times more likely to be listed for surgery than a patient seen in the surgical clinic in 2022 (odds ratio 1.9, chi^2 = 6.5, p = 0.011). Wait times analysis incorporated all of the changes that occurred to the health service during the period, since this is an ecological study.

The first round of interviews showed consistently that APP clinical assessment of patients is highly valued. Patients appreciated early advice and interventions; surgeons appreciated filtering of patients. The high quality of surgery was recognised, but all participants noted that waits were unacceptably long, especially for high-risk complex patients unsuitable for elective surgery outsourced to the private hospital and at risk of deterioration. A community-based program that provided assessment, advice and review was recommended. APPs were acknowledged as skilled and appropriate to conduct this clinic, working at top of scope. Mechanisms to escalate deteriorating patients were needed. Several funding models were proposed, but success was felt to depend on access to imaging, ability to refer directly to the orthopaedic list, and quick access to surgeon advice. Good communication with the community to promote allied health interventions prior to considering surgery and for prehabilitation was essential. Facilitating the right patients having responsive access to surgery was essential for an efficient system. Good communication and listening to stakeholder voices are essential effective drivers of practice change.

The second round of interviews evaluating the changes made was synthesised into themes as follows. A responsive system had empowered confidence in self-management for patients. APP clinics were highly regarded by patients and health professionals. An imperative has arisen to expand this model of care to patients with other orthopaedic conditions and to other specialist clinics across the health service. There has been a major improvement for those patients with knee osteoarthritis, and other patients now face inequity in access to care. Barriers to expanding the successful model include training sufficient APPs to resource APP clinics. The program for knee osteoarthritis relied on strong community allied health programs available as a non-surgical pathway, but such programs do not exist for problematic foot or shoulder conditions with long delays to consultation. Participants told us that community health services need resourcing to meet demand, particularly in podiatry and dietetics, where demand is great. Some quick wins were identified, such as utilising the DHR to send notifications to patients on the progress of their referral, and for tracking referrals. There is a widespread request for

education in self-management for patients, particularly in pain management. Changes have improved patients' experience and responsiveness of the system. Stakeholder engagement has been essential to the success of the project, to staying grounded in patient-centred decision-making, and to meeting demands within resource priorities and constraints.

Costs to patients, including only out-of-pocket costs, ranged from $5,329 to $83 in 6 months (median $1,355, mean $1,824, SD 1,421). Total costs per day ranged from $16.09 to $0.45 (median $7.42 per day, mean $7.98 per day, SD 4.63). Total costs comprised direct costs of $921 (median), and indirect costs of $233 (median) over 6 months. There were no relationships confirmed between financial stress and costs, income category or quality of life metrics. This study is limited by its small sample size, but given the absence of more recent data, this information provides cost estimates for subsequent economic modelling.

Economic evaluation using the Markov chain to model costs to the health sector and patients found that Wait 2 was a key determinant in the costs and benefits of knee osteoarthritis care for public patients. Policy changes to increase resources to the APP clinic and screen all patients with knee osteoarthritis will direct patients to care earlier. Reduced Wait 2 time and earlier direction to care pathways that exhaust conservative care for public patients with knee osteoarthritis decrease public healthcare costs by approximately 36% and indirect patient costs by 24%. It is reasonable to expect that such significant changes will affect the relative demand for, and supply of, knee osteoarthritis care in both the public and private sectors.

An optimisation modelling platform (GAMS, general algebraic modelling system) was used to find (solve for) optimal care solutions in response to a user-defined objective function. The objective function was set to maximise Knee Osteoarthritis Outcome Scores for patients, reflecting outcomes important to patients and their function. Final modelling will be available for the next report.

Conclusions

Very positive changes may be attributed to an increased proportion of people with knee osteoarthritis being seen by APPs, to DHRs reducing the risk of lost referrals, to the availability of community exercise and education programs and to compliance with the clinical standards for management of knee osteoarthritis. Care has improved for patients with these improved pathways.

There is now an urgent imperative to expand this model of care to patients with other conditions in orthopaedics and to other specialist clinics across CHS, where it has been identified that advanced clinical practitioners would benefit from patients' elevated access to care.

Impact analysis

The impact analysis will be conducted using the GiAF (Global Impact Analysis Framework) tool and RE-AIM evaluation, and those results will be available at the end of 2025. The impact will explore reach, acceptability, resource demands and effectiveness of collaboration of stakeholders.

Sustainability factors

Four key features of this project have been identified from the qualitative analysis as critical to the sustainability of this project, and others like this that seek to embed best evidence into improved models of care.

1. Communication and collaboration across CHS divisions. This project established a strong cross-division investigator group from the start, embedding key stakeholders within committees and working parties. The interviews and focus groups also cemented this stakeholder engagement as participants' views were recorded and fed back to the decision-makers, so that it was demonstrated they have been heard. The Division of Acute Care, Division of Surgery, Division of Rehabilitation and Community Care, and Division of Allied Health were all involved. In the words of participants:

   > *The approach that we took was a really positive and sound approach. The approach is a very sound one and we probably at some point need to document how we did it. (Health Exec D)*
   >
   > *Well, it's the right way to do it, and it's the consensus building is something which does change practice. (David, surgeon).*

2. Communication and collaboration between GPs and the Health Service. APPs worked with Capital Health Network (CHN) to streamline appropriate referrals. The interviews showed that GPs, when referring a patient to orthopaedics, are seeking a specialist consultation for their patient – but it does not have to be with a surgeon. They are not necessarily seeking surgery for this patient, and so consultation with the APP met their needs.
3. Resourcing and planning for APPs to provide these additional services. APP clinics can improve access to care and efficiency of surgical clinics, in that the patients in surgical clinics are more likely to be ready for surgery been first screened through the APP clinic. However, there are insufficient trained APPs and it is difficult to recruit them from elsewhere. These staff resource issues need to be addressed if this model of care is to be expanded.
4. Collaboration in planning service changes is essential and is most successful when underpinned by sound data. The DHR has enabled better administrative management and has the potential to produce useful reports. There is pressure to continue to report on wait times in specialist clinics, bringing the ACT into line with Queensland, Victoria, Western Australia and Tasmania, who report these wait times. Collaboration between the CHS divisions and the stakeholders is critical to planning for service changes, as the complexity of the health system moves pressures from one area to the next, such as from knees to feet and shoulders, or from the public to the private system, or from acute hospital care to the community health service. Planning these service changes requires consultation and collaboration between the range of stakeholders.

Key recommendations

Recommendations arising from this project are based in the qualitative and quantitative evaluation of the project. The CHS is recommended to:

Monitor and report on wait times and the impact of waiting

1. Be accountable for wait times for patients. Wait times should be monitored and reported. Develop a report in EPIC-DHR that will report on wait times for specialist clinics.
2. Adopt the clinically recommended timeframes (AIHW, 2022) for specialist clinics.
3. Embed in EPIC-DHR patient-reported outcomes measures. Good planning for care is based in sound data, and to embed patient-centred principles both consumer engagement and patient-reported outcomes are required. Otherwise, the impact of changes is not measured.

Expand and resource the APP clinic concept, and monitor the efficacy of that expansion

4. Expand and resource the APP clinic to see patients with other conditions in orthopaedic clinics.
5. Adopt clinically recommended timeframes for APP clinics.
6. Support resourcing of APPs to see Category 2, not only Category 3 urgency patients.
7. Commit to exploring expanding the APP concept to other specialist clinics.
8. Develop agreements with specialists to mentor and communicate regularly with APPs.

Improve cross-sector communication

9. Carry out the planned review of the CHN Health Pathways for GPs to refer to Canberra Hospital orthopaedic clinics.
10. Provide information via CHN that will assist GPs to refer to CHS Community Care services.

Communicate with patients about wait times

11. Provide simple phone text communication with patients about their waiting position.

Expand the advanced clinical practitioner workforce

12. Train more advanced clinical practitioners.
13. Address gaps in training pathways for advanced clinical practitioners.
14. Address issues in recruitment of advanced clinical practitioners.

Provide CHS Community Care health services with sufficient resources

15. CHS Community Care services need increased resourcing to provide the services that will: (1) meet the demand of patients living with complex chronic conditions requiring allied health services, and (2) to take the strain from specialist clinics for treatment of those chronic conditions where evidence shows allied health interventions can be most effective.
16. Address barriers to GPs referring patients to Community Care. My Aged Care, Central Health Intake and long wait times all present barriers to GP referral.

17. Develop services in Community Care to meet emerging demand. This may include implementing needs assessment for conditions that impact on patient quality of life, and where management in the community is appropriate and keeps people living effectively in their communities.
18. Develop patient education programs for managing osteoarthritis. Patients clearly asked for education programs to train themselves in self-management. Education can effectively change belief systems for those with osteoarthritis to enable good self-care and less reliance on surgical solutions.

Background

Summary

The project, *Best practice pathway for knee osteoarthritis – Implementing an advanced musculoskeletal pre-surgical triage and assessment clinic*, was instituted in response to the Canberra Health Service (CHS) identifying issues in elective orthopaedic surgery wait times. CHS approached Professor Scarvell at University of Canberra (UC) to develop and conduct a collaborative project to address the issues while implementing best practice solutions. A structured project was developed collaboratively to investigate the factors contributing to extended wait times for patients with knee osteoarthritis referred for orthopaedic consultation at Canberra Hospital. The project was funded by a Translation Grant from the HCF Foundation for a 3-year period from July 2022 to June 2025.

Waiting for a total knee replacement (TKR) can take years. The wait times reported by the Australian Institute of Health and Welfare (AIHW) miss the hidden wait between referral and surgical review. While waiting, patients deteriorate, losing capacity for physical activity and work. Evidence from the UK and Australia shows that advanced musculoskeletal physiotherapy clinics improve accurate referral to surgery and facilitate uptake of effective non-surgical knee osteoarthritis programs in the waiting period. Evidence supports translation of this research into the Australian Capital Territory (ACT) and southern NSW catchment region.

A best practice advanced musculoskeletal clinic received patients referred to surgery in the public system. The clinic, staffed by advanced practice physiotherapists (APPs) with rapid access to consultation with a surgeon, funnelled patients to either Canberra Hospital surgical clinics or to management for knee osteoarthritis through exercise, education, diet and pain management in CHS Community Care.

The project was a planned, co-designed venture between consumers and stakeholders to resolve the persistent problem of wait times. The implementation planning was grounded in knowledge translation and behaviour change frameworks. A steering group of consumers, medical professionals and allied health providers guided the project. First, baseline data were gathered on wait times, and barriers to implementation were identified through mixed methods approaches. Working groups of consumers, general practitioners (GPs), surgeons and orthopaedic teams used ‘deliberative engagement’ to determine how to overcome these barriers. Evaluation, again by a mixed methods approach, mapped patient outcomes and patient experiences, waiting times, costs and stakeholder feedback.

This project aimed to improve patient outcomes by appropriately timing TKRs for public patients and providing better chronic care management alternatives. Research team leaders were key clinical governance decision-makers in order to make this sustainable.

The case for change

Delays to elective surgery such as TKR are highly publicised, and there is national monitoring. However, there is an urgent unmet need for people waiting for surgical review (Morris et al.,

2018). In the ACT in 2019–20, delay to TKR blew out to median 344 days, compared to the national median 223 days, and 44% patients waited over 365 days (compare this with the national proportion of patients waiting over 365 days, 11%) (AIHW, 2025). But prior to this is the hidden, unreported wait for surgical consultation.

Delays to consultation in orthopaedics are worsening. A CHS internal review in 2020, 'The Reboot Project', found 1,590 patients awaiting orthopaedic consultation at Canberra Hospital; after 2 years 62% were yet to be seen. The median wait time for patients with knee osteoarthritis (*n* = 344) was 741 days (with a maximum of 1,688 days). For feet and shoulder problems, the wait time was worse (feet problems: *n* = 404, median 920, max. 2,106 days; shoulder problems: *n* = 192, median 896, max. 2,133 days). In 2024, these wait times have further deteriorated (feet problems median 1,803 days; shoulder problems median 1,772 days). While they wait for surgical consultation, patients typically do not access effective non-surgical interventions such as physiotherapy and podiatry, missing valuable therapeutic windows. The impact of waiting for patients includes worsening pain, diminished quality of life and reduced work productivity (Morris et al., 2018).

Knee osteoarthritis affects 1.2 million Australians and has a high burden on quality of life and productivity for people living with this chronic condition. Yet knee osteoarthritis has a well-developed evidence base for non-surgical and surgical interventions and well-developed guidelines for practice. The Australian Commission on Safety and Quality in Health Care (ACSQHC) Osteoarthritis of the Knee Clinical Care Standard (Australian Commission on Safety and Quality in Health Care, 2024) provides guidance to clinicians and healthcare services on managing knee osteoarthritis (originally published 2017, revised August 2024). The Royal Australian College of General Practitioners (RACGP) guidelines for management of knee osteoarthritis were endorsed in 2018 (RACGP, 2018).

Best practice is to manage knee osteoarthritis as a chronic condition, using surgery as a last resort. Programs incorporating exercise, weight loss and education are consistently effective for people with knee osteoarthritis (Barton et al., 2021; Panunzi et al., 2021; Skou & Roos, 2017; Verhagen et al., 2019). Sadly however, 54% of patients having TKR will have attempted no exercise intervention prior to surgery (Hinman et al., 2015) for reasons as diverse as scepticism of non-surgical management, confidence and health system complexities. Victoria and NSW Health have established advanced practice community clinics staffed by multidisciplinary teams of experts in exercise, physiotherapy, diet, pain management and rheumatology (Australian Commission on Safety and Quality in Health Care, 2024; Briggs et al., 2018; Musculoskeletal Network, 2019). These clinics refer the right patient at the right time to surgery. The UK National Health Service (NHS, 2017) mandates that a patient must have exhausted non-surgical options prior to surgical review. The current waiting times for expert osteoarthritis consultation present a significant cost to quality of life, physical activity and comorbidities for the patient. There is a lost opportunity to empower the patient to manage their chronic condition in shared care with a multidisciplinary team (Australian Commission on Safety and Quality in Health Care, 2024). Translating this evidence into clinical practice should be straightforward for knee osteoarthritis.

The role of Advanced Practice Physiotherapists in osteoarthritis care

Advanced musculoskeletal review clinics in Victoria, New South Wales and the UK staffed by credentialled APPs have resolved access issues, providing timely care for patients needing surgery (Victorian Musculoskeletal Clinical Leadership Group, 2018). Furthermore, most patients were satisfied to manage their osteoarthritis non-surgically once provided with access to the tools, skills and support they needed.

Internationally, there is robust evidence to demonstrate that advanced practitioners provide high-quality care. A systematic review by Saxon et al. in 2014 showed 19 studies of physiotherapists in advanced roles, one of an occupational therapist and five across several disciplines (Saxon et al., 2014): they describe the roles of practitioners and the studies' positive findings for waiting time and patient satisfaction. A systematic review of systematic reviews found solid support for accurate diagnosis, appropriate triage and improved patient treatment outcomes and access to care through the APP system (Vedanayagam et al., 2021). Specifically, a systematic review of consistency between APPs and specialists in clinics showed high concordance and patient satisfaction (Lafrance et al., 2023), while another review of 191 papers found no adverse events arising from advanced practitioners working at top of their scope (Evans et al., 2021). This body of evidence supports advanced practitioner role development.

Advanced practitioners working in specialist clinics, emergency departments and urgent care clinics at the top of scope is not a new phenomenon in Australia. In Victoria and Queensland, advanced practitioners have been recognised since 2005 (Harding et al., 2015), and by 2012, at least 13 health care services had APPs with musculoskeletal expertise working in orthopaedic clinics and emergency departments. There is evidence for good outcomes and patient satisfaction from seeing an advanced scope practitioner instead of a medical specialist. However, barriers persist (Nancarrow & Borthwick, 2021), and these include lack of support for non-medical prescribing and the absence of a consistent and recognised education framework or curriculum (Morris et al., 2014; Morris & Grimmer, 2014; Stanhope et al., 2012). Stanhope et al. (2012) and Harding et al. (2015) both recommended a national framework and curriculum content for advanced practitioner training.

ACT orthopaedic waiting times

The pathway for public patients in the ACT region begins with the GP.

Wait 1 is the time between symptoms and seeing a GP. GPs often refer their patient for surgical consultation, and develop a shared-care plan with only 46% of patients. The letter to the hospital orthopaedic clinic is triaged by a physiotherapist based on urgency.

Wait 2, from GP referral to surgical consultation, is not reported in New South Wales or the ACT. However, in Victoria, the wait to see an orthopaedic surgeon is 769 days. For comparison, the wait time before seeing a gynaecologist is 454 days and a rheumatologist 468 days (Australian Medical Association [AMA], 2022). This is referred to as 'the hidden wait'. Professor Graeme Stewart from the Westmead Institute for Medical Research spoke to ABC News and described the figures as 'unconscionable' (Dalzell, 2023). The Australian Bureau of Statistics (ABS, 2022) recorded that 30.3% of patients living with a chronic condition found wait times to

see specialists were unacceptable, and recorded cost and long wait times as significant barriers to seeking care. Queensland and Victoria have adopted performance indicators based on wait times: Category 1 patients should see a specialist within 30 days, Category 2 patients within 90 days and Category 3 patients within 365 days, similar to the AIHW procedure indicators (AIHW, 2025).

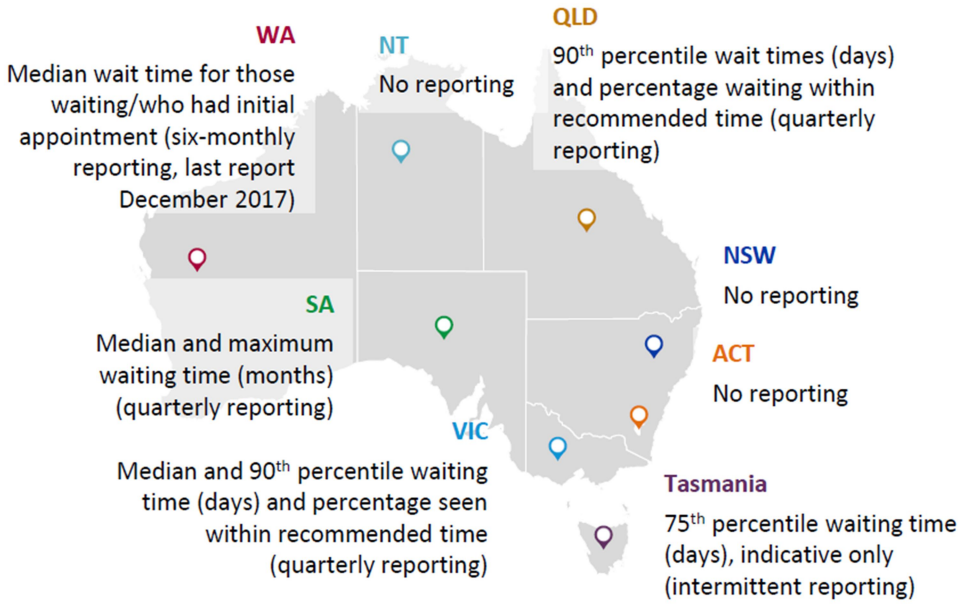

Figure 1. The states and territories that report metrics for outpatient wait times

Source: AMA 2022.

Wait 3 is the time between a surgeon writing a request for TKR, and that procedure being completed. Wait 3 times are publicly available in the AIHW My Hospitals dataset (AIHW, 2025).

Goal of the project

This implementation project aims to translate the best evidence from research into clinical practice. In our project, we investigated how implementing strategies aligned with best practice care of knee osteoarthritis could impact the care pathways and wait time for patients referred to see an orthopaedic surgeon in the ACT public health system.

Synthesis of the best evidence included clinical trials, clinical guidelines and a breadth of diverse health services research. A key guideline adopted by CHS is the AQHCS Osteoarthritis of the Knee Clinical Care Standard (published 2017, revised 2024). Importantly, in alignment with national and international guidelines for knee osteoarthritis, this standard recommends that joint arthroplasty surgery be reserved for end-stage joint disease that has failed to respond to all trials of non-surgical strategies.

The aim of this project was to sustainably eradicate Wait 2 and ensure that public patients have access to best practice care, including shared decision-making and non-surgical interventions. To unravel and remove access barriers to best practice interventions, we need to:

1. Use a systems approach to implement expert review that was responsive, cost-effective and follows best practice.

2. Establish strong collaboration between consumers, primary health care, public orthopaedic triage and surgeons, and across public and private sectors.
3. Develop pathways to ensure patients have TKR surgery at the right time.

By increasing resources for effective orthopaedic triage, to screen patients and to provide effective access to knee osteoarthritis programs, we aimed to improve the confidence of health practitioners and patients to manage knee osteoarthritis as a chronic condition.

Ethical considerations

This project was a health services evaluation and implementation of best practice project and was assessed by ACT Health Human Research Ethics Committee under the provisions of low-risk ethics. It involved no randomisation or blinding of participants, clinicians or researchers. For qualitative and health economics aspects of the project, voluntary informed consent was obtained, and in all aspects, strict data management protocols were observed.

ACT Reference: 2022.LRE.00185

Cross-institutional ethics approval was provided by University of Canberra Human Research Ethics Committee.

Project team and governance

A collaborative group of investigators was invited from CHS, UC and the primary care and non-government sectors to develop this project. The project required a robust knowledge translation framework and effective stakeholder engagement and collection of data to inform decisions.

Table 1. Project Investigators

Prof Jennie Scarvell (CI)	Assoc Dean Research, Professor of Physiotherapy	UC
Dr Jo Morris	Executive Director Allied Health Exec Director – Rehabilitation Aged and Community Care	CHS
Prof Paul Smith	Director of Orthopaedics Orthopaedic Consultant	CHS, ANU
Dr Tom Ward	Orthopaedic Consultant, VMO	Hip Knee Surgery Inc
A/Prof Angie Fearon	Associate Professor Physiotherapy	UC
Prof Theo Niyonsenga	Professor of Epidemiology, Health Research Institute	UC
Dr Joe Lynch	Clinical Research Lead, Trauma and Orthopaedic Research Unit	CHS
Mrs Rebecca Davey	CEO	Arthritis ACT
Ms Judy Stone	Director of Physiotherapy, Community Care	CHS
A/Prof Christian Barton	Assoc Professor Physiotherapy, GLA:D program	La Trobe University
Prof Nick Brown	Joint Professor of Allied Health, Director Clinical School (Now: Head of School of Health Sciences)	UC, CHS QUT
Prof Kirsty Douglas	Professor of General Practice ANU Director Academic Unit of General Practice	ANU ACT Health

Note: ANU = Australian National University; CHS = Canberra Health Services; CI = Chief Investigator; GLA:D = Good Living with osteoArthritis: Denmark program; QUT = Queensland University of Technology; UC = University of Canberra; VMO = Visiting Medical Officer.

Table 2. Steering Committee

Dr Michael Gillespie	Orthopaedic Surgeon (Chair)	
Dr Louise Kenyon	GP educator, General Practitioner	Capital Health Network
Dr Andrew Cottrill	Chief Medical Officer	HCF
Mr Bjarne Kragh	Physiotherapy Principal	Southside Physiotherapy
Dr Jo Morris (Investigator**)	Executive Director, Rehabilitation, Aged & Community Services, Executive Director Allied Health	CHS
Prof Nick Brown **	Head of School: Health Sciences	QUT
Ms Linda Trompf	President	Health Care Consumers Association
Ms Danealle Gilfillan	Advanced Practice Physiotherapist, and Project Manager	CHS

Dr Ros Stanton	Director Research Mentorship, Supervision, and Education Programs, Office of Research and Education	CHS
Ms Debbie Kaczor	Secretariat	CHS

Note: CHS = Canberra health Services; HCF = Hospitals Contribution Fund; QUT = Queensland University of Technology.

Table 3. Working Parties

Data Working Party	Prof Jennie Scarvell	CI, Assoc Dean Research (ADR), UC
	Prof Theo Niyonsenga	CI, Professor Epidemiology, UC
	Dr Joe Lynch	AI Clinical Research Lead TORU, CHS
	Dr Carol McCrum	Dr, Advanced Practice Physiotherapist (Rheumatology), CHS
	Ms Tahlia Stewart	Senior Research Lead, TORU, CHS
	Ms Danealle Gilfillan (Chair)	Project Manager and Advanced Practice Physiotherapist (APP), CHS
Patient Journey Working Party	Prof Jennie Scarvell (Chair)	CI, ADR, UC
	A/Prof Angie Fearon	CI A/Prof Physiotherapy, UC
	Ms Tahlia Stewart	Senior Researcher, TORU, CHS
	Ms Danealle Gilfillan	Project Manager, APP, CHS
Implementation Working Party	Dr Tom Ward	CI, Orthopaedic surgeon, CHS
	A/Prof Christian Barton	A/Prof Physiotherapy, La Trobe University
	Prof Kirsty Douglas	Professor General Practice, ANU
	Ms Danealle Gilfillan (Chair)	Project Manager, CHS
	Ms Judy Stone	Director of Physiotherapy, Community Care, CHS
	Ms Kerry Boyd	Director of Physiotherapy, Acute care, CHS
	Dr Carol McCrum	PhD, APP, CHS
Health Economics Working Party	Prof Theo Niyonsenga	A/Prof, Professor Epidemiology, UC
	Prof Jennie Scarvell (Chair)	Prof Physiotherapy, ADR
	Dr Phil Townsend	PhD candidate and Economist, UC
	Dr Joe Lynch	Clinical Research lead, TORU, CHS
	Ms Tahlia Stewart	Senior Researcher, TORU, CHS
	Mr Michael Ceravolo	Physiotherapist, Belconnen Health Centre, CHS
	Ms Renai De Marco	Physiotherapist, Belconnen Health Centre, CHS
	Ms Danealle Gilfillan	Project Manager, CHS

Note: ADR = Associate Dean Research; AI = Associate Investigator; ANU = Australian National University; APP = advanced practice physiotherapist; CHS = Canberra Health Services; CI = Chief Investigator; TORU = Trauma and Orthopaedic Research Unit (Canberra Hospital); UC = University of Canberra.

Meetings

- Project executive comprising J. Scarvell, D. Gilfillan, T. Ward and J. Lynch met monthly during 2022–23 and 6-weekly in 2024–25
- Steering Committee, quarterly
- Working parties 2- or 4-weekly, during periods of work intensity
- Whole of Team: Chief Investigators (CIs), Associate Investigators (AIs) and Trauma and Orthopaedic Research Unit (TORU) team at Canberra Hospital met monthly during 2022–23 and 6-weekly in 2024–25.

Publications and authorship approach

We agreed that publications would follow the National Health and Medical Research Council authorship guidelines: authorship contributions were founded on involvement and contribution to design, conduct, analysis, interpretation and writing of publications (including abstracts, conference papers and journal articles). HCF Research Foundation funding is acknowledged.

Methodologies

The project applied a knowledge translation approach (Graham et al., 2006) that collaboratively engaged stakeholders to develop activities specifically to address the identified barriers to best practice care pathways for knee osteoarthritis. Key to the implementation plan were frameworks of knowledge translation (Graham et al., 2006; Health Canada, 2017), behaviour change (Atkins et al., 2017; Michie et al., 2011) and program evaluation (Agency for Clinical Innovation, 2013; Barton et al., 2021).

Knowledge translation framework

A knowledge translation project aims to translate the best evidence from research into clinical practice. Applying the Knowledge to Action model (Graham et al., 2006; Health Canada, 2017), the project implemented behaviour change activities aimed at increasing awareness of the Osteoarthritis of the Knee Clinical Care Standard (Australian Commission on Safety and Quality in Health Care, 2024), supporting communication between and among care providers for knee osteoarthritis patients, and education within CHS and the ACT regarding available care pathways for knee osteoarthritis. Figure 2 describes the model as a cycle of planning based on sound evidence and local data collection.

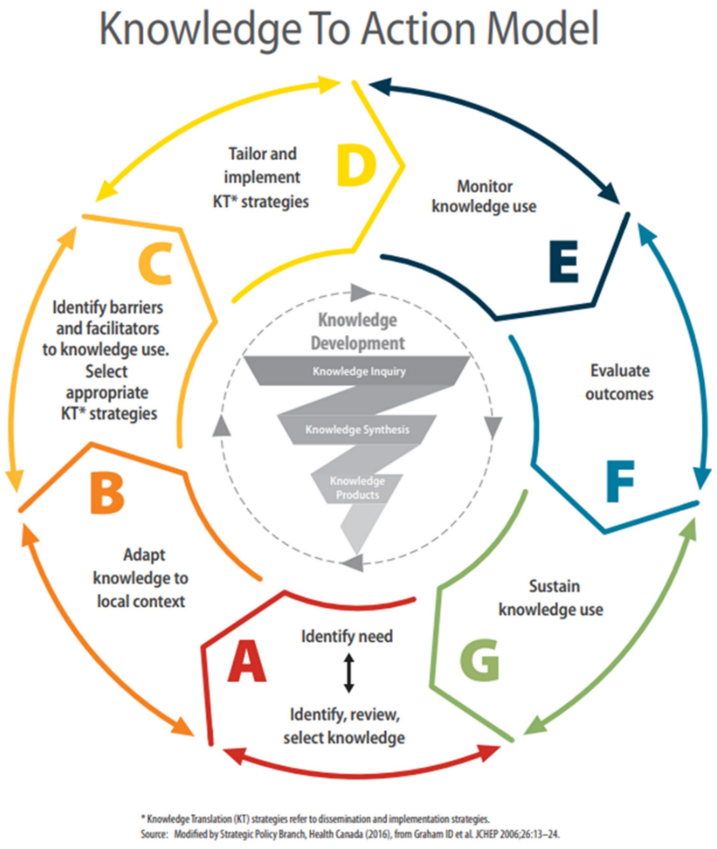

Figure 2. Knowledge to Action Model, KT Canada

Source: After Graham et al. (2006).

Increased use of the APP clinic to redirect non-urgent patients to non-surgical care pathways was a key feature that tied together this behaviour change. Table 4 details the application of steps to the method of the project.

Table 4. Steps to plan for knowledge dissemination and implementation

Steps to plan for knowledge dissemination and implementation	Activities of the project
A Identify need. Identify, review and select knowledge. Identify and consult with your stakeholders and target audience Define the need and the expected outcomes of your initiative Identify the knowledge you want to disseminate and implement	• Purposive engagement with stakeholders through project investigators, steering committee and working parties. • Baseline data collection: interviews with stakeholder participants (patients, GPs, surgeons, physiotherapists, other primary care providers and CHS health executives). • Identified wait time for patients with knee OA to see a surgeon, compared to clinically recommended times. • Gathered data on costs to patients of living with knee OA. • Evidence from care pathways exemplified in Vic Health OAHKS clinics, UK NHS Musculoskeletal clinics. ACSQHC Osteoarthritis of the Knee Clinical Care Standard (2017, 2024).
B Adapt knowledge to local context Identify any adaptations needed to the knowledge	• Four working parties conducted parts of the project. Implementation working party established as decision-making body for the APP clinics. • A clinical standard for knee osteoarthritis locally developed by CHS.
C Identify barriers and facilitators to knowledge use. Select appropriate knowledge translation strategies. Identify barriers and facilitators Choose appropriate dissemination and implementation strategies	• Barriers to best practice identified via stakeholder interviews. • Established working parties for each part of the project. • Dissemination plan sketched out.
D Tailor and implement knowledge translation strategies Define the dissemination and implementation strategies Assess the context for your strategies Tailor the strategies Prepare to implement the strategies Validate your outputs, outcomes and indicators	• Implementation: increase the proportion of knee OA patients seen in APP clinic. • Conduct workshops to address barriers to referral e.g. care of high-BMI patients, referral to GLA:D.
E. Monitor knowledge use Plan to monitor knowledge use	• Implementation working party discuss progress.
F Evaluate Outcomes Plan to evaluate outcomes	• Comparison of wait times, service statistics, patient and stakeholder experience 2022, 2023, 2024. • GiAF and RE-AIM QuEST tools to evaluate the impact of the project.
G Sustain knowledge use Plan for sustainability	• Final project report discusses sustainability, using quantitative and qualitative data support. • Impact evaluation. • Recommendations.

Note: ACSQHC = Australian Commission on Safety and Quality in Health Care; APP = advanced practice physiotherapists; BMI = body mass index; CHS = Canberra Health Service; GLA:D = Good Living with osteoArthritis: Denmark program; GiAF = Global Impact Analysis Framework; GP = general practitioner; NHS = National Health Service (UK); OA = osteoarthritis; OAHKS = Osteoarthritis Hip and Knee Service (Victoria); RE-AIM QuEST = evaluation framework, see Appendix 4.

Approach

The project used a mixed methods approach within a knowledge translation framework.

The experiences of patients, physiotherapists, orthopaedic surgeons and GPs who were all stakeholders involved in the care of knee osteoarthritis patients were recorded and documented before (at baseline, 2022), and after (2024) the intervention. The sense of the barriers and enablers to best practice care pathways for knee osteoarthritis were explored from the perspective of qualitative data using semi-structured interviews and thematic analysis

Analysis of wait time used a consecutive case series prospective records audit to extract data. We examined the impact of increased use of the APP clinic with respect to wait time and care pathways for patients referred to CHS orthopaedics by a GP.

The economic impacts on patients of waiting, and on the health system of implementing the APP screening clinics, combined the quantitative data on patients, wait time and pathways of referral, with patient direct out-of-pocket costs, costs to the hospital and the health system and costs to the economy of absenteeism and presenteeism, as well as impact on the economy of impairments to participation in the economy for those retired. Patient out-of-pocket costs were calculated from a group of participants over 6 months using the Costs to Patients in Quebec (CoPaQ) tool. Hospital costs were input from the Independent Pricing Authority for Hospitals, and a collation of economic peer-reviewed literature.

The evaluation of the impact of the project in changing practices was conducted using GiAF and RE-AIM (as mentioned above). (This evaluation is not in scope of this report.)

Setting

Canberra Hospital, the main tertiary teaching hospital in the ACT, which has a large regional catchment area.

Intervention

A best practice APP clinic for public patients with knee osteoarthritis referred by GPs for orthopaedic surgery consultation and, when appropriate, TKR. The clinic was situated close by the orthopaedic clinics at the hospital.

A new pathway was established whereby all patients with knee osteoarthritis referred by GPs could be seen in the APP clinic. This replaced the prior pathway in which physiotherapists used the referral letter to triage by category of urgency, and then patients waited to see a surgeon (Wait 2). Initially, APPs filtered specifically those patients with insufficient information on the referral for accurate judgement of urgency, or those patients who clearly had not exhausted non-surgical interventions.

APPs have specific postgraduate qualifications in musculoskeletal conditions (i.e. master's degree), 5 years minimum clinical experience, rights to order X-ray and triage patients, non-medical prescribing training (usually from Queensland University of Technology) and licence in the ACT. They will refer patients on to community programs and, importantly, they can identify patients for priority surgical consultation or refer patients back to their GP.

For the APP clinic to be effective, it needed:

- capability to rapidly access surgical consultants when needed, preferably by surgeon involvement for a short period at each clinic
- enhanced access to community care management for knee osteoarthritis through exercise, education, diet and pain management programs (e.g. the Good Living with osteoArthritis: Denmark or GLA:D program)
- physiotherapist privileges to order x-rays when required (it is not indicated to x-ray most patients with osteoarthritis, only if a differential diagnosis is suspected)
- support of health leadership and executive to fund this, supported by cost–benefit analysis.

At commencement of the project, the APP clinic was resourced at 0.8 FTE (full-time equivalent).

Such advanced musculoskeletal clinics are established in Victoria, New South Wales and the UK (Agency for Clinical Innovation, 2013; Briani et al., 2018; National Institute for Health and Care Excellence, 2020) and are effectively and efficiently providing better patient outcomes.

Canberra Hospital piloted an advanced physiotherapy pathway in 2012, with a 12-month legislative amendment to permit extended scope practices of injection, prescribing and ordering imaging. Patient satisfaction was very good and Wait 2 times were abolished (Morris et al., 2014; Morris et al., 2015). The pilot ended with the legislative provision, however, and Wait 2 times recurred. Now, the physiotherapy department has an orthopaedic review clinic, but without authority and without a surgeon, it cannot impact Wait 2 times. This project differs from the 2012 pilot as physiotherapists will not be required to prescribe. Project leaders are senior surgeons, physiotherapists and executive directors. Further, a focus on health costs will strengthen the case for change in the ACT.

There are two types of APP clinic. The first type (we propose) is a pre-surgical clinic specifically to screen and triage those patients referred for surgery. The second type is a community specialist advisory clinic that provides the skills of a multidisciplinary team with specific expertise in the management of osteoarthritis. The community clinic accepts patients with any stage of osteoarthritis. The principles are self-management of osteoarthritis as a chronic disease using shared decision-making frameworks and access to highly effective non-surgical interventions. The APP clinic model (UK) has reduced referrals to secondary care by 20–30% (NHS, 2017) The St Vincent's clinics in Melbourne found that only 5% of patients went on to require TKR (St Vincent's Hospital Melbourne, 2018). The clinics were multidisciplinary and staffed by physiotherapists, allied health with advanced expertise, and a surgeon. The APP clinics have been able improve care management along principles of 'right patient, right care, first time'.

The systems for the management of hip and knee osteoarthritis internationally in high-income countries are evolving. The exploding number of referrals for joint replacement overloads the

capacity for the public system, particularly if joint replacements are viewed as a solution for hip and knee osteoarthritis, instead of an end-stage salvage procedure (Ackerman et al., 2019). This overload has been responded to, by either rationing joint replacement (as in the UK) or encouraging movement of patients from public to private systems (as in Australia and the US). Establishment of care pathways using a pre-surgery APP clinic model to screen and review public patients has been demonstrated to effectively triage patients and ensure surgical referrals are appropriately made for those with end-stage osteoarthritis for whom all non-surgical interventions have failed. These clinics (St Vincent's Hospital, for example) can break through waiting lists, improve the responsiveness of health systems and educate patients and referrers on the better use of non-surgical programs such as GLA:D (a comprehensive exercise, education, diet and pain management program). Often concurrently, community-based APP clinics are established to provide expertise and support in the chronic care management of osteoarthritis. Such clinics are described in the NSW Model of Care (Agency for Clinical Innovation, 2013), the Victoria Model of Care (Briggs et al., 2018) and the UK *Transforming musculoskeletal and orthopaedic elective care services* handbook (NHS, 2017). These clinics provide expert advice to patients and access to a range of non-surgical interventions to manage their osteoarthritis, as well as periodic review. These clinics then ensure surgical referrals are made for appropriate patients at the right time.

Appropriate non-surgical management for knee osteoarthritis may include exercise, education, diet and pain management in community care. Concordance between APPs and physicians is probably good to very good for diagnosis and good to very good for surgical triage of musculoskeletal disorders (Lafrance et al., 2023). Furthermore, this systematic review of 19 concordance studies and six RCTs concluded that 'patients with musculoskeletal disorders managed in an APP model of care probably report comparable or greater pain and disability reductions when compared with usual medical care'. The APP model of care is implemented widely across Victoria and Queensland in Australia, as well as in UK and Canada, and demonstrates good efficiencies in providing appropriate and timely care and streamlined referral to surgeons when needed.

Data collection cycles

Data on waiting times for three cohorts were collected: 2022, 2023 and 2024, in 6-month snapshots. Waiting times were measured for patients with a new referral for knee osteoarthritis and those already waiting for a consultation between 1 March and 30 September for baseline capture in 2022, then each year cohort 2023 and 2024. Characteristics of the cohorts, wait time and pathways – either seen by an APP, a surgeon or both – and the outcome of those visits were analysed for predictive factors (see Paper 2).

Qualitative data were collected in two cycles, at baseline 2022 and in 2023 and 2024 for evaluation (see Papers 1 and 3).

Health economics evaluation was conducted once in 2023, for the costs incurred to patients of living with osteoarthritis (see Paper 4).

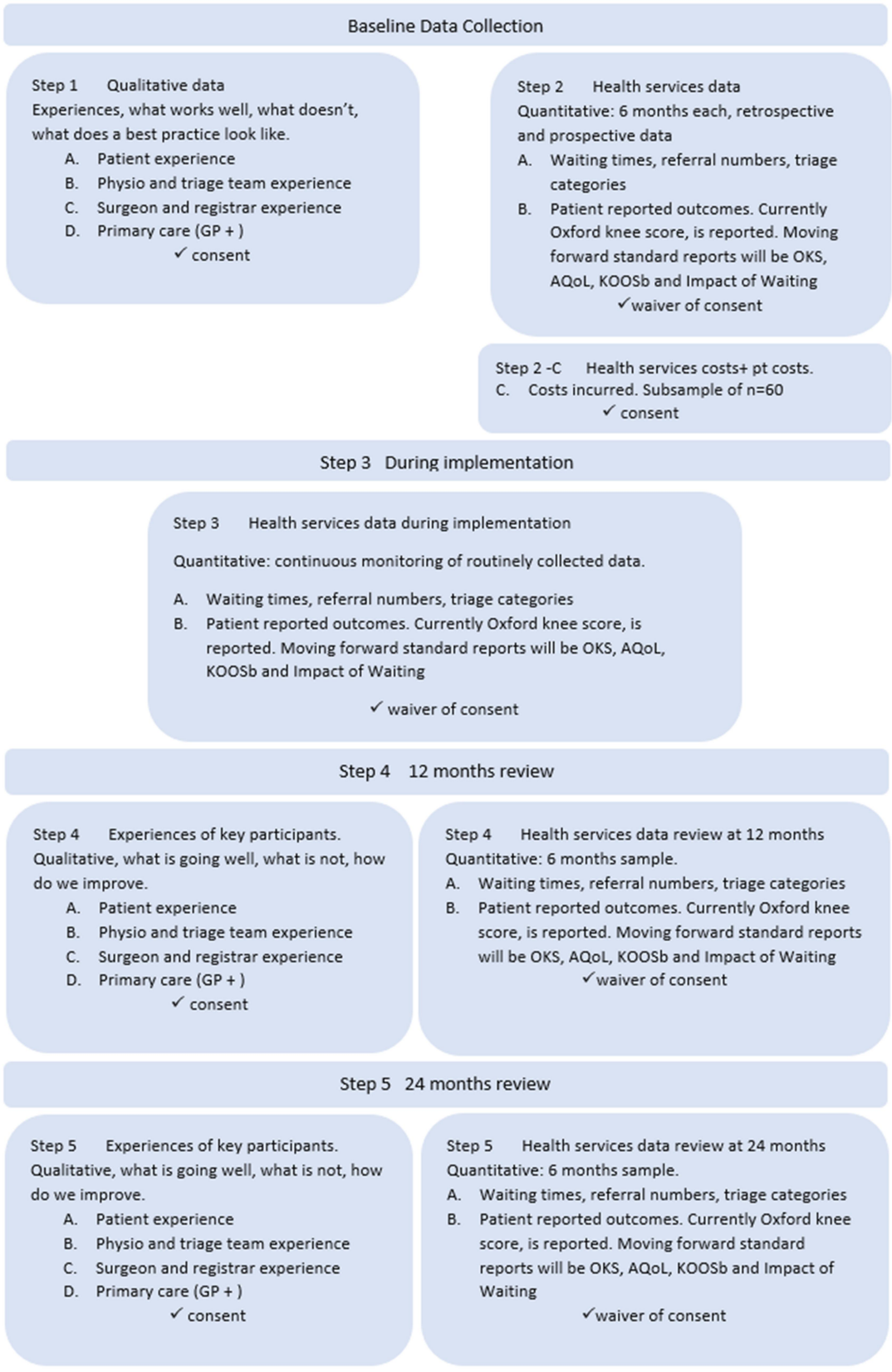

Figure 3. Project diagram showing data collection cycles at baseline, 12 and 24 months (i.e. 2022, 2023, 2024)

Data definitions

Triage decision: When referrals are received, an APP reads the referral and makes a clinical decision regarding the triage category of that referral.

Waitlist triage category patient referrals are triaged by APPs by reading the patient referral from the GP plus any attached/available imaging or supporting records. The referral is then assigned a triage category based on a triage category protocol:

- Category 1 – patients with urgent conditions (such as cancer) will be seen within 15 days.
- Category 2 – patients with severe symptoms, to be seen within 90 days.
- Category 3 – patients with non-urgent conditions (i.e. everyone else), to be seen within 365 days.
- APP clinic – patient will be seen in the APP clinic (triage category delayed until clinic assessment).
- Referral rejected – the referral is for a condition not accepted for treatment at CHS or does not contain the minimum specified details required for referral triage as detailed on 'Health Pathways'.

Clinician: defined as either APP, surgeon, either or both (APP and surgeon concurrently or sequentially).

APP clinic: a clinic staffed by APPs to provide a consultation to patients referred to an orthopaedic surgeon at CHS. The intention is to identify patients who may not meet the criteria for consultation with a surgeon and direct them to appropriate care pathways, or to ensure the appropriate waitlist triage category is applied. This is particularly relevant when the GP referral does not contain sufficient information to assign a triage category.

APP clinic decision: patients seen in the APP clinic will be assigned a waitlist triage category (Category 2 or 3) to see a surgeon for consultation or will be redirected to non-surgical management and returned to the care of their GP. Some patients may be reviewed again in the APP clinic at a future date for a definitive decision, often after a trial of alternative care or following further investigation.

Wait time 1 to GP: defined as time between symptom onset and seeing a GP. This is not reported here, nor the time during which the patient is managed by the GP.

Wait time 2 to see a surgeon: defined as the number of days waited between the date the GP referral was received by CHS administrative systems and the date of consultation with a surgeon.

Wait time 3 to surgery: defined as the time waited between the date of the surgical consultation and being placed on a surgical waiting list and the date of the planned surgery. This is the nationally reported data on waiting time (AIHW, 2022).

Wait time to APP clinic: calculated as the number of days between the date the referral was received and the date of the APP consultation.

Surgeon seen: the name of the consultant who was responsible for the clinic on the day of consultation. Patients are usually seen initially by an orthopaedics registrar and clinical decisions are discussed with the consultant who may or may not personally assess the patient.

Surgeon decision: the clinical decision made following the consultation.

- RFA – a ‘request for admission’ form was completed and the patient is allocated to a surgical waitlist as the consultant has decided that surgical intervention is required.
- Review – the patient was re-booked at a future date, to discuss the results following a trial of alternate care or further investigation.
- Discharged – the patient did not require further specialist care and has been returned to the care of the GP.

Recommended to GLA:D (Y/N): a note was made when reviewing the clinical records regarding whether GLA:D or other exercise-based non-surgical care was recommended to the patient by the clinician and documented.

BMI recorded (Y/N): the clinical record contains height and weight to calculate body mass index (BMI), or BMI was documented.

OKS recorded (Y/N): the clinical record contains documentation of an Oxford Knee Score (OKS).

Pathway summary: patients in the study were followed to the point of a clinical decision following initial consultation in APP +/- a surgeon. This allowed allocation of a single care pathway summary for each patient.

Evaluation of impact

Evaluation of the impact of the project is scheduled for June to December 2025, for reporting in June 2026. This will comprise evaluation using the RE-AIM QuEST framework (Forman et al., 2017) and the GiAF (Global Impact Analysis Framework) (Lukersmith et al., 2025; Salvador-Carulla et al., 2021; Salvador-Carulla, Lukersmith & Woods, 2024) (see Appendix 4)

The following chapters will document the project, as it was conducted.

- The experiences of patients, physiotherapists, orthopaedic surgeons and GPs who are all stakeholders involved in the care of knee osteoarthritis patients at baseline
- Wait times reports for 2022 for patient pathways and factors that influence wait time
- Evaluation of the project as experienced by stakeholders (patients, primary care, hospital and community health professionals)
- Costs of living with knee osteoarthritis to patients
- Health economics modelling of the impact of the APP screening clinics on costs to patients and the system
- Optimisation of patient pathways, by economic modelling
- Impact analysis of the project, using the GiAF and RE-AIM frameworks (this will follow in the June 2026 report)
- Recommendations.

Paper 1: The patient journey I. A documentation of stakeholder perspectives

Paper 1: The patient journey I. A documentation of stakeholder perspectives

Summary

Problem: CHS reported issues with many patients with knee osteoarthritis experiencing long wait times for orthopaedic consultation and commonly not exhausting non-surgical interventions prior to being referred to a surgeon, resulting in delays to receiving appropriate care and poor patient outcomes.

Aim: To capture the experiences of stakeholders and inform the implementation of a model of care adapted to the CHS context. The barriers and enablers to such a model of care would also be recorded, to further inform implementation.

Method: A phenomenological inductive approach was taken, in which the interviewers sought to understand the meaning of the experiences and ideas presented, and examples of patient journeys. Interviews were conducted in March 2023 by UC academic staff Angie Fearon and Jennie Scarvell, recorded, transcribed and de-identified. Member checking of emerging themes and quotes resulted in some requests for revisions from participants. While thematic analysis was based on phenomenological perspectives, a framework to organise the findings was developed based on the aims of the project: to understand what is working well, what needs improvement, what a model of care would look like, and the barriers and enablers to implementation.

Participants: purposive sampling included patients (*n* = 6), primary care practitioners in general practice (GPs) (*n* = 4) and other primary care (*n* = 3), surgeons and registrars (*n* = 6), physiotherapists in the community, acute service, and private care (*n* = 5), and with CHS Executive (*n* = 5).

Results: Consistent findings were that APP clinic assessment of patients is valued. Patients appreciated advice and interventions; surgeons appreciated filtering of patients. Quality of surgery was appreciated, but all felt waits were unacceptably long, especially for high-risk complex patients unsuitable for private hospital care of public patients (i.e. patients treated through the Elective Joint Replacement Pathways – EJRP) and at risk of deterioration. A community-based program that provided assessment, advice and review was recommended. APP were skilled to conduct this, working at top of scope. Mechanisms to escalate deteriorating patients were needed. Several funding models were proposed, but access to imaging, ability to refer directly to the orthopaedic list, and prompt access to surgeon advice would enable success. Good communication with the community to promote allied health interventions prior to considering surgery and for prehabilitation was essential. Facilitating the right patients having responsive access to surgery was essential for an efficient system.

Conclusion: Stakeholder voices are essential change-drivers, with good communication between stakeholders essential to acceptance of change.

Impact: Advanced physiotherapy clinics are already improving patient pathways and likely to improve these further in a dedicated clinic.

Background

Problem: CHSs reported issues with many patients with knee osteoarthritis experiencing long wait times for orthopaedic consultation and commonly not exhausting non-surgical interventions prior to being referred to a surgeon, resulting in delays to receiving appropriate care and poor patient outcomes. The most vulnerable patients in our community were most at risk of detrimental outcomes from these long delays.

The second aim of the project was to 'Establish strong collaboration between consumers, primary health care, public orthopaedic triage and surgeons, and across public and private sectors'. Therefore, hearing the voices of stakeholders was fundamental to the project success. Step A in the Knowledge to Action model is 'Identify need', and Step C is 'Identify barriers and facilitators to knowledge use' and use them to select appropriate knowledge translation strategies. Stakeholder perspectives were sought to inform these steps.

The aim of this aspect of the project was therefore to capture the experiences of stakeholders and use these to inform the implementation of a model of care adapted to the CHS context. The barriers and enablers to such a model of care would also be recorded, to inform implementation.

Method

Study design

The qualitative element of the project had a constructivist paradigm, in that the researchers wanted to hear the participants' context and interpretation. Constructivism is participant-centred and engages with a person's own experience and truth from their own perspective. This phenomenological approach and methodology allowed exploration for clarity and expansion of ideas. A thematic analysis using a framework analysis approach was chosen, with reference to systems theory, conceptualising the system of interconnected parts and interoperating systems.

Researchers positioned themselves prior to the study to bracket their narrative, experience and perceptions. Four female researchers included two academic physiotherapists (AF, JS) at UC who interviewed the participants. To maintain confidentiality, all recordings, transcripts and analyses were stored at UC under password protection. The project manager (DG) and research officer (TS), staff of CHS, participated in secondary analyses. AF and JS both have extensive clinical experience and lived experience of osteoarthritis, have been employed at CHS in the past and are currently visiting fellows of the Trauma and Orthopaedic Research Unit. DG is an advanced physiotherapy practitioner in orthopaedic clinics and emergency department. TS is involved in research but not clinical care. DG has conducted the advanced practice screening clinic in orthopaedics but did not interview any of the patients she has personally managed. Including DG and TS strategically increased the research skills and capabilities of CHS staff. Researchers wrote out a personal narrative on their perspectives on the project, lived experience and professional experiences of managing patients with osteoarthritis. Researchers described the health system in which they operated and preconceived notions against the research questions. These narratives and reflections were shared and discussed with the group, to maintain vigilance and reflexive practice during

analysis and call out where the personal experience intersected with the analysis and interpretation of participant transcripts.

Participants: Participants were provided with information about the researchers interviewing them, their professional background, employer and role in the project. Participants were recruited by purposive sampling. Health professional stakeholders included Canberra Hospital surgeons and registrars (trainee surgeons), health executive and management, and the orthopaedic APP triage team, with primary and community healthcare providers. Consumer participants included patients of CHS referred to orthopaedics, purposefully including samples of patients waiting to be seen, having seen a surgeon or having seen an APP. A mix of patients who were referred to different pathways were sampled: those listed for surgery, those referred to non-surgical care and those discharged from further care. The project intended to sample six to eight participants in each group; however, some samples included all available members of a group.

We interviewed six patients waiting for a surgeon consultation (4F,2M), four surgeons (2F, 2M), five health executives (4F, 1M), six physiotherapists (4F, 2M) and six primary care practitioners (4F, 2M).

Interview processes: In April 2023, all data were collected by individual interviews. There were no repeat interviews within the year for clarification or deeper questioning, but some health professional participants were interviewed in 2024. Interviews were allocated up to 1.5 hours, but most took 40 minutes to one hour. Data saturation was not a goal since there were too few health professionals in stakeholder groups, however, conceptual density was possible, in that:

> *The concepts must be demonstrably part of a rich network of concepts and themes in the data within which there are complex connections. The concepts have resonance with existing literature in the area being investigated. And the concepts, as part of a wider analytic story, stand up to testing for external validity. (Nelson, 2017*)

Interviews were held variously online via Microsoft Teams, or in person at Canberra Hospital, UC or at Community Health Centres to provide privacy and flexibility to participants.

Interviews and focus group questions were designed to understand the following questions:

- What was their lived experience? Issues, stories, narrative.
- What was working well, and what is not, in the orthopaedic system now?
- What was their vision of best practice?
- What were the barriers and facilitators to implementing best practice?

A guide to the semi-structured interviews is available in Appendix 3.

Thematic analysis

Thematic analysis was based on phenomenological perspectives, in which the interviewers sought to understand the meaning of the experiences and ideas presented. Procedures described by Braun and Clarke (2006) and Smith et al. (2012) were followed to examine the meaning and interpretation of narratives. Interviews were recorded and transcribed. A

framework to organise the findings was developed based on the questions above. Transcripts were coded according to the framework. At least two people coded and analysed at least two participants from each group. Analysis of the group for supraordinate themes was conducted as a round table.

Member checking: The emerging themes were grouped by participant group and returned to participants for checking. Some revisions were requested by participants to redact quotes or withdraw a comment.

Reporting was conducted with reference to the COnsolidated criteria for REporting Qualitative research (COREQ) guidelines (Tong et al., 2007).

Results

These summary themes are from the consolidated groups. Group by group analysis and the quotes of participants can be found in the appendix.

Works well now

From the point of GP referral of patients to CHS surgical services, there was support for the processes currently in place, in particular triage and screening of patients referred for orthopaedic consultation. Beginning with the experience of GPs, 'HealthLink' provided a much more streamlined way to refer, though some aspects could be improved: (1) It forced the choice of surgeon, which was not needed by GPs and constrained clinic booking processes; (2) It did not allow for the necessary Oxford Knee Score (OKS) to be completed online – this must be done on paper, scanned and attached; (3) Visibility of the status and progress of patient referrals within CHS would be valuable to GPs.

Triage of the referrals received that was completed by the APPs was efficient and accurate. The **screening of patients by APPs** was a highly regarded service by all stakeholders. This face-to-face comprehensive assessment provided patients with confidence that they had been properly examined, had their voices heard and had been assisted to navigate health systems that would provide them with the best outcomes. Patients, GPs and surgeons found this service to be essential. The GPs appreciated the expertise in the consultation, and the surgeons appreciated the filtering of patients, to identify those who had exhausted non-surgical interventions and were ready for surgery. Surgeons would like to see patients appropriate for surgery and prefer to have education and advice for those with early- or middle-stage osteoarthritis provided by the APPs, who did this very well. There was comprehensive support for both the high quality of assessment and the accurate and appropriate referral to community services or surgery, provided by the APPs.

There was a **high degree of confidence** in the broader health care at Canberra Hospital and across the ACT community. Equity and access for patients is valued, and the quality of the orthopaedic surgery itself and the elective surgery program is highly valued. Services receiving positive commendations include the obesity management service and emergency department. The **GLA:D program,** offered privately in Community Health Centres and by Arthritis ACT, is highly valued by all stakeholders.

Reporting and monitoring of wait time for **patients who have been listed for surgery** is accurate and is used effectively to improve surgical services. The availability of these reports would mean the service was publicly accountable.

Needs improving now

There was a **pressing imperative to change** the health system for CHS's management of elective orthopaedics. Once referred to the orthopaedic services, lack of monitoring of patients, lack of reporting on patient case load and wait time, and extensive waits both to see a surgeon and to have surgery, were leading to poor patient journeys and outcomes, and high-risk situations for patients and surgical teams. The 'silent wait list' and the patient journey was described by surgeons as 'utterly hopeless'. The deterioration in the condition of waiting patients was unacceptable. Underneath this problem, a lack of data, reporting and responsibility for patients prior to seeing a surgeon required health system change.

There were some major issues for the patient journey, underpinned by community beliefs that surgery is inevitable for knee osteoarthritis, long wait times in the public system and high costs in the private sector.

Despite messaging from Australian Commission on Safety and Quality in Health Care (ACSQHC) and the Royal Australian College of General Practitioners (RACGP) that most patients do not need a TKR and will manage very well with exercise, education and weight management, there was still **a belief that TKR is a matter of course**. Consequently, patients were referred too early to surgery without exhausting non-surgical avenues, were unlikely to complete programs of physiotherapy or weight loss or manage pain medications well. In support of these observations, GPs recounted that patients were more likely to take up non-surgical interventions as prehabilitation to 'be stronger going into surgery'.

Once referred to surgical services, APPs conducting triage and screening found that many patients had **not exhausted non-surgical interventions,** and APPs referred these patients out to community services. At the time of interviewing (April 2023) APP screening clinics saw only patients in triage Category 3, who had a high likelihood of being referred to the community. Surgeons still found a lot of patients coming to them who were not ready for surgery. These 'too early' referrals were filling waiting lists and clinics unnecessarily. Patients waiting in these pipelines did not take up non-surgical interventions during the years waiting, missing out on both better surgical outcomes from prehabilitation and the possibility of avoiding surgery altogether.

The long wait time between triage and seeing a surgeon, followed by a long wait time for elective joint surgery, were entirely unacceptable and led to deterioration in waiting patients. This was most severe for the most complex and vulnerable patients. Well patients were generally operated along recommended timeframes using the EJRP, but medically complex patients needing higher postoperative care at Canberra Hospital waited a very long time and deteriorated during this time, resulting in high risks in surgery and poor outcomes for the patients. Surgeons described this experience 'like going into a boxing ring with a paper bag on your head – you don't know where you'll be hit'. The **most vulnerable patients were getting the poorest care**.

Improvements needed in the CHS system included **accountability and monitoring** of those patients waiting to see a surgeon and waiting for surgery. Lack of performance indicators, lack of data and lack of accountability contributed to the issue. Health systems improvements were also needed at the community care level, as primary care professionals found referring patients to public allied health services very difficult. My Aged Care registration was barrier to patients entering the system. Lack of communication was a barrier to GPs referring – they needed to know the patient would be seen, and the outcomes of that. In the acute system, pressures at outpatient clinics in Canberra Hospital on time, space and resources, together with administrative inefficiencies, were a barrier to improving wait time to see surgeons.

Model of care

In describing what an excellent service might involve, there were some key principles that would be essential to uphold in any model of care that was developed. **Key principles** included that:

- First-line care (non-surgical interventions) needed to be the mainstay of management for people with knee osteoarthritis, and surgery a last resort. A public campaign of self-efficacy and self-management was recommended.
- Managing patients at the right time and in the right place meant responding in a timely manner to referrals, and that acute problems be treated in the tertiary hospital, and chronic problems managed in the community.
- Equity for those most vulnerable was a priority, for those who do not have the means to cross between private and public health systems and who need help planning surgery in advance due to family, carer responsibilities, rehabilitation and other complex health issues.
- Transitions between services needed to be efficient. For patients with knee osteoarthritis to feel confident about being managed in the community, GPs and patients needed to know they can access surgical services when/if needed.
- Patients needed to be seen and assessed, not wait long periods without having been assessed.

Unmet needs were identified. In any model of care, these key factors needed to be considered, including help for patients to navigate systems and referrals to services, the ability for advanced practitioners to refer patients back to the CHS orthopaedic team, and the capacity to review patients to identify any who were deteriorating and respond accordingly, and to identify patients with complex health or social issues who needed additional planning and support.

There was strong support for the **APP clinic screening program**, from patients, referrers and surgeons, for the expertise and thoroughness of those practitioners, their accurate decision-making and their communication back to referrers. Surgeons appreciated the filtering of appropriate patients and recommended increasing the service.

There was broad support for an osteoarthritis clinic to be located in the community. In the community, it would provide a clearer message of chronic disease management, and capacity for ongoing care and review. It would be accessible and take pressure off acute health resources. The practitioners leading this clinic would need to be advanced practitioners with expertise in management of musculoskeletal issues, and able to refer patients to surgeons if needed.

The role of a **community osteoarthritis clinic** would be different from the current APP clinic. The APP clinic acted as a filter to ensure surgeons are seeing patients ready for surgery, and provided patients referred to orthopaedics with a thorough assessment to ensure that they were referred onto the appropriate management pathway quickly. A community clinic may have more of a chronic disease management expertise role, drawing resources from a multidisciplinary team, providing education on self-management and assisting patients to navigate non-surgical care. They might refer to orthopaedic surgery the small number of patients who do need surgery. One potential model of care expands the assessment and examination of patients coming in for the GLA:D program, with additional expertise and capability to refer back to orthopaedics team if required.

There was some consistency and some variation from health staff for such a community clinic. There was broad consensus on APPs leading it, and having social work, occupational therapy, podiatry or clinical psychology also available. Where views diverged was on having a GP or a surgeon in the clinic. The role of the patient's GP is to manage ongoing care, including medication management, so involving a second GP at the clinic is unwarranted. Having a surgeon close by may help with rapid referral back to the orthopaedic surgical pathway and help with funding the clinic, but the surgeon would be needed to see just a few patients.

The role of an APP in the clinic would be critical. There was consensus that an APP should be able to refer a patient back to the orthopaedic team, and inform their GP. APPs wanted to be collocated with surgeons, for rapid acceleration of patients with complex or difficult to diagnose problems and for teaching and learning to continually develop their advanced practice skills. It was contentious whether APPs should be able to list a patient for surgery, and this role is probably insufficiently mature at present to recommend this major step beyond current scope.

To implement this model of care, systems would be needed that would monitor patient wait time and run reports on volume and performance indicators. Health executives recommended that the changes are made in incremental steps, along with extensive stakeholder engagement and community consultation and communication strategies. In the meantime, it was recommended that CHS rapidly implement better communication for patients in the orthopaedic surgery pipeline: they and their GPs needed to know their referral was still current, and their waiting was according to plan.

Barriers and enablers

There were barriers described to each part of the model of care, beginning with barriers to patients fully optimising allied health interventions prior to seeing a surgeon. Barriers included attitudes of the entire community, including the belief that knee osteoarthritis means a TKR is inevitable. It was recommended that a public education campaign should encourage changing the language from fatalistic and mechanical ('wear and tear'), to ongoing management language of living your best life with osteoarthritis. Education would promote self-efficacy and lifestyle management through exercise, diet and education. Health professionals need to provide consistent messaging and patients can be expected to push back as the patients, health professionals and community are subject to the commercial pressures of a consumer society. A knee is not a fridge, simple to replace. Implementing the changes described would be facilitated by a strong public education campaign.

Barriers to patients accessing health care, especially for public patients with complex social circumstances, needed to be considered. An important barrier to referring patients for surgery at the right time was the legend of the long wait list, resulting in ‘too early’ referrals. If your TKR is inevitable, you may as well put your name on the list.

Implementing the changes described in the model of care may be impeded by health services resources, and resource priorities. The health service may be unwilling to monitor and expose wait times. Current funding models in Medicare do not support multidisciplinary care, nor allied health practitioners working at top of scope, nor chronic and complex care by GPs.

Effective use of allied health interventions (diet, exercise, physiotherapy, etc.) would provide patients with the confidence to self-manage when supported by the education campaign. Making it easier for patients to access high-quality osteoarthritis education, advice and interventions is a key enabler. Sufficient advanced practice allied health professionals, well-trained and with expertise, will facilitate trust in patients and stakeholders. Easy access to GLA:D in CHS Community Care is highly recommended, both as a first-line intervention and as prehabilitation prior to surgery at that time (if needed).

Demonstrating the cost-effectiveness of the model of care will facilitate the business case to support it. To provide visibility of wait time and systems metrics, reports can be developed in the Digital Health Record (DHR). Such service metrics can be used in activity-based funding and value-based funding. Leveraging the clinical standards to support the model of care as part of hospital accreditation would help. Funding models recommended included activity-based funding, which would support a multidisciplinary team approach and an approach that employs a practitioner acting at the top of their scope. A Medicare-funded model, however, would require a GP or surgeon in the clinic.

Discussion for the patient journey

Our participants told us that CHS were doing some things well but that there was considerable room for improvement, including changes that needed to happen quickly. Participants were generous in their suggestions for improvements in services for people with knee osteoarthritis.

Participants told us that the APPs did a very good job of triaging and assessment of patients with knee osteoarthritis. This is consistent with reports from other states that physiotherapists working at the top of their scope of practice receive the respect from patients, orthopaedic surgeons and patients (Evans et al., 2021). The Evans et al. review (2021) included 191 evaluation studies, and concluded that ‘ACP roles were reported to be achieving beneficial impacts across a range of clinical and health system outcomes’. Recently the Victorian APP clinic patients have described importance of a strong therapeutic alliance and foundations of trust (Gibbs et al., 2025). Gibbs’ team also noted, as we did, that ‘While physiotherapy assessment and management is initially acceptable to most, surgery is considered inevitable and the optimal treatment by most people’. It will take a major public education campaign to change these beliefs when major multinational corporations are successfully marketing for a new model knee to replace the worn one. Positively, however, there is a growing body of evidence that education can be effective, particularly in the level of agency that education on self-management can change (Simick Behera et al., 2024).

It was made clear that it was important that this project did not jeopardise those aspects of CHS care that were working well. Patients told us of their struggles to understand where in the queue they were waiting, or if they were still on ‘the list’ at all. Such comments reflect Albert Bandura’s vision of health promotion by social cognitive theory that founded the self-efficacy movement (Bandura, 1998): ‘People's beliefs in their collective efficacy to accomplish social change, therefore, play a key role in the policy and public health approach to health promotion and disease prevention.’ Finally, to the motivation to improve quality of life for patients: ‘Thus perceived self-efficacy is an important personal attribute in the maintenance of health. Enhancing perceived self-efficacy should be an important ingredient of the provision of health care’ (Holman & Lorig, 1992).

Conclusions

Overall, these interviews demonstrated that there was widespread and consistent support for APPs working at the top of scope to screen, advise and make clinical decisions on the care pathways for patients with knee osteoarthritis. Their expertise was highly valued by all stakeholders. There was strong support for the APP clinic process to provide assessment and better pathways for patient journeys and fully resourcing the APP clinic was recommended by participants. A potential expert multidisciplinary osteoarthritis clinic in the community was well supported by GPs, and certainly having the clinic physically located in the community, and providing high-quality care to patients, would be supported. Despite ACSQHC, RACGP and other guidelines that strongly advocate exhausting all allied health options prior to considering TKR, there were strong community beliefs that posed hurdles. Consultation, community engagement and a public health education campaign were considered key enablers to any proposed health service implementation.

Recommendations

This research, in the context of the literature available, supports the following recommendations:

- ✓ The orthopaedic triage service be augmented and resourced to see all patients referred.
- ✓ A community multidisciplinary expert osteoarthritis clinic led by APP and supported by other allied health be developed, with capacity to review and to refer directly to orthopaedic surgeons for consultation.
- ✓ Infrastructure support to report on service loads and wait time, is required.

References are consolidated at the end of the report.

Paper 2: Wait time and care pathways 2022, 2023, 2024

Paper 2: Wait time and care pathways 2022, 2023, 2024

Summary

Patients can wait years following GP referral for an orthopaedic consultation in the public health system. APPs can streamline this waiting period by providing thorough examination, advice and education and filtering those patients who have not exhausted the non-surgical interventions with demonstrated effectiveness for knee osteoarthritis. The aim of this aspect of the study was to quantify the impact of changes to the orthopaedic service on wait time between GP referral and surgeon consultation for those patients with knee osteoarthritis and to identify the factors influencing wait time.

Method: Wait time to consultation was measured for patients with knee osteoarthritis referred to orthopaedics or waiting to be seen between 1 March and 30 September for baseline capture in 2022, then post-intervention in 2023 and 2024. Changes to the health service during the period included: increasing resources to the APP clinic so that more patients with knee osteoarthritis could be seen, streamlining connections with community osteoarthritis and obesity programs, introducing the DHR and HealthLink referral system, and stakeholder engagement activities. Characteristics of the samples, wait time and pathway – either seen by an APP, a surgeon or both – and the outcome of those visits were analysed for predictive factors.

Results: Compared to 2022, wait times to see a surgeon were 0.14 times shorter in 2023 and 0.10 times shorter in 2024. The waiting time improved: from 50% of patients seen within 114 days in 2022 to 45 and 46 days in 2023 and 2024 respectively, and from 90% seen within 1,248 days to 91 and 84 days respectively. The proportion of patients seen in the APP clinic increased from 20% in 2022 to 81% in 2023 and 76% in 2024. Patients seen in the APP clinic risked less delays than those seen only in the surgical clinic (APP clinic incidence rate ratio [IRR]: 0.55; 95%CI: 0.43, 0.72; and if seen in both APP and surgical clinics IRR: 0.54; 95%CI:0.41, 0.70). Patients in 2023 and 2024 had reduced risk of extended wait times to see a surgeon (adjusted odds ratio [AOR]: 0.11; 95% CI: 0.04, 0.31; AOR: 0.02; 95% CI: 0.004, 0.09). The number of patients referred to orthopaedics and listed for surgery fell from 46% in 2022 to 38% in 2023 and then to 35% in 2024. There was no difference between the years for people referred back to see a surgeon by their GP after APP consultation. Of the patients who were seen in the APP clinic and referred on to see a surgeon, nearly 94% of the patients were identified as most likely to require surgery.

Discussion: Wait times improved greatly, which may be attributed to multiple factors including increased activity of the APP clinic, improved electronic records systems and availability of community exercise and education programs. Compliance with the clinical standards for management of knee osteoarthritis has improved access to care for patients with knee osteoarthritis.

Background

There is an urgent unmet need for people waiting for surgical consultation for knee osteoarthritis (Morris et al., 2018). In the ACT in 2019–20, delay from surgical consultation to TKR blew out to median 344 days (national median 223 days) and 44% patients waited over 365 days (compare this with the national proportion of patients waiting over 365 days, 11% [AIHW, 2022]). However, while these figures are reported and publicly available, there exists a hidden unreported wait before surgical consultation (Morris et al., 2018). At the time of writing, some patients had been waiting since 2016, a silent 1,227 days (mean; range 425 to 2,020 days) since being referred by their GP to see a surgeon.

The pathway for public patients in the ACT region begins with the GP. Wait 1 is the time between symptoms and seeing a GP (Morris et al., 2018), at which time, GPs often refer their patient for consultation with an orthopaedic surgeon. GPs develop a shared-care plan with 46% of patients, and refer 5% patients to physiotherapy (Bennell et al., 2021). Referral letters to the hospital orthopaedic clinic are triaged by an APP to determine urgency by reviewing the referral, the x-rays and OKS, if one is included. Wait 2, the time from referral to surgical consultation, is not recorded in any national dataset, though at the state level, Tasmania, Queensland and Western Australia do now report it. Following surgical consultation, a patient may be placed on the surgical waiting list. Wait 3, from consultation to surgery, is reported nationally in the My Hospitals dataset (AIHW, 2022).

Best practice guidelines advise health professionals to manage knee osteoarthritis as a chronic condition, using surgery as a last resort (Australian Commission on Safety and Quality in Health Care, 2024; National Institute for Health and Care Excellence, 2020; NHS, 2017; RACGP, 2018). First-line interventions incorporating exercise, weight loss and education are consistently effective for between 65% and 78% of patients with knee osteoarthritis (Barton et al., 2021; Skou & Roos, 2017). However, 54% of patients having TKR will have attempted no exercise intervention prior to surgery (Bennell et al., 2021; Hinman et al., 2015). Advanced musculoskeletal physiotherapy review clinics in Victoria and the UK have minimised Wait 2 by providing expert physiotherapy consultation and direction to appropriate care pathways efficiently (Briggs et al., 2018; Victorian Musculoskeletal Clinical Leadership Group, 2018). Furthermore, most patients were satisfied to manage their osteoarthritis non-surgically once provided with access to the tools, skills and support they needed (Agency for Clinical Innovation, 2013; Australian Commission on Safety and Quality in Health Care, 2024; Briggs et al., 2018). Level 1 evidence demonstrates these clinics refer the right patient at the right time to surgery (Lafrance et al., 2023). The clinical guidelines agree that non-surgical interventions should be exhausted prior to considering TKR. Indeed, the UK NHS mandates that a patient must have exhausted non-surgical options prior to surgical review (National Institute for Health and Care Excellence, 2020). However, many GPs refer their patients to the orthopaedic clinic, not for TKR necessarily, but for expert advice on how to manage osteoarthritis. This advice is within the scope of practice of APPs to provide.

As demonstrated in Paper 1, the current wait time presents a significant cost to quality of life, physical activity and comorbidities for the patient. There is a lost opportunity to empower the patient to manage their chronic condition in shared-care with a multidisciplinary team (Agency

for Clinical Innovation, 2013; Australian Commission on Safety and Quality in Health Care, 2024).

For the project as a whole, the aim was therefore 'to sustainably eradicate Wait 2 and ensure that public patients have access to best practice care, including shared decision-making and non-surgical interventions'. To unravel and remove access barriers to best practice interventions, we aimed to:

1. Use a systems approach to implement expert review that is responsive, cost-effective and follows best practice.
2. Establish strong collaboration between consumers, primary health care, public orthopaedic triage and surgeons, and private healthcare sectors.
3. Develop pathways to ensure patients have TKR surgery at the right time.

By developing effective orthopaedic triage, to screen patients and provide effective access to knee osteoarthritis programs, we aimed to improve the confidence of health practitioners and patients to manage knee osteoarthritis as a chronic condition.

For this paper, we monitored the impact of implementation, coordinated by the implementation working party, on waiting times to be seen in the APP clinic and/or the surgical clinic.

We then recorded the wait time for patients referred with knee osteoarthritis to be seen in orthopaedic clinics at Canberra Hospital, at the APP clinic and at the surgical clinic. We examined which patient and health system factors predict longer wait time, from the baseline cohort of patients in 2022, to a matched cohort in 2023 and 2024.

Method

Study design

We undertook a prospective medical records audit to investigate the wait time for an initial consultation with a surgeon, the factors that predict wait time, and the resultant pathways of care for patients with knee osteoarthritis following initial consultation. Three cohorts of consecutive cases were captured to monitor patients waiting to be seen from 1 March to 30 September of 2022, 2023 and 2024.

The study was approved as a low-risk project by ACT Health Ethics Committee (reference: 2022.LRE.00185), November 2022 until May 2025, and endorsed by the UC Human Research Ethics Committee.

Setting

CHS delivers publicly funded health care to the population of the ACT and region, under agreement with New South Wales. It comprises three hospitals (two acute, one rehabilitation), and mental health and community care services. Canberra Hospital is a tertiary care and trauma hospital serving the catchment area including the ACT and surrounding regional New South Wales.

Patients in this population

Patients were included who were referred by a GP to orthopaedic clinics and who had not yet been seen for this issue, and new patients referred during the data collection period. Patients were included if the GP diagnosis of knee osteoarthritis was written on the referral, or the patient was aged over 40 years and had a history of chronic knee pain. Patients were excluded if the diagnosis was changed by the hospital clinician to another condition such as ligament injury or inflammatory arthritis, or if the referral was received for a patient already listed for surgery (commonly to expedite the intervention).

Patients were excluded if their referral was cancelled – for example, if they could not be contacted for an appointment, failed to attend multiple appointments, declined the offer of an appointment as they no longer wanted care within CHS because their issue had resolved, they had received treatment elsewhere or had died.

Sampling and data source

The period 1 March to 30 September 2022 was identified as appropriate for a snapshot of ‘business as usual’, as it avoided the Christmas/New Year period. Records were obtained from two data sources, the ACT Patient Administration System (ACTPAS) for those who had been referred prior to March 2022 and were waiting to be seen and the Clinical Portal for people who had new referrals to orthopaedics during the collection period (Figure 4).

In November 2022, the two data sources were transferred into ‘EPIC’, the new DHR system. The DHR was used for data extraction in 2023 and 2024, with all attempts made to repeat the process used in 2022 as closely as possible. A report function was used to generate a list of patients referred to orthopaedic clinics and then filtered to exclude conditions other than knee osteoarthritis.

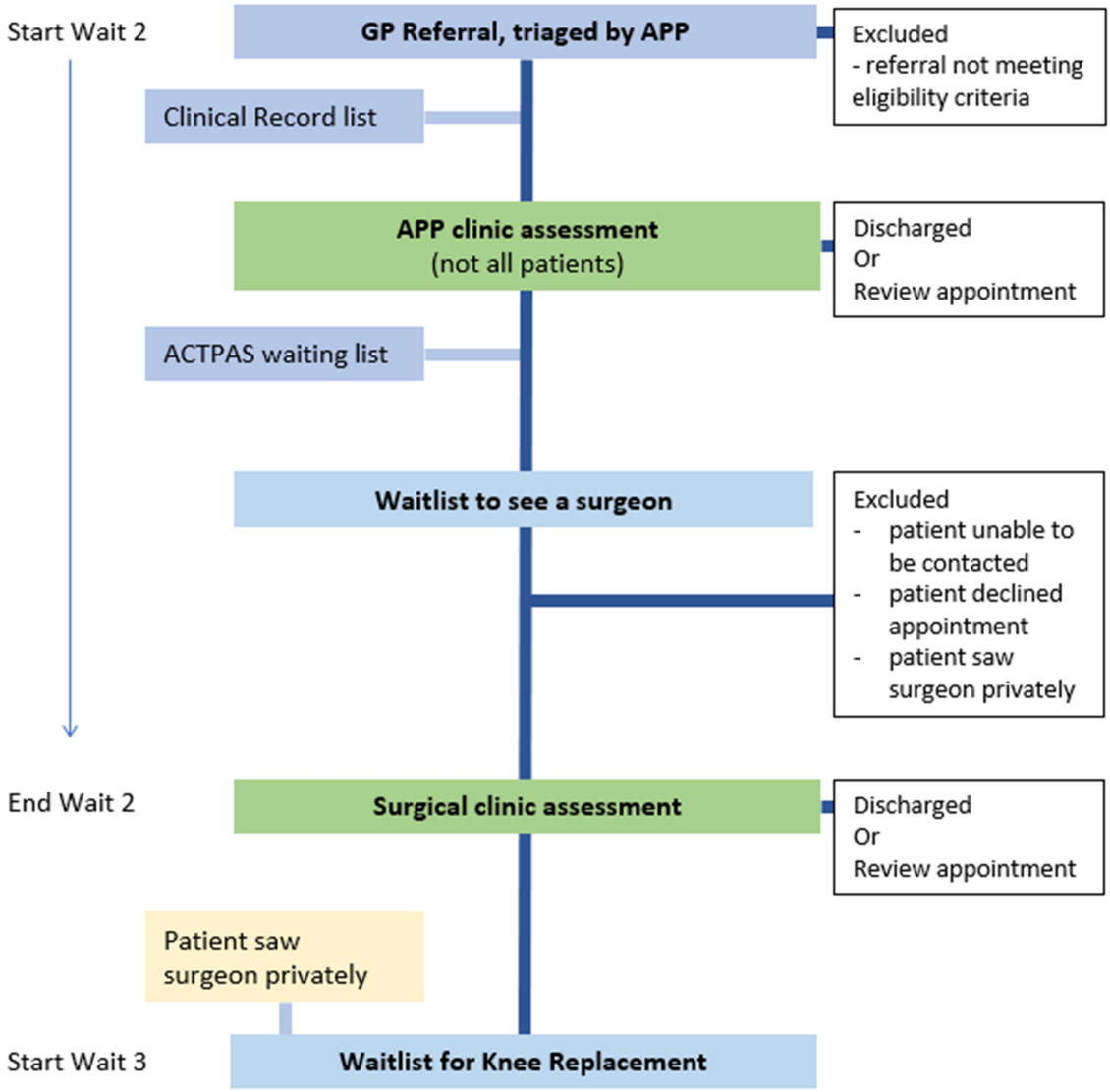

Figure 4. Pathway of care for patients with knee osteoarthritis referred to Canberra Hospital orthopaedic clinics for consultation

Green boxes are clinical consultations, blue boxes are administrative steps.

Data extraction

Data extracted included patient characteristics (age, sex, postcode, language), date of referral and dates of clinical consultations, used to calculate wait time, and care pathways that were initiated following the clinical decisions made at the point of encounters.

Primary performance measure – Wait time to access consultation after referral from a GP

Days waited for consultation were calculated from date of receipt of the referral to date of attendance at either an APP clinic or a surgical clinic. In addition, some patients attended for consultation at both clinics.

Patient journeys progressed through one of eight possible care pathways following receipt of a referral:

1. APP clinic + Discharged (Not seen by a surgeon)
2. APP clinic + Review again by APP (Not seen by a surgeon)
3. APP clinic + Surgical clinic + Discharged from service
4. APP clinic + Surgical clinic + Review again by a surgeon
5. APP clinic + Surgical clinic + Waitlisted for surgery
6. Surgical clinic + Discharged from service
7. Surgical clinic + Review again by surgeon
8. Surgical clinic + Waitlisted for surgery

Interventions occurring between the 2022 and 2023 waitlist and care pathways snapshots

Aspects of the health services changed during the period of the project, some as a result of deliberations by the health professional teams, stakeholders and project working parties exploring the implementation of best practice, and some independent of the project, serendipitously by the health service. Health professionals associated with the project and working parties made the following changes.

- APP clinics increased staffing resources from 0.5 FTE in 2022 to 1.5 FTE staff at the start of 2023.
- APP practices changed from selectively filtering patients whose referrals suggested that non-surgical interventions had not been exhausted, and were therefore unlikely to need surgery in 2022, to seeing as many of the referred patients with knee osteoarthritis as possible.
- APPs began collecting OKS and BMI and preparing necessary workup (such as medical imaging as indicated) for patients being referred to surgical clinics, to streamline the efficiency of those clinics.
- Following assessment in the APP clinics in 2023 and 2024, all Category 3 patients were referred to the community health services for non-surgical interventions, and only Category 2 patients were referred on to the surgical clinics.
- APP and CHS Community Care physiotherapists examined their referral practices to streamline referrals from orthopaedic clinics to community care programs such as GLA:D.
- The project team met with the Obesity Management Service to understand demand for intervention for those people with BMI over 40, unsuitable for surgery.

Meanwhile,

- Patient records systems changed to EPIC-DHR in November 2022.
- Provisions of GLA:D programs in CHS Community Care increased from one health centre with two classes; to two health centres and six classes running.

Variables of the study and research questions

The outcome of interest for this part of the project was the patients' wait time to see a clinician (surgeon and/or APP). The independent variables included were participant age, sex, place of residence, clinical pathway, cohort year and surgeon on the referral. Due to data incompleteness, covariates such as BMI and OKS were excluded.

This section of the project addressed the following research questions:

- What were the characteristics of the patients included in the study?
- What were the care pathways for patients?
  - How many patients went through each of the eight care pathways and how did the baseline of 2022 compare to 2023 and 2024?
- How did baseline 2022 wait time to consult a clinician (in days) compare to 2023 and 2024?
  - What was the wait time for each of the care pathways: APP consultation only, surgeon consultation only, both APP and surgeon consultation?
  - What was the wait time for each care pathway in 2023 and 2024 compared to baseline year, 2022?
- What were wait times to see a surgeon for Category 2 and Category 3 patients?
- What were the predictors of wait time to see a clinician?
- What were the predictors of wait time to see a surgeon stratified by APP determination of urgency status?
- Which variables predict an extended wait for surgeon consultation?

Data management

All identifiable data were housed at Canberra Hospital in the Trauma and Orthopaedic Research Unit or Physiotherapy Department servers, respectively. For statistical analyses, a dataset was maintained at UC. This was a re-identifiable dataset, from which all names and date of birth were removed, and the unique identifier for the DHR was exchanged for a re-identification code. This dataset was held under security protocols at UC, requiring dual-phase authentication and providing access only to nominated researchers. Lists of nominated trained researchers, approved by the chief investigator with permission to access data, were maintained and updated to the HREC.

Data were first checked for completeness and clarity before the analysis. Data cleaning and recoding was done using Stata 17 software. The collected data were entered into Excel and exported to Stata 17 for further analysis.

Data analysis

Descriptive statistics were used to describe the characteristics of the participants across each cohort year. All the analyses were conducted using Stata software (version 17). The results were presented in tables, figures and narrative text using frequency distributions and summary statistics. For each cohort year, the mean, median, 10th percentile and 90th percentile of wait times to see a clinician were reported. Participants' wait times to see a surgeon were stratified based on whether they attended APP clinic.

Analytical approaches were implemented to identify predictors of waiting time to see a clinician (defined as either APP, surgeon, or APP followed by surgeon) and identify predictors of extended waiting time to see a surgeon. Since the data on wait times to see a clinician were continuous, over-dispersed and not normally distributed, a negative binomial regression was implemented. The negative binomial regression model for wait times to see a surgeon was stratified based on whether the patients attended an APP clinic or not. This is because patients attending or not attending the APP clinic have different start times for calculating the wait time to see a surgeon. A cumulative frequency distribution plot was generated to visualise patient wait times by clinician pathway for each cohort year.

Extended wait time to see a surgeon was defined as follows: for participants in Category 2, waiting more than 90 days; and for those in Category 3, waiting more than 365 days (AIHW, 2025; Queensland Government, 2022). Patients who met this criterion were categorised as ‘Yes’ and those who waited longer than the recommended guidelines were categorised as ‘No’. Given the binary nature of extended waiting time, a binary logistic regression analysis was conducted to examine its predictors.

Results

Characteristics of patients in the three cohorts

There were three cohorts of patients waiting for orthopaedic consultation monitored in this study, totalling 563 patients (177 in March to September 2022, 181 in March to September 2023, and 205 in March to September 2024) (Table 5). Of these, 57.6% (2022), 68.5% (2023) and 51.7% (2024) of the patients were female, respectively. They had a mean (±SD) age of 64.2 (±10.8) years, with the most frequent age group being 65–74 years (32.9%). The majority (88.1%) of the patients included in the study were residents of the ACT and Queanbeyan.

Table 5. Characteristics of the study cohorts in 2022, 2023 and 2024

Study characteristics		Frequency (%)			
		2022	2023	2024	Total
Referrals received		270	206	205	681
Patients included		177	181	205	563
Age at referral	40–54	47 (26.6)	31 (17.1)	40 (19.5)	118 (21.0)
	55–64	47 (26.6)	54 (29.8)	49 (24.0)	150 (26.6)
	65–74	51 (28.8)	60 (33.2)	74 (36.1)	185 (32.9)
	75 and above	32 (18.1)	36 (19.9)	42 (20.5)	110 (19.5)
Sex	Female	102 (57.6)	124 (68.5)	106 (51.7)	332 (59.0)
	Male	75 (42.4)	57 (31.5)	99 (48.3)	231 (41.0)
Language spoken	English	161 (91)	161 (89)	192 (94)	514 (91.3)
	Non-English	16 (9)	20 (11)	13 (6)	49 (8.7)
Postcode	ACT + Queanbeyan	162 (92)	157 (87)	176 (86)	496 (88.1)
	Rural	15 (8)	24 (13)	29 (14)	67 (11.9)

Waiting time to see a clinician

For the 2022 cohort, the median waiting time to be seen by a clinician in orthopaedics (either an APP or a surgeon) was 114 days, with 90% of patients seen within 1,248 days (Table 6). The range, however, was from 4 days to 1,983 days. In 2023, the median waiting time reduced to 45 days, and 90% were seen within 91 days. Similarly, in 2024, the median waiting time to see a clinician was 46 days, and 90% were seen within 84 days. These results indicate a substantial reduction in waiting times for first consultation with a clinician from 2022 to 2023 and 2024 (Table 6).

Compared to 2022, wait times to be seen were shorter in 2023 and 2024. Indeed, in 2023 patients seeing a surgeon directly waited 0.14 times less; in 2024, 0.10 times less of the time they waited previously. Patients who were seen in the APP clinic and may have been referred on to see a surgeon also, waited 0.20 times less in 2023 and 2024 compared to 2022 (Table 6).

Table 6. Analysis of wait time to see any clinician stratified by care pathway

		2022	2023	2024
Waiting time to be seen by any clinician (APP or surgeon) in 2022, 2023 and 2024				
Patients who saw a clinician (total, days)	Frequency (*n*)	177	181	205
	10th percentile	19	20	21
	50th percentile	114	45	46
	90th percentile	1248	91	84
	Mean ± SD	411.5 ± 489.4	52.0 ± 32.3	52.4 ± 30.4
	Range	4–1983	6–195	7–188
Waiting time to be seen by a surgeon (no APP clinic) in 2022, 2023 and 2024				
		2022	**2023**	**2024**
Total included for analysis	Frequency (*n*)	141*	35	49
	10th percentile	27	20	10
	50th percentile	404	53	32
	90th percentile	1259	132	83
	Mean ± SD	509.6 ± 503.4	63.8 ± 40.9	44.0 ± 37.8
	Range	7–1983	12–175	7–188
Wait time to see a surgeon Cat 2 (days)	Frequency (*n*)	84	35	49
	10th percentiles	23	20	10
	50th percentile	57	53	32
	90th percentiles	536	132	83
	Mean ± SD	226.9 ± 351.0	63.8 ± 40.9	44.0 ± 37.8
	Range	7–1983	12–175	7–188
Wait time to see a surgeon Cat 3 (days)	Frequency (*n*)	57	0**	0
	10th percentile	437	–	–
	50th percentile	904	–	–
	90th percentile	1534	–	–
	Mean ± SD	926.2 ± 392.9	–	–
	Range	342–1935	–	–
Waiting time to be seen by a surgeon (APP clinic + surgeon) in 2022, 2023 and 2024				
		2022	**2023**	**2024**
Total included for analysis	Frequency (*n*)	10	75	73
	10th percentile	247	38	48
	50th percentile	542	69	91
	90th percentile	858	171	167
	Mean ± SD	519.5 ± 234.1	96.0 ± 80.8	101.0 ± 47.7
	Range	228–1002	12–484	35–257

Notes: * Of the 177 included patients in 2022, 36 were seen in APP clinic and did not go on to see a surgeon, leaving 141 patients for calculation of 'wait time to see a surgeon'.

** APP clinic was able to filter out Category 3 patients and refer them for non-surgical interventions, with result that all patients being referred onto the surgical clinic were Category 2.

APP = advanced practice physiotherapist; SD = standard deviation.

Patients seen first in the APP clinic were seen faster than those that waited to see a surgeon (Figure 5). Figure 5 describes the cumulative proportion of patients waiting to be seen, demonstrating shorter wait times for those seeing APP clinic only or APP clinic and surgeon (both). The pattern remains in 2023 (Figure 6) and in 2024 (Figure 7) although wait times are shorter (Table 6).

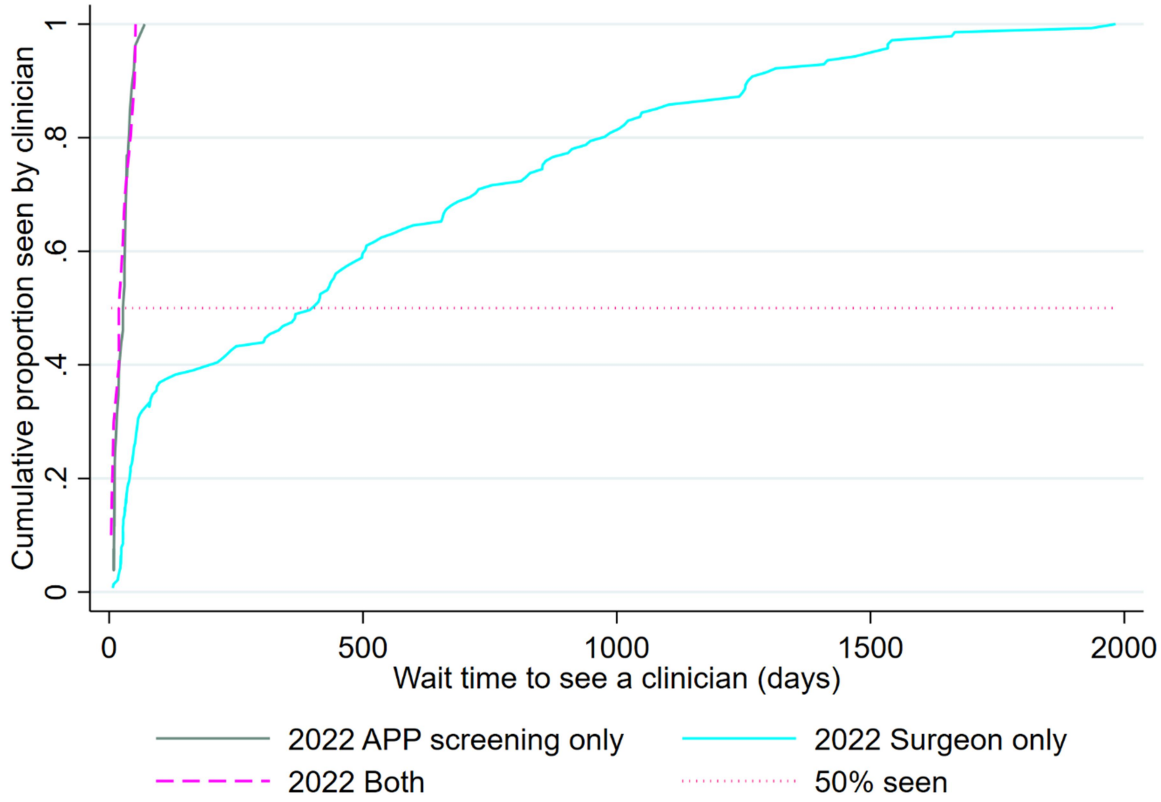

Figure 5. Wait times to see clinician (either APP, surgeon, or both) by clinical pathway in 2022

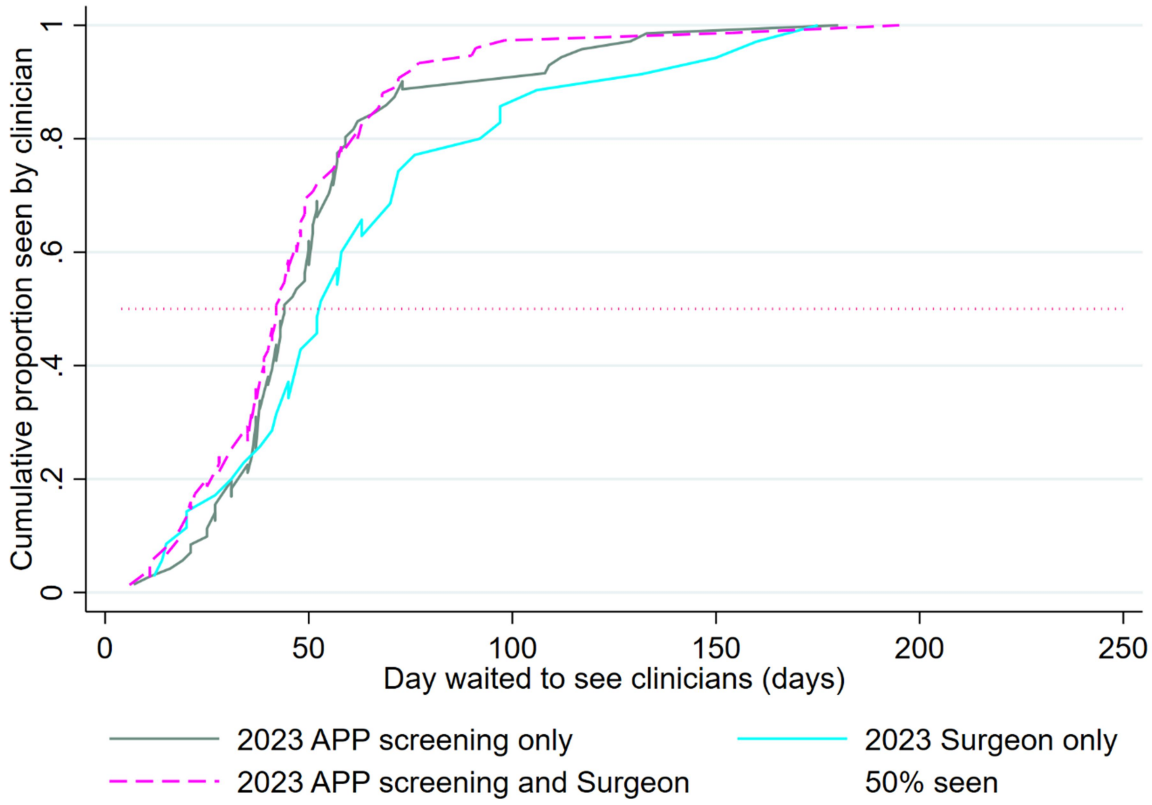

Figure 6. Wait times to see clinician (either APP, surgeon, or both) by clinical pathway in 2023

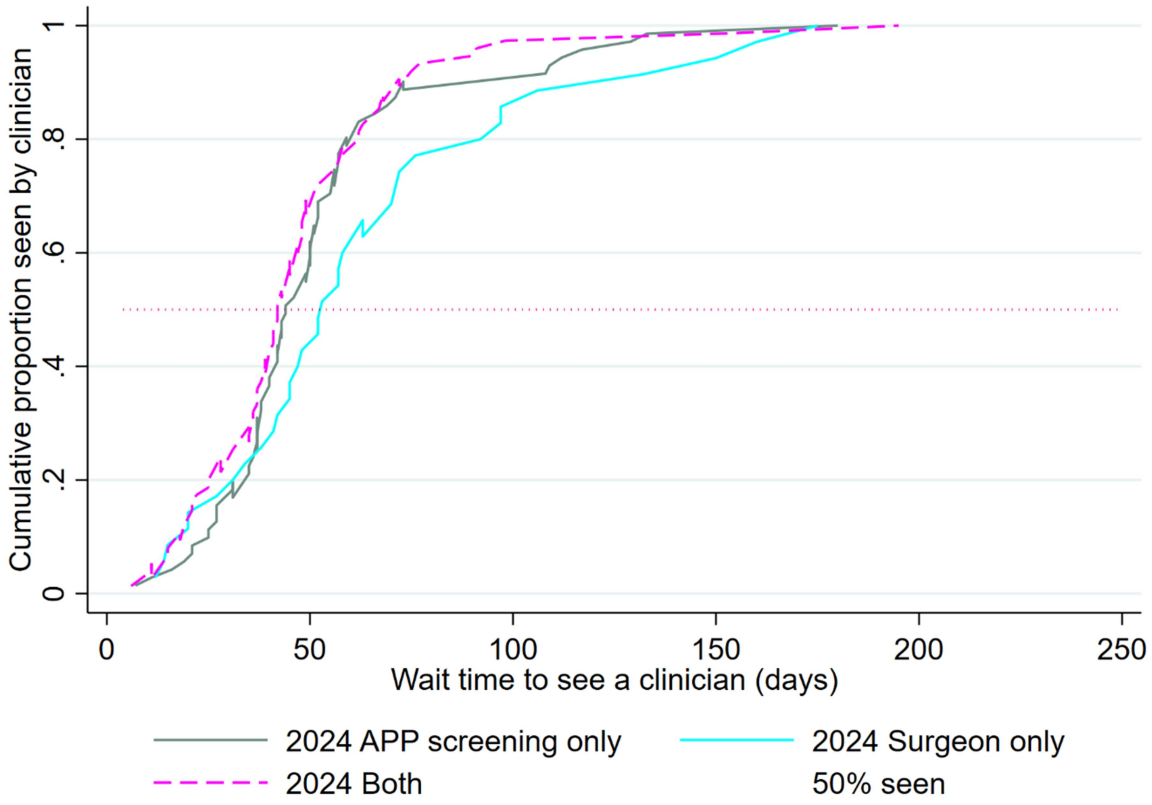

Figure 7. Wait times to see clinician (either APP, surgeon, or both) by clinical pathway in 2024

Care pathways for patients with knee osteoarthritis at Canberra Hospital

The proportion of patients seen by the APP clinic increased from 2022. In 2022, the APP clinic saw 36 of the 177 patients (20.3%) (Table 7). In 2023 the APP clinic saw 146 patients (80.7%) and in 2024 saw 156 patients (76.1%).

The number of patients who were seen in both the APP clinic and surgical clinics increased from 2022. In 2022, of the 36 patients seen in the APP clinic, 27.8% were then listed for consultation with a surgeon. In 2022 the APPs filtered out specific patients who were unlikely to need to see a surgeon, whereas in 2023, the APPs attempted to see as many patients with knee osteoarthritis as possible. Therefore, in 2023 and 2024 respectively, 51.4% of the 146 patients and 46.8% of the 156 patients who were seen in the APP clinic then saw a surgeon. The percentage of patients seen in the APP clinic and finally listed for TKR surgery increased from 2.8% in 2022 to 27.6% in 2023 and 20% in 2024.

Of the patients in the 2022 cohort referred to orthopaedics, 81 (45.8%) were eventually listed for TKR. In the 2023 cohort this dropped to 72 (37.8%) and in 2024 to 71 (34.6%).

Table 7. Breakdown of pathways for patients with knee osteoarthritis

Study characteristics		Frequency (%)		
		2022	**2023**	**2024**
Total sample		177	181	205
APP clinic only	Total	26 (14.7)	71 (39.2)	83 (40.5)
	Discharged	24 (13.6)	25 (13.8)	67 (32.7)
	Review	2 (1.1)	46 (25.4)	16 (7.8)
APP clinic + surgeon	Total	10 (5.6)	75 (41.4)	73 (35.6)
	Discharged	1 (0.6)	9 (5.0)	10 (4.9)
	Review	4 (2.3)	16 (8.8)	22 (10.7)
	Listed for surgery	5 (2.8)	50 (27.6)	41 (20)
Surgeon only	Total	141 (79.7)	35 (19.3)	49 (23.9)
	Discharged	42 (23.7)	4 (2.2)	16 (7.8)
	Review	23 (13.0)	9 (5.0)	3 (1.5)
	Listed for surgery	76 (42.9)	22 (12.2)	30 (14.6)

Note: APP = advanced practice physiotherapist.

Waiting time to see a clinician, stratified by care pathway

Waiting times to see a surgeon were stratified based on whether they were first seen in the APP clinic. A total of 141 patients saw a surgeon directly (without being seen in the APP clinic) in 2022, compared to 35 in 2023 and 49 in 2024. The median waiting time to see a surgeon in 2022 was 404 days, and 90% of the patients saw a surgeon within 1,259 days. In 2023, the median waiting time to see a surgeon dropped to 53 days, and 90% of the patients saw a surgeon within 132 days. Similarly, in 2024, the median waiting time to see a surgeon was 32 days, and 90% of the patients saw a surgeon within 83 days (Table 6).

In 2022, 10 patients were seen in the APP clinic and then referred on to see a surgeon, with a median waiting time of 542 days, and 90% were seen by a surgeon within 858 days. In comparison, in 2023, 75 orthopaedic patients were seen in both the APP clinic and the surgeon

clinic, with a median waiting time of 69 days, and 90% were seen within 171 days. In 2024, of the 73 patients seen in both the APP clinic and the surgeon clinic, 50% of them saw a surgeon within 91 days, and 90% saw a surgeon within 167 days (Table 6).

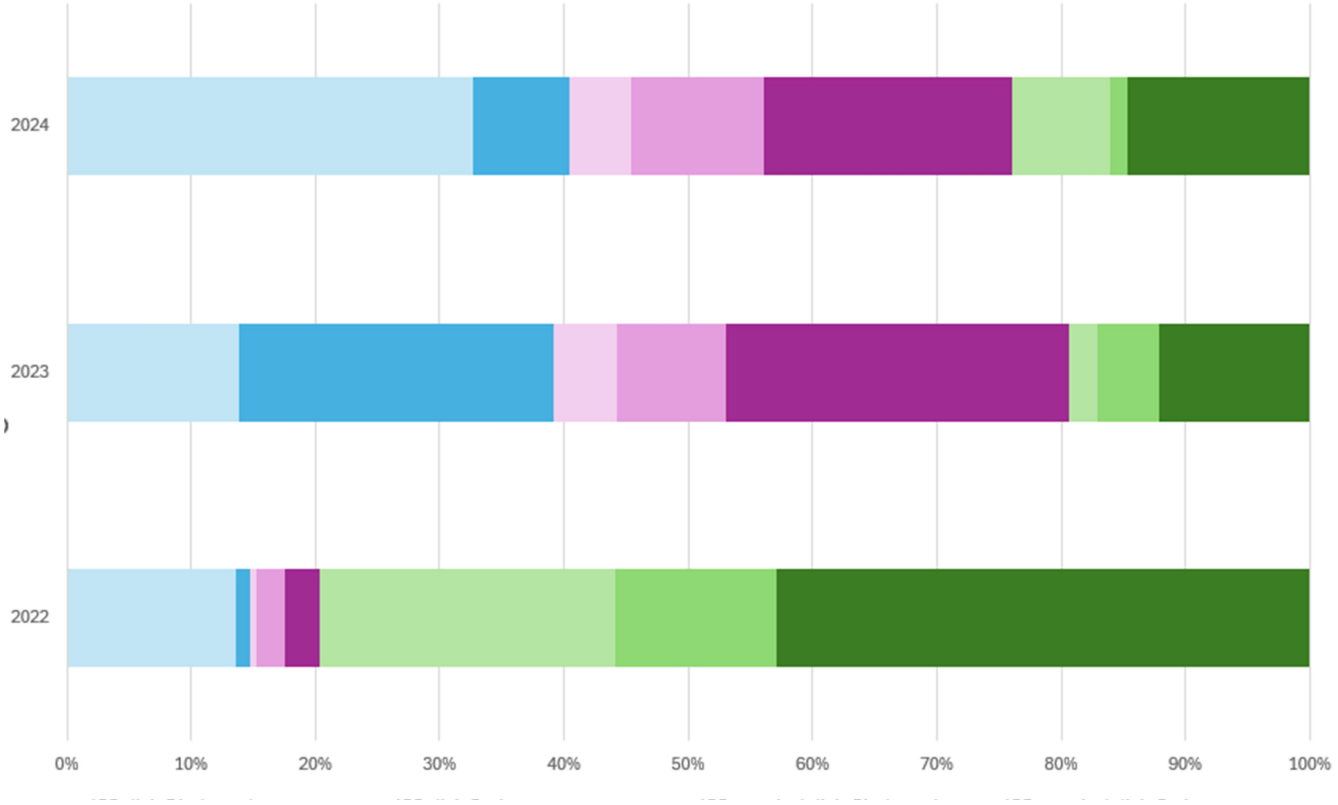

Figure 8. Patient pathways: proportion of patients seen in APP clinic, surgical clinic or both, and discharged, returned for review or listed for surgery

Key:

APP clinic – Discharged	
APP clinic – Review	
APP + Surgical clinic – Discharged	
APP + Surgical clinic – Review	
APP + Surgical clinic – Listed for surgery	
Surgical clinic – Discharged	
Surgical clinic – Review	
Surgical clinic – Listed for surgery	

Patients with multiple referrals

In 2022, patients with multiple referrals from their GP had longer wait times. In some cases, the triaging APP had requested further information to assist with assigning a triage category, but in other cases, a GP sent a repeat referral to expedite consultation. In 2022, 40 (24%) of patients had more than one referral for knee osteoarthritis attached to their record. Eight patients had three referrals, and one patient had four referrals. The wait time for patients with three or four referrals was longer, at 729 days ± 673 (mean ± SD); higher than the 2022 cohort median of

141 days. That four of these patients waited greater than 3 years to see the surgeon indicates a systematic failure, and perhaps the referrals were lost.

Extended waiting time to see a surgeon

Among patients not attending the APP clinic, in 2022, 64.5% were **not** seen by a surgeon within the clinically recommended timeframes (AIHW, 2022; Queensland Government, 2022). In 2023, this was reduced to 22.9%, and then to 6.1% in 2024. For patients who attended the APP clinic in 2022, 70% experienced extended waiting times to see a surgeon. In 2023 this fell to 34.7% and then to 52.1% in 2024. Specifically, 43.2% of those patients classified as Category 2 waited over 90 days to see a surgeon, while 70% of those in Category 3 waited more than 365 days. This highlights a marked reduction in the proportion of patients who had extended waiting times to see a surgeon within the clinically recommended time frame since baseline in 2022 (from 2022 to both 2023 and 2024) (Tables 8 and 9).

Table 8. Extended waiting time to see a surgeon in 2022, 2023 and 2024 by triage category

Extended waiting time to see a surgeon (no APP clinic)				
		2022	**2023**	**2024**
Extended waiting time to see a surgeon	No	50 (35.5%)	–	–
	Yes	91 (64.5%)	–	–
Category 2	No	49 (58.3%)	27 (77.1%)	46 (93.9%)
	Yes	35 (41.7%)	8 (22.9%)	3 (6.1%)
Category 3	No	1 (1.8%)	–	–
	Yes	56 (98.3%)	–	–

Extended waiting time to see a surgeon (APP clinic + surgeon)				
		2022	**2023**	**2024**
Extended waiting time to see a surgeon	No	3 (30%)	–	–
	Yes	7 (70%)	–	–
Category 2	No	0	49 (65.3%)	35 (48.0%)
	Yes	0	26 (34.7%)	38 (52.1%)
Category 3	No	3 (30%)	–	–
	Yes	7 (70%)	–	–

Note: Following assessment in the APP clinics in 2023 and 2024, all Category 3 patients were referred to the community health services for non-surgical interventions, and only Category 2 patients were referred on to the surgical clinics. APP = advanced practice physiotherapist.

Waiting time to be seen in APP clinic

The median waiting time to be seen in the APP clinic in 2022 was 27 days and 90% of patients were seen within 50 days (Table 9). In 2023, waiting time to be seen in the APP clinic was longer, median 43 days, and 90% of patients were seen within 73 days. This stabilised in 2024,

with median wait to APP clinic of 47 days while 90% of patients were seen within 84 days. Of the patients who were seen in the APP clinic and referred on to see a surgeon, nearly 94% of the patients were identified as most likely to require surgery (Category 2) (Table 8).

Table 9. Waiting time to see APP in 2022, 2023 and 2024

		2022	2023	2024
Total included for analysis	Frequency (*n*)	177	181	205
Patients screened by the APP	Frequency (%)	36 (20.33%)	146 (80.66%)	156 (76.09%)
Wait time to attend APP clinic (days)	10th percentile	9	21	33
	50th percentile	27	43	47
	90th percentile	50	73	84
	Mean ± SD	27 ± 16	49 ± 29	55 ± 27
	Range	4–70	6–195	7–183

Note: APP = advanced practice physiotherapist; SD = standard deviation.

Predictors of waiting time to see a clinician

Patient age, sex, clinician pathway, postal code and cohort year were included as potential predictors of waiting time to see a clinician. In the negative binomial regression analysis, clinician pathway and cohort year were identified as significant predictors of waiting time to see a clinician.

Patients seen only in the APP clinic had a 45% shorter waiting time (IRR: 0 .55; 95%CI: 0.43, 0.72) to be seen by a clinician than those seen only by a surgeon. Similarly, patients seen by both an APP and a surgeon had a 46% (IRR: 0 .54; 95%CI:0.41, 0.70) shorter waiting time to see a clinician compared to those seen only by a surgeon.

Patients in cohort years 2023 (IRR: 0.20: 95%CI; 0.16, 0.27) and 2024 (IRR: 0.21: 95%CI;0.16, 0.28) had shorter waiting time to see a clinician compared to the 2022 patient cohort (Table 9).

Regression analysis results of waiting time to see a surgeon stratified by APP clinic status

In the stratified analysis, cohort year and surgeon seen were significant determinants of waiting time to see a surgeon in both groups: those patients who were seen in the APP clinic and those who were not. In the analysis for patients without being seen by APP, patients in the 2023 (IRR: 0.14: 95%CI: 0.09, 0.20) and 2024 (IRR: 0.1: 95%CI: 0.07, 0.14) cohorts had shorter waiting times to see a surgeon compared to patients in the 2022 cohort. Similarly, in the analysis for patients seen by an APP, being in the 2023 (IRR: 0.21: 95%CI: 0.15, 0.29) and 2024 (IRR: 0.20; 95%CI: 0.14, 0.28) cohorts was associated with shorter waiting time to see a surgeon compared to patients in the 2022 cohort (Table 10).

Table 10. Negative binomial regression analysis of waiting time to see any clinician

Variable	Category	Incidence rate ratio	Standard error	*p*-value	95%CI
Age (years)	40–54	Reference	–	–	–
	55–64	1.06	0.12	0.60	0.85, 1.31
	65–74	1.08	0.11	0.44	0.88, 1.19
	75 and above	0.91	0.11	0.42	0.72, 1.14
Sex	Male	1.04	0.08	0.75	0.88,1.194
	Female	Reference	–	–	–
Postal code	Rural	0.91	0.10	0.26	0.69, 1.11
	Metropolitan	Ref	–	–	–
Clinician pathway	APP clinic only	0.55	0.07	0.000	0.43, 0.72
	APP clinic + surgeon	0.54	0.07	0.000	0.41, 0.70
	Surgeon only	Reference	–	–	–
Cohort year	2022	Reference	–	–	–
	2023	0.20	0.03	0.000	0.16, 0.27
	2024	0.21	0.03	0.000	0 .16, 0.28
Negative binomial regression analysis of waiting time for a patient to see a surgeon (no APP clinic)					
Variable	**Category**	**IRR**	**SE**	***p*-value**	**95%CI**
Age (years)	40–54	Reference	–	–	–
	55–64	0.95	0.20	0.80	0.63, 1.43
	65–74	0.92	0.18	0.70	0.62, 1.37
	75 and above	0.82	0.17	0.44	0.54, 1.24
Sex	Male	0.92	0.13	0.56	0.69, 1.22
	Female	Reference	–	–	–
Postal code	Rural	0.99	0.19	0.97	0.66, 1.50
	Metropolitan	Reference	–	–	–
Cohort year	2022	Reference	–	–	–
	2023	0.14	0.03	0.000	0.09, 0.20
	2024	0.10	0.02	0.000	0.07, 0.14
Surgeon seen	Surgeon A	Reference	–	–	–
	Surgeon B	0.37	0 .23	0.12	0.11, 1.24
	Surgeon C	0.40	0.13	0.01	0.21, 0.76
	Surgeon D	0.70	0.26	0.32	0.34, 1.42
	Surgeon E	0.61	0.14	0.035	0.38, 0.96
	Surgeon F	0.96	0.34	0.91	0.48, 1.91
	Surgeon P	0.48	0.12	0.003	0.300, 0.78
	Surgeon Q	0.63	0.19	0.14	0.35, 1.15
	Surgeon R	0.92	0.32	0.81	0.47, 1.80
Negative binomial regression analysis of waiting time to see a surgeon + APP clinic					
Variable	**Category**	**IRR**	**SE**	***p*-value**	**95%CI**
Age (years)	40–54	Reference	–	–	–
	55–64	1.04	0 .13	0.84	0.81, 1.34
	65–74	1.11	0.13	0.44	0.87, 1.39
	75 and above	0.86	0.12	0.27	0.65, 1.13

Sex	Male	1.09	0.09	0.31	0.92, 1.28
	Female	Reference	–	–	–
Postal code	Rural	0.84	0 .11	0.19	0.65, 1.08
	Metropolitan	Reference	–	–	–
Cohort year	2022	Reference	–	–	–
	2023	0.21	0.04	0.000	0.15, 0.29
	2024	0.20	0.032	0.000	0.14, 0.28
Surgeon seen	Surgeon A	Reference			
	Surgeon B	0.87	0.23	0.62	0.52, 1.48
	Surgeon C	0.89	0.23	0.66	0.53, 1.49
	Surgeon D	0.95	0.34	0.89	0.47, 1.92
	Surgeon E	0.56	0.19	0.01	0.35, 0.87
	Surgeon F	1.09	0.30	0.74	0.68, 1.87
	Surgeon P	0.49	0.12	0.003	0.31, 0.79
	Surgeon Q	0.51	0.13	0.007	0.31, 0.83
	Surgeon R	0.92	0.24	0.75	0.56, 1.52

Note: CI = confidence interval; IRR = incidence rate ratio; SE = standard error.

Extended waiting time to see a surgeon stratified by APP clinic pathway

A separate binary logistic regression was conducted to identify factors associated with extended waiting time to see a surgeon for patients who saw a surgeon directly, and for those who saw an APP who then directed them to see the surgeon. For patients who saw a surgeon directly, being in the 2023 (AOR: 0.11; 95% CI: 0.04, 0.31) and 2024 (AOR: 0.02; 95% CI: 0.004, 0.09) cohort years was associated with lower odds of having an extended waiting time to see a surgeon. Also, participant age of 75 years and above (AOR: 0.33; 95%CI: 0.11, 1.00) was marginally associated with lower risk of extended waiting time to see a surgeon. Moreover, being male (AOR: 0.47; 95%CI: 0.23, 0.95) was associated with a lower risk of extended waiting time to see a surgeon compared with being female (Table 11). In summary, being over 75 years, or male, or seeing Surgeon C, E or P had less risk of extended delay to be seen.

Being in year cohort of 2023 or 2024 was associated with a lower risk of delay to be seen for patients who saw an APP and were then directed to see a surgeon (AOR: 0.27; 95%CI: 0.05, 1.53; AOR: 0.47; 95%CI: 0.0.08, 2.69, respectively). Seeing Surgeon P had lower risk of delay to be seen (AOR: 0.06; 95%CI: 0.004, 0.71). Contrary to the 2022 cohort, in which being male or over 75 years were associated with reduced risk of delay, the reduced risk of delay no longer held true for the 2023 and 2024 cohorts.

Table 11. Binary logistic regression analysis of extended waiting time to see a surgeon stratified by APP clinic status

Binary logistic regression analysis of extended waiting time for patient to see a surgeon (no APP clinic)					
Variable	**Category**	**Adjusted odds ratio**	**Standard error**	***p*-value**	**95%CI**
Age (year)	40–54	Reference	–	–	–
	55–64	0.81	0.40	0.68	0.31, 2.17
	65–74	0.96	0.48	0.94	0.36, 2.57
	75 and above	0.33	0.19	0.05	0.11, 1.00
Sex	Male	0.47	0.17	0.04	0.23, 0.95
	Female	Reference	–	–	–
Postal code	Rural	0.99	0.58	0.99	0.32, 3.13
	Metropolitan	Reference	–	–	–
Cohort year	2022	Reference	–	–	–
	2023	0.11	0.06	0.000	0.04, 0.31
	2024	0.02	0.015	0.000	0.004, 0.09
Surgeon seen	Surgeon A	Reference	–	–	–
	Surgeon B	0.14	0.21	0.20	0.07, 2.67
	Surgeon C	0.061	0.05	0.001	0.01, 0.32
	Surgeon D	2.46	2.77	0.42	0.27, 22.32
	Surgeon E	0.24	0.16	0.027	0.069, 0.85
	Surgeon F	2.08	2.23	0.49	0.25, 17.08
	Surgeon P	0.18	0.12	0.009	0.05, 0.65
	Surgeon Q	0.23	0.19	0.078	0.05, 1.18
	Surgeon R	0.39	0.34	0.28	0.07, 2.15
Binary logistic regression analysis of extended waiting time for patient to see a surgeon + APP clinic					
Variable	**Category**	**AOR**	**SE**	***p*-value**	**95%CI**
Age(year)	40–54	Reference	–	–	–
	55–64	0.79	0.49	0.70	0.24, 2.67
	65–74	1.15	0.67	0.79	0.38, 3.82
	75 and above	0.66	0.45	0.54	0.18, 2.73
Sex	Male	0.61	0.26	0.25	0.27, 1.42
	Female	Reference	–	–	–
Postal code	Rural	0.76	0.49	0.67	0.21, 2.72
	Metropolitan	Reference	–	–	–
Cohort year	2022	Reference	–	–	–
	2023	0.27	0.24	0.14	0.05, 1.53
	2024	0.47	0.42	0.39	0.08, 2.69
Surgeon seen	Surgeon A	Reference	–	–	–
	Surgeon B	0.46	0.63	0.57	0.03, 6.68
	Surgeon C	0.56	0.77	0.67	0.04, 8.17
	Surgeon D	–	–	–	–
	Surgeon E	0.11	0.13	0.07	0.01, 1.19
	Surgeon F	2.46	4.07	0.57	0.09, 62.89
	Surgeon P	0 .06	0.07	0.026	0.004, 0.71

Surgeon Q	0.12	0.16	0.113	0.01, 1.64
Surgeon R	0.60	0.82	0.71	0.04, 8.65

Note: AOR = adjusted odds ratio; CI = confidence interval; SE = standard error.

Metrics of dissatisfaction with the APP clinic

To conduct a safety check for potential harms, we considered the negative outcomes that might arise from implementing the APP clinic. Possible outcomes were negative patient experience and frustration at having an intermediate appointment before seeing a surgeon (see qualitative research data, Appendix 3). The patient's GP might express their dissatisfaction by repeat referral and request to see a surgeon. Patients in the 2022 and 2023 cohorts, who were seen in the APP clinic and did not see a surgeon were followed for 12 months to see whether another referral from their GP was received. The 2024 cohort was not included as 12 months had not elapsed.

Table 12. Patients seen in APP clinic re-referred to orthopaedics

	2022 Re-referred	2022 Not re-referred	2023 Re-referred	2023 Not re-referred
Patient seen in APP clinic	26	–	71	–
Repeat referrals *n* (%)	4 (15)	22 (85)	4 (6)	67 (94)
Time of receipt of repeat referral (range, months)	18 to 26	–	11 to15	–
Outcome of repeat referral	• 2 listed for TKR • 2 completed GLA:D • 1 attended CCPT	• 13 no further encounters • 4 completed GLA:D • 2 attended CCPT • 2 attended hydrotherapy • 1 deceased	• 2 listed for TKR • 1 completed GLA:D • 1 attended hydro • 2 attended CCPT • 4 listed for review by APP	• 30 no further encounters • 19 completed GLA:D • 4 attended hydrotherapy • 4 attended CCPT

Note: APP = advanced practice physiotherapist; CCPT = Canberra Health Service Community Care Physiotherapy; GLA:D = Good Living with osteoArthritis: Denmark program; TKR = total knee replacement.

Of those re-referred patients, some patients were booked for review appointments as a safety net by the APP. One in 2022 returned to the clinic following GLA:D intervention as they had not improved. The outcome of the surgical consultation was that they were listed for TKR. In 2023, 10 patients returned for review appointments in the APP clinic after non-surgical interventions (four attended GLA:D, three attended CHS Community Care Physiotherapy [CCPT], three had

not engaged with the non-surgical management they were referred to). The outcome of the surgeon's consultation with these patients was: six were referred for TKR, and those that had not engaged with non-surgical intervention were recommended to GLA:D. One patient was referred to an obesity management service. APP physiotherapists and surgeons report this also, that some patients do have an expectation of seeing a surgeon for consultation and advice on TKR.

Appropriateness of patients being seen in surgical clinics

Surgeons perceive two key roles in the specialist clinics for orthopaedics at CHS (see Paper 3). First, to provide specialist advice and consultation for patients referred by GPs, for complex orthopaedic patients including those with high-risk and urgent conditions such as tumours or complex comorbidities. Second, to see patients requiring elective orthopaedic surgery in the public health service. Patients referred for advice for simple conditions such as knee osteoarthritis are not a high priority for orthopaedic consultation, unless they are ready for surgery. The term used by clinic teams is 'ready for care'.

There was no difference in the proportion of surgically appropriate patients referred from the APP clinic to the surgical clinic than those not seen first in the APP clinic (chi^2 = 0.57, p = 0.449) (Table 13).

Table 13. Analysis of APP clinic decisions on whether a patient seen in surgical clinic would be listed for surgery

	Listed for surgery	2022	2023	2024
APP clinic + surgeon	Yes	5	56	41
	No	5	25	32
Surgeon only	Yes	76	22	30
	No	65	23	19
Overall:				
chi^2 = 0.57		chi^2 = 0.057	chi^2 = 0.15	chi^2 = 0.579
p = 0.449		p = 0.811	p = 0.69	p = 0.31

However, when comparing the proportion of patients who were discharged from the service to those listed for surgery, patients referred in 2023 and 2024 were 1.9 times more likely to be listed for surgery than a patient seen in the surgical clinic in 2022 (chi^2 = 6.5, p = 0.01) (Table 14).

Table 14. Analysis of years 2023 and 2024 compared to 2022 whether a patient seen in surgical clinic would be listed for surgery

	2022	2023+24
Listed for surgery: Yes	81	143
Discharged: No	43	39
Odds ratio 1.9, chi^2 = 6.525, p = 0.011		

Summary of key findings from 2022

Several inefficiencies were identified that contributed to long wait times:

- Wait times were outside of clinically recommended timeframes
- There were sometimes multiple and sometimes inappropriate referrals received from GPs
- Patients who had not exhausted non-surgical care were referred for orthopaedic consultation
- Low proportions of patients referred to orthopaedic clinics were listed for surgery
- Two sources of patient records – the clinical record and the ACTPAS list – led to lost referrals and poor systems coordination. DHR commencing in November 2022 resolved this.

Summary of key findings from 2022 compared to 2023 and 2024

- The waiting time to see any clinician was faster as the APP clinic increased operation: 50% of people were seen in 114, 45, 46 days (2022, 2023 and 2024 respectively), and 90% were seen in 1,248, 91, 84 days respectively.
- The proportion of patients seen in the APP clinic increased: in 2022, 20%; 2023, 81%; 2024, 76%.
- Of the total number of patients referred to the orthopaedic service, more patients were referred to non-surgical interventions in 2023 and 2024, and the proportion of patients finally listed for surgery dropped from 46% in 2022 to 38% in 2023 and then 35% in 2024.
- There were very few people re-referred after APP consultation back to see a surgeon by their GP, and no difference between the years.

Discussion

The greatest determinant of waiting time, and of the risk of exceeding clinically recommended waiting times, was year cohort. Changes in practice, including changing the structure and function and resourcing of the APP clinic, and implementation of the DHR, significantly improved patient management.

Environment and context changes in 2022, 2023 and 2024 impacted the study as well as deliberate health service changes

Post-COVID phenomena: At baseline in 2022, the community was emerging from the COVID-19 pandemic. During this time elective surgery had been paused. People had avoided visiting health services, and there was a backlog of patients with health conditions that needed to be addressed (AMA, 2022). This is evident in the post-COVID increase in delays to joint replacement, and in the increase in numbers of people seeking hospital outpatient services nationwide. The Australian Medical Association (AMA) report shows that nationally during 2016–2020, outpatient visits were less than 35 million visits per year, and in 2020–21 jumped to 47 million, before dropping back down to 41 million in 2024 (AIHW, 2024). After peaking in 2022, the median wait time for TKR surgery decreased by 43 days, from 308 days in 2022–23 to 265 days in 2023–24. This is 42 days more compared with 5 years ago in 2019–20 (AIHW, 2025). So, in 2022, we could expect a longer wait time to see orthopaedic clinics, as a post-COVID phenomenon.

Countering the post-COVID peak in waiting time, The Reboot Project was resourced to contact people waiting for orthopaedic consultation and find out how many could be removed from the list and how many were validly waiting. The Reboot Project removed approximately 25% of Category 3 patients from the orthopaedics waitlist. The project ended in November 2022. This meant the list of people waiting for orthopaedic consultation had already been checked and patients who no longer needed consultation removed, such as those who had sought treatment elsewhere, left the ACT or died.

Implementation of the DHR system: The DHR brought close to 40 different data and administration applications into one system. Importantly, the Clinical Portal and the ACT Patient Activity System (ACTPAS) were incorporated into the DHR. Streamlined administration systems had the impact of losing fewer patients in transfer between systems, being able to track patients across and between health services and being able to track referrals from GPs into the health service. The HealthLink e-referral system commenced prior to this project, but the impact of it is reported in the GP interviews. It is now possible for GPs and patients to see that a referral has been received and logged, though it does not provide estimated wait time.

In 2023, CHS Community Care received funding to provide GLA:D programs at community health centres, where GLA:D had not previously been available. The requirement that patients over 65 years complete a My Aged Care application was removed by CHS. Ethics approval was achieved, enabling data collection for GLA:D in the La Trobe dataset, and able to be released to CHS.

In 2024, CHS nominated a team to develop the ACT Osteoarthritis of the Knee Clinical Care Standard, to bring CHS in line with the ACSQHC standards for care (2017 and later 2024) (Australian Commission on Safety and Quality in Health Care, 2024). The working party for the Clinical Care Standard was led by the Allied Health Manager of the Community Care Program and engaged with allied health, nursing, and quality and safety in healthcare staff to develop, implement and monitor the standard. It functions to provide a locally endorsed guideline, and a reporting structure for quality and safety assessment.

At baseline, waiting times to orthopaedic consultation were too long. Patients were likely to have waiting times exceeding recommended clinical timeframes (AIHW, 2022; Queensland Government, 2022): 42% of Category 2 patients with knee osteoarthritis were likely to have waited longer than the recommended 90 days, and 98% of Category 3 patients exceeded the recommended waiting time of 365 days if they saw a surgeon directly. If they were first screened by the APP clinic, none of the Category 2 patients and 70% of the Category 3 patients waited longer than recommended times. The ACT performance was an outlier compared to data from ‘all specialist clinics’ reported in other states. For example, in Victoria, 89.7% of non-urgent patients were seen in recommended timeframes, and Tasmania had a median wait of 536 days for non-urgent patients. For orthopaedic clinics, Category 3 patients’ 90th percentile wait time was 720 days in Queensland and 800 days in Victoria; the CHS 90th percentile wait time was 1,534 days. (Note this is after The Reboot Project validated the orthopaedic clinic waiting lists by telephoning all the patients.)

We found that many patients referred to orthopaedic clinics were not listed for surgery. By cohort: 46% in 2022, 38% in 2023 and 35% in 2024. We proposed that GPs were listing their

patients early in response to the long wait times. Data from the Australian Bettering the Evaluation and Care of Health (BEACH) study showed that GPs referred 68% of patients to an orthopaedic surgeon, and just 18% to physiotherapy (Bennell et al., 2021), despite evidence for exercise interventions for knee osteoarthritis (Barton, 2021). The average age of the patients, at 62 years, also suggests that patients are being referred before TKR is indicated.

Long wait times and poor administrative systems led to inefficiencies in administration, as seen in the difference between the numbers of referrals in 2022, and low conversion to clinic appointments. Many patients had duplicate referrals as their GPs tried to expedite consultation, and patients sought treatment privately, moved away or died while waiting, due to the long delays. Of patients who saw a surgeon, 24% had two or more referrals for their knee osteoarthritis. Systems improvements such as e-referral systems (HealthLink), communication strategies (Capital Health Network [CHN] Health Pathways) and DHR enabling GPs and patients to track referrals in the system provide more confidence in systems and less administration waste.

Improved waiting time to consultation between 2022, 2023 and 2024 was attributed to several factors: increased resourcing of the APP clinic, from 0.5 to 1.5 FTE APPs; the digital records system; the tracking of referrals enabled by the HealthLink e-referral system; and improved cross-divisional streamlining of referrals. Also, during this time, the provision of CHS Community Care GLA:D programs increased from two to six available classes, across two health centres. APPs also worked with CHN to improve the completeness of referrals to orthopaedics. Lastly, some of the improvement in waiting times may be attributed to Hawthorne effect (Sedgwick & Greenwood, 2015). Running a project such as this, involving the extensive network of stakeholders, will have alerted health professionals and focused clinical decision-making in a way that is not necessarily attributable to only the APP clinic. To manage this effect, the project used mixed methodologies including stakeholder interviews and focus groups.

This was an ecological and pragmatic study. It monitored the outcomes on wait time of many concurrent events and activities. Data were collected from medical records, and in 2022 two different sources (Clinical Portal and ACTPAS) allowing for differences in terminology, definitions and data veracity. In 2023 and 2024, the DHR provided a new source of data. Thorough efforts were made to retrieve as complete a dataset as possible, data are limited by what was recorded.

In conclusion, wait times were successfully addressed for those patients with knee osteoarthritis through a range of diverse and interconnected strategies and activities of the service. This project is limited to patients with knee osteoarthritis and may even have been detrimental to patients with other conditions due to the attention on knee osteoarthritis. However, it has been demonstrated that APP clinics can effectively and efficiently filter those patients requiring specialist consultation and direct those for whom first-line interventions are indicated expediently to that care.

References can be found at the end of the report.

Paper 3: The patient journey II. Changes experienced during the project from stakeholder perspectives

Paper 3: The patient journey II. Changes experienced during the project from stakeholder perspectives

Summary

To find ways to improve waiting time to orthopaedic consulting clinics we ran a knowledge translation project over 3 years. Some of the changes during this period were increased resourcing of APP screening clinics, implementation of a DHR system in the health service, increased provision of hip and knee osteoarthritis classes in the community and collaborative stakeholder engagement and problem-solving for better streamlining of referrals and communication. This paper examines stakeholder perceptions of the changes (if any) in patient experience for those with knee osteoarthritis referred to the orthopaedic clinics.

Method: Focus groups and interviews were conducted with participants from patient, GP, physiotherapy, surgeon and registrar, and health executive groups. Three researchers derived themes against a framework of questions: What changes have you noticed? What is working well? What needs improving now? What would a good model of care look like for you and what would be the barriers and enablers to implementing that model of care?

Findings: A responsive system has empowered confidence in self-management for patients. APP clinics were highly regarded by patients and health professional stakeholders. An imperative has arisen to expand this model of care to patients with other orthopaedic conditions and to other specialist clinics across the health service. Barriers to expanding the successful model include training sufficient APPs and resourcing those clinics. The program for knee osteoarthritis relied on strong community allied health programs available as a non-surgical pathway, but such programs do not exist for problematic foot or shoulder conditions with long delays to consultation. Community health services need resourcing to meet demand, particularly in podiatry and dietetics, where demand is great. Some quick wins were identified using the DHR to send notifications to patients on the progress of their referral, and for tracking referrals. There is a widespread request for education in self-management for patients, particularly in pain management.

Conclusion: Changes have improved patients' experience and responsiveness of the system. Stakeholder engagement has been essential to the success of the project and to stay grounded in patient-centred decision-making and meeting demands within resource priorities.

Background

Orthopaedic elective surgery waiting times in public health systems are notorious, but prior to the wait for surgery, there is often delayed access to specialist consultation. APP clinics have been applied as a solution to access and are now routine practice in the UK. In Australia, some states have successfully implemented APP clinics. This paper sought the stakeholder experience of the implementation to identify barriers to translation, systems challenges and to assess quality of care.

Access to specialist medical appointments at hospitals faces extended delays, so that patients sometimes wait years to be seen by a consultant (AMA, 2022). Queensland, Western Australia, South Australia, Victoria and Tasmania report on wait times to see specialists, and have actively moved to address the issue, but in Northern Territory, New South Wales and the ACT, wait times to see specialists are not reported and health systems are not accountable for this major problem (AMA, 2022). Indeed, in 2023–24, 29% of people reported waiting longer than they felt acceptable for a medical specialist appointment, similar to 28% in the previous year (ABS, 2022). People more likely to report unacceptable waits to see specialists were those in areas of socioeconomic disadvantage, those with long-term health conditions, females and younger people (ABS, 2022). The Australian health system has parallel private and public healthcare systems, resulting in disparities in access between public and privately insured patients for planned care, such as specialist consultation and elective surgery. In recent years there has been little improvement evident in the trajectories (ABS, 2022; AIHW, 2024, 2025).

Advanced practitioners can effectively streamline access to expert consultation and improve the efficiency of clinics. APPs are equipped with autonomy, high-level clinical expertise and the ability to make complex decisions. Advanced practitioners are positioned to lead healthcare innovation, bridge gaps in patient care and mitigate workforce strains (Morris et al., 2014). Further, it is broadly recognised that utilising health professionals at the top of scope to resolve health care access problems is sensible. For example, it is recommended by the Strengthening Medicare Taskforce, which sought to minimise costs and delays and provide better access to care (Strengthening Medicare Taskforce, 2022). High-level evidence supports APPs. A systematic review of systematic reviews found accurate diagnosis, appropriate triage and improved patient treatment outcomes and access to care in the APP care model (Vedanayagam et al., 2021). Specifically, there is consistency between APPs and specialists in clinics (Lafrance et al., 2023). Remarkably, a review of 191 papers found no adverse events arising from advanced practitioners working at the top of their scope (Evans et al., 2021). This is a body of evidence worthy of translation to practice.

While there is level 1 evidence supporting APPs in orthopaedic and musculoskeletal advanced roles, translation of the evidence depends on the perspectives of stakeholders and identification of the barriers to translation. In preparation for such physiotherapy-led clinics, there have been concerns about a lack of confidence from GPs or surgeons that physiotherapists will be safe (i.e. not missing diagnoses) and some perceptions of professional threat (Naik et al., 2023). Evaluation of clinics has been built into the implementation phases of model of care changes, so that physiotherapy-led clinics in Canada (Desmeules et al., 2012; Kennedy et al., 2010) and Europe (Fennelly et al., 2017) have been demonstrated to be efficient, safe and well accepted. In implementing a new model of care, best practice recommends key engagement with

stakeholders and evaluation of both quantitative and qualitative data (Graham et al., 2006; Health Canada, 2017).

Therefore, this study explores the stakeholder perceptions of the implementation of advanced physiotherapy clinics in orthopaedics at a public hospital.

Method

Study design

To evaluate the implementation of the model of care, an inductive approach was used based on the social cognitive theory of self-efficacy (Bandura, 1998). A framework analysis was used for its contribution to systematic, orderly methodology for comprehensive data management and analysis, and suitability for qualitative health research where structured and definitive outcomes are essential. Framework analysis provides structure for accountability, and a disciplined approach for consistency. Data were arranged by an organised framework of predefined categories. In this case we asked:

- what changes have you noticed in your experience of the orthopaedic clinics?
- what is working well in your experience of the orthopaedic clinics?
- what needs improvement?
- what would a good model of care look like to you?
- what are the barriers and enablers to being able to deliver your ‘good model of care’?

Interviews were conducted by two physiotherapy academics. They were both visiting fellows of the orthopaedic research unit at the health service but had no line management relationships with the health service. They both had basic training in qualitative research methods and sought advice from other academics with extensive qualitative research experience. Focus groups of patient participants were conducted by one physiotherapy academic assisted by an orthopaedic research officer with little knowledge of qualitative research methods, but experienced in clinical trials, participant recruitment and highly effective communication skills. All researchers were female.

The researchers had broadly diverse relationships to participants. The researchers knew many of the health professional participants from their interactions with the health service, and because of the extensive stakeholder engagement in the project. Participants in the patient group were formerly unknown to the researchers.

Setting and context

The health service is a publicly funded tertiary care hospital supported by a community care health service, also publicly funded. In Australia, private and publicly insured health systems enable people with financial resources to choose between service providers. For example, a person may attend a public hospital for orthopaedic consultation for TKR but attend privately funded physiotherapy in the community. Choices are made based on cost, utility, convenience and access (waiting times). Exceptionally long waiting times for surgical consultation have been addressed by increasing resources to the APP clinic. This has enabled most patients with knee osteoarthritis to be seen by an APP, implementing the ACSQHC Osteoarthritis of the Knee

Clinical Care Standard (Australian Commission on Safety and Quality in Health Care, 2024) across the health service, increasing resources for exercise and education-based interventions in the community health service for knee osteoarthritis. Concurrently, the health service implemented a DHR system upgrade, and a e-referral system to improve patient records management. The project was driven by an implementation working party of health service professionals and consumers to address the model of care improvements incrementally, according to deliberative democratic processes. A community stakeholder steering committee provided governance and guidance.

Participants

A purposive sample of participants was drawn from five pools: patients, GPs, physiotherapists, surgeons and registrars, and executives of the health service. Participants in the patient group were recruited by the research officer from the medical record system, identified in three groups: they had all attended the APP clinic, but one group (*n* = 3) was discharged to non-surgical interventions in the community and was not seen by a surgeon, one group (*n* = 3) attended both APP and surgeon clinics, and was recommended to use non-surgical interventions in the community and return in 12 months, and one group (*n* = 3) attended both clinics and was waitlisted for TKR surgery. Of 12 in the patient group screened for participation, nine consented to participate; of five GPs approached, four consented; of five physiotherapists approached, all consented; of five surgeons and registrars approached, four consented; of seven health executives approached to participate, four consented. Approach to patient participants was made by telephone, and approach to health professional participants was made by email. Those that did not respond are counted above. Formal written consent was given by all participants, and the project was approved by the jurisdictional research ethics committee (LRE.00185).

Focus groups of patient participants were held at the academics' university, at a venue with good access. Interviews with health professionals were at their place of work or online. All interviews and focus groups were recorded in Microsoft Teams for the purpose of transcription. The interview guide was framed on the questions above. It was reviewed by the project steering committee and consumer advocate. The questions commenced with an introduction, requesting the experience of each participant, their expectations and prompting for examples and clarification. Field notes were taken, and recordings listened to multiple times for revision of transcripts, for meaning, clarification and expression. Focus groups were 90 minutes. Interviews ranged from 20 minutes to one hour.

Thematic analysis

Transcription, coding and initial themes were conducted by the two academics. For at least one of each group, the recording and transcript was coded independently by two people. Then each participant group was thematically analysed collaboratively by two people according to the framework, and to derive the themes from pooling all five groups, three people worked collaboratively. Analysis software was not used.

Resulting thematic analysis of each participant group was sent back to each group member to confirm we had captured the key themes and accurately interpreted the quotes. On occasion, participants clarified the wording of a quote.

Results

Nine patient participants, four general practitioners, five physiotherapists, five orthopaedic surgeons or registrars, and four health executives participated (Table 15). Pseudonyms have been applied, and sex of participants has been masked for some participant groups to protect against identification.

Table 15. Characteristics of participants

Participant	Group	Sex	Age	Stage of patient journey
Wolfie	Patient	F	60–69	Seen by APP and discharged
Amber	Patient	F	70–79	Seen by APP and discharged
Ace	Patient	F	50–59	Seen by APP and discharged
Felishta	Patient	F	50–59	Seen by APP and surgeon, for review
Carla	Patient	F	60–69	Seen by APP and surgeon, for review
Taj	Patient	M	50–59	Seen by APP and surgeon, for review
Melissa	Patient	F	50–59	Seen by APP and surgeon, for TKR
K	Patient	F	60–69	Seen by APP and surgeon, for TKR
Emily	Patient	F	50–59	Seen by APP and surgeon, for TKR
Primary care	**Group**	**Sex**	**Age**	**Patient insurance**
Samson	GP	F	30–39	Mainly public
Nathan	GP	M	60–69	Mixed private and public
Suresh	GP	M	50–59	Mainly private
George	GP	F	50–59	All public
Physiotherapists	**Group**	**Sex**	**Age**	**Health Service Division**
PT1	Physio	F	–	Acute Hospital
PT2	Physio	M	–	Acute Hospital
PT3	Physio	F	–	Rehabilitation and Community Care
PT4	Physio	F	–	Rehabilitation and Community Care
PT5	Physio	F	–	Rehabilitation and Community Care
Surgeons and registrars		**Sex**	**Age**	**Patient insurance**
Elliot	Surgeon/registrar	*	30–39	All public
David	Surgeon/registrar	*	60–69	Mixed private and public
Henry	Surgeon/registrar	*	50–59	Mainly private
Jill	Surgeon/registrar	*	30–39	All public
One other	Surgeon/registrar	*	50–59	Mainly private

Health Executive	Group	Sex	Age	Health Service Division
Health Exec D	Health Exec	*	50–59	Allied Health
Health Exec C	Health Exec	*	50–59	Acute Hospital
Health Exec B	Health Exec	*	50–59	Rehabilitation and Community Care
Health Exec A	Health Exec	*	60–69	Surgery

Note: APP = advanced practice physiotherapist; F = female; GP = general practitioner; M = male; Physio = physiotherapist; TKR = total knee replacement.

Table 16. Derived themes from stakeholder groups, clustered according to the framework

Changes you have noticed	Elements of this theme	Quote
Improved experience for patients	Improved wait time to be seen in APP clinic	I'm going to say I was absolutely blown away, so I saw my GP and within a month of my GP referral I had a phone call from the hospital. I just about fainted. [K, patient] It has changed the last couple of years, and I'd like to be very positive about what's happened. It really works really well. [George, GP]
	Options available for non-surgical interventions	I thought the numbers would start to dwindle and decrease as we started to clear waitlists. It's done the opposite because of the success of this. And I think the public's increasing awareness of conservative management for OA knees in particular, I think. [Health Exec B]
	Patient confidence, self-efficacy growing	Was reading some reviews [of plasma injection interventions] and that's why I just went, you have to ask [Ace, patient]
Access to care has improved	Simpler access to allied health care pathways	I have noticed that physio assessments happening and that obviously fast tracks people to where they're supposed to be going [Nathan, GP]
	Community able to access GLA:D	There is a much clearer route to get people into GLA:D and try to reduce some of that kind of bottleneck effect so that patients are able to access that non-surgical avenue prior to being considered for surgery. [Health Exec C]
	APP clinic is now seeing most of the patients with knee osteoarthritis	we used to triage differently … made this decision to see all knee OAs in the clinic. I think that's probably contributed to the numbers changing [PT2, physio]
Systems improvements noticed	Reduced time to be seen in orthopaedic consultant clinics. Responsiveness	On the other spectrum, see people who are really severe and who may previously have needed to wait several years, maybe, to be seen by one of us, to be able to come to one of the surgeons and say, 'hey, this person's really bad. I think they need to be seen now'. And to get them to come into a clinic a lot sooner than they otherwise would have. [Elliot, surgeon] So he [APP] rang up and that was the Tuesday, and I saw the surgeon on Thursday. [Carla, patient]
	Communication pathways across CHS divisions	Getting an appreciation and understanding of how our service fits into the bigger picture and how it is viewed and appreciated by our stakeholders or our clients or patients as well [Health Exec C]

	HealthLink referral system online improves accountability	Because earlier, we sent a fax, had to fax something. And when they don't hear, invariably, when they don't hear, then the patient rings the orthopaedic, or whichever department and they say the doctor has sent a referral and I haven't heard anything. [Suresh, GP]
	APP have access to surgeons to review cases, learn, increase skills	I meet with them regularly to review cases which they're not quite sure which way to go, and so we clarify all doubt, but it's working really well. [David, surgeon]

Working well	**Elements of this theme**	**Quote**
Working well for patients	Better outcomes for patients	if you go to have a knee replacement or hip replacement or something you need to have good, conditioned muscles attached to the joint as well. So, if you're going to lose weight and do exercise, you might do it now, rather than after you've had the operation. It's probably getting in before the horse bolts [Nathan, GP]
	Empowering patients to take care of themselves	I take on board what the physios say, I do my exercises and basically as I said, you know, I'm managing what is wrong with my body. [K, patient, Wait 3]
	Access to better care pathways	I'd like to say something about the Canberra medical system. We're lucky we live here because it's a fantastic system. It's overloaded, they all are. [Taj, patient] from the Australian Commission on Safety and Quality, the OA knee Clinical Care Standards, so we've developed a group of clinicians working on that, that is multidisciplinary. And really made up of physios and dieticians, just in line with what the standards are recommending around nutrition and exercise and conservative management [Health Exec B]
	Timing of surgery and TKR at the right time	They recommended that I delay. Get back into the exercise and the Panadol Osteo [Taj, patient] I've always been surprised at the number of patients that have been referred for surgery and yet don't want it. [PT3, physio]
APP clinic is providing an excellent service	APP clinic enables physios to escalate patient care when required	So he [APP] rang up and that was the Tuesday and saw the surgeon on Thursday. [Carla, patient]

		Another patient may be really struggling and you can get them in front of a surgeon really quickly … I'm very happy about that process to me is working a lot better than. [PT2, physio]
	APP capability is seen in thorough and complete examinations	He actually made me walk up and down and he make me take my shoes off. He's done the whole thing. [Ace, patient] It's an expert physio. It's an excellent opinion that you usually get from that physio and they can also start the investigation trail if needed. [George, GP]
	Increased confidence in the APPs to provide health care decisions	It's like having a sieve, almost, so we get all of these referrals in and some people will benefit from seeing us in clinic and some people won't benefit from seeing us in clinic. So having someone who's quite experienced but has a specific role of identifying which, like group, these people fit in and having an early discussion with them before they see us, is helpful. [Elliot, surgeon] It's kind of really very nice positive affirmation in terms of the impact of the actual orthopaedic screen service and what they can deliver for that patient cohort. [Health Exec C] That professional recognition, of certainly the medical, world that physio can do that work. [Health Exec B]
	Recognition of level of expertise of APP	They're not interested in the tag. They've met the specialist at the hospital [George, GP] The feedback we've had is that the physios are actually doing a good job in identifying which patients can proceed along a conservative route of management for the time being or referred to GLA:D. They're pretty good at identifying those patients who really need to be seen by a surgeon. [Health Exec C]
	Collaborations between surgeons and APPs is enabling better care, and professional development	There is a better communication with the surgeons, dropping into the clinics to talk to them about cases, potentially. [PT2, physio]
Community care	GLA:D is proving successful	What I like about the GLA:D for everything you do, it's a group, a small group. It's not 25, but it was I think only about 10 people. They were going to look after you one by one. [Ace, patient]

		I swim laps, I do GLA:D twice a week. But now I do a full-on GLA:D. I do 60 reps of each one, so I really push it hard. [Taj, patient] We started out with a group (GLA:D) a week. We're now at 12 groups a week. [Health Exec B]
	Better access to community care from systems improvements	We can direct them, have a more of a conversation around where they could be going, going now, to manage in terms of talking about what's available in the community. [PT2, physio] A physio will probably say you need exercises and different things, like weight loss, and they're all the extra things that go with it. [Nathan, GP]
Better Information management and records systems	Access to better data for decision-making	We have a much better idea about a lot of the data. Mine at the start was around understanding what all those hidden wait times were. [Health Exec C]
	No more lost patients	And I think there's a greater appreciation and greater collaboration and working to ensure that those you know no patients are falling through the gaps. [Health Exec C] Hopefully for the patient you know the process coming through the system is more efficient. [Health Exec C]
Experience of surgical clinics has improved	Surgeons feel they are seeing more appropriate patients	So that process has enormously improved the efficiency of patient allocation. So the patients that you're now seeing are seeing a greater proportion of people that are more appropriate to be seen in a surgical clinic, in that they are people who are more than likely going to require surgery. [David, surgeon] Improving the efficiency of the consultant's time by only discussing or escalating or putting forward those patients or with those referrals, the people who actually really need to see a surgeon, who then are likely to convert to surgery. [Health Exec C] They already started physiotherapy. They have already been spoken to about weight loss. Already been referred to an obesity management service. [Jill, surgeon]

	Patients have already been educated	The physio-led screening clinic that we have now has made seeing those patients in the consultant clinic a lot easier. Most of the education has been done already. They come to see us and I think they are already expecting to hear that they need that knee replacement done. We just talk about the operation, and it saves time in the consultant clinic. [Jill, surgeon]
	Improved efficiency in clinics	The clinics, certainly in my particular area, are very efficient, in that the allocation and triaging of patients coming into clinics is appropriate. So you're not wasting any clinic time. [David, surgeon] People who are appropriate to be seen in a surgical clinic, in that they are people who are more than likely going to require surgery. [Health Exec A]
Communication	Communication between hospital and GPs has enabled more accurate referrals	The online referral system seems to work. Gives you ammunition too. Not for orthopaedics, but for any other clinic. You look 3 months later, the patient hasn't heard anything. So well, here it is, 25th of February, it said here it was accepted. [Nathan, GP]

Needs improving now	Elements of this theme	Quotes
Education needs improving, patients and public	Public education campaign on OA management	And over those years, I have been told Panadol Osteo is all I really need for the pain and I don't need a specialist. [Wolfie, patient] So that the patients understand as well. They can go and have a very informed conversation with their own GP. To say look … from this evidence that I've seen … maybe the approach that we need to take from my knee condition is this. [Health Exec D]
Funding for non-surgical pathways	Medicare funding for patients to access allied health services	The problem is when we as a GP, refer to GLA:D program and privately, most of my patients who are quite elderly and geriatric, although they do the CAP [Medicare Enhanced Care] plan they get only five visits to the physiotherapy free. [Suresh, GP] Invariably they have something else, a podiatry need or something else and they don't have many appointments with the physio. [Suresh, GP]
Pathways of care	Access to non-surgical care should be located in the community	If we're serious about care, closer to home, wrap-around care, patient-centred care, then patients shouldn't have to be going on to a hospital campus for this. [Health Exec B]
	More access to allied health in community	Hydrotherapy worked and I'd love to do it all the time. But it's 6 weeks is all you have. No, it's 4 weeks. [Carla, patient]
	– For vulnerable people without Medicare	Well, there are some services that will only look after you if you've got a healthcare card. They [vulnerable groups without access to health care cards, e.g. asylum seekers with Medicare] cannot access community health, for example … [George, GP]
	– For different cultural groups	I do have a curiosity around delivery of GLA:D and resources for people who don't speak English. In my experience delivering the program, which is a good year ago now, that [posters in other languages] would have been helpful. [PT5, physio] I think the GLA:D program is a good idea, but I also think it's not fit for the purposes for some of our groups. [George, GP]
	Inconsistency in who is appropriate for surgery	X-rays that show grade 3, grade 4 and OKS somewhere under 15, means you've got a patient who will most certainly benefit from having a knee replacement. Then of course, there's a grey area. [Jill, surgeon]

	Patients needing long-term pain management, need prescriptions for a longer period held by a pharmacist	You know Melissa's comments about having to go back in and get her whatever medications every month because of the type of medications they are. Why that particular type of script couldn't be issued with 'this script is valid for 12 months'. [K, patient]
Delays in intervention	Deterioration, additional morbidities, loss of agency	Exhaustion of living with chronic pain Melissa, multiple comorbidities each time I have a joint replacement … [K, patient] Cause now I keep falling on my knees, my knees have gotten even worse. [Wolfie, patient] Because of my hip surgery and I'm on my own, my health in the last three years has deteriorated. [Emily, patient]
Health service systems that need improving; private hospital provides poor experience for patients in EJRP	Private hospital provides poor experience for patients in EJRP	I think it'll be the same thing because I'm a public patient. I think they're going to make me wait until there's nothing urgent coming through, because that's how I felt I was treated in hospital as well because I am a public patient, it was a little bit different to if I was a private patient. [Emily, patient] I've just come back from rehab today, and the pain from my knees and the way I have been left to my own devices with my pain management with my knee, is a lot different to what I found with my hip replacement surgery. [Melissa, patient]
Workforce development and training	Need to be able to train up more APPs	I guess if we could train more [APPs]. [Jill, surgeon] Any time we bring on advanced practice physiotherapists, they are usually on a pathway that takes up to two years to complete. [Health Exec C]
	Health professionals need training on the OA clinical standards	Ongoing education across all sectors of health to increase knowledge about best practice and non-operative pathways. [Health Exec B] Our use of language to not use catastrophising language. Bone on bone; collapsing. It's all there. Language I think is big [Health Exec B]
	Workforce development	Diagnosing on clinical presentation is really, really important, I think. [Health Exec B]

		I think there's a lot of education that still needs to take place across the health sector and across the public sector, in the sense of patients and the public know about the knowledge and skill sets that physios in this case have got. [Health Exec B]
Staff conditions	Junior doctors have poor work conditions	I think there's a whole lot that can be done to improve the entire experience of all of the junior doctors within medicine and the orthopaedic department, which I think then would go on to improve the clinic. [Elliot, surgeon]
	Management of clinics with 60–65 patients is bad for patients and staff	The only criticism I have is with the clinics was waiting in there. You're sat on the on the end of the bed. And there was a curtain either side of you and it was uncomfortable and cold. And you're supposed to sit there for, I don't know how many hours. [Carla, patient] I think we'll always be understaffed in the public health sector but having more staff. Because some of these clinics have 12 people and some of them have 60 or 65 people. And that's not a reasonable number of patients to see in the time span we have. It's not a reasonable amount of pressure to put on this staff there, the nurses and the doctors, and it's not reasonable to expect patients to wait for two or three or four hours to be seen at an elective clinic to see a surgeon. Because the nitty gritty of it is, sure they need a service that we're here to provide, and it's a niche service, and they can only really get it here if they want to be managed publicly. But it gives them no options than to wait for four hours and that can be so frustrating, especially when they're elderly and frail and have other comorbidities. [Elliot, surgeon]
Information and patient management systems more improvement needed	Central intake system is problematic	It's really hard. To follow up [on a referral] or to ask a question, you have to go through the Central Health Intake. And unless you have an hour of free time to just sit on the phone, you never get anywhere. [Samson, GP]
	HealthLink is unreliable/unstable	It might be several weeks before you hear anything, even that it's been accepted and they've got a date sometime in the future. But you have an appointment. [Samson, GP] Or occasionally at our end, we find HealthLink doesn't always load the data properly, but that's something that's to do with HealthLink, not the system. I'm just waiting for the day when it won't load anything in there and this won't process in. [Nathan, GP]

	It is impossible to follow up lost referrals	The specialist rang and said to me, 'You have sent the same referral three times'. So every time (the nurses are receptionist over there), they say 'we haven't received it'. But when the patient turned up, they set out the set of three referrals, the same thing three times. [Suresh, GP]
Communication needs improving	Patients need to know where they are on surgical waiting lists	Well, here we are, June. Not one phone call. I tend to think if I was to ring now and say 'Where am I on the list for the for my knee replacement?' [Emily, patient] We have had people who have rung the waiting list people every 6 months just to make sure they're still on the list and they haven't vanished. They say 'hello, it's me. Am I still on the list?' [Samson, GP] They have our mobile numbers, even a simple text message coming through would at least mean knowing that they hadn't lost you. [Melissa, patient Wait 3]
	GPs would like to be able to speak with community allied health	There's no listed fax numbers and there's no direct line for GPs and there's no way to contact them or ask questions or be like, 'Is this suitable? Is there something you can do whatever' [Samson, GP]
	We need better coordination between specialist clinics	The orthopaedic surgeons could have referred him straight to the to the cardiac clinic, so that would have accelerated the process. [Suresh, GP]
Model of care		
Imperative to expand current APP orthopaedics model from knees to other conditions	Currently there is lack of equity between conditions in same clinic	it feels like this group is getting some preferential treatment in terms of access, and to be able to replicate that similar kind of model to different cohorts, universally [Health Exec C] Waiting time for a Category 3 foot patient is 1,400–1,500 days. There's no movement on that list whatsoever, and it is similar for upper limb patients. [PT2, physio] This model is a template for how the other areas could be managed, with the screening by health professionals – although there is an issue that we don't have a GLA:D for shoulders, or feet. So, there is no clear pathway for evidence-based conservative management. [Henry, surgeon]

	Get the wait times for other conditions under control	The extended scope physiotherapy group have been really good in getting all of our metrics, in knee particularly, but also in hip, under control. So, the same model would definitely work for foot and ankle, it just needs that little element of having a non-surgical pathway I think. [Health Exec A]
Expand the APP model of care to other clinics across CHS	Imperative to expand model to other specialist clinics	I think it would really work. I think the neurosurgeons should do it. And I think they [APPs] should deal with the people with back pain. [George, GP] I assume get the patient in early, do a bit of an assessment, then send them off to one of the clinics they need to go to – sleep clinic, respiratory or COPD [chronic obstructive pulmonary disease] or something like that so. [Nathan, GP] They might wait for years on the neurosurgery list. I don't even want to put them on the neurosurgery [list] because the neurosurgeons aren't going to do anything. What they need is somebody like the OA person for the knees who just listens to them, and then says, 'oh, that MRI of your back' (they've often got one that's got some issue), and they'll say, 'well, that – lots of people have got that'. [George, GP]
	Expand model from APP to other health professionals	We could apply the way that project unfolded into, whether it's ENT [ear, nose and throat] and speech pathology; and ENT and audiology. [Health Exec D] They need a nurse that does endoscopes. I'm sure a nurse practitioner could do that. It's really tying up the work of the specialists having to do that. [George, GP]
A good model of care is patient-centred	Patients want to be empowered in decision-making	[My knee] wasn't a real problem, but my doctor had referred me to it, because she's a bit like that. Just very proactive; we shouldn't complain. [Amber, patient] I think that that little bit of knowledge so that you could really prepare yourself, you know, the doctor's saying 9 months, but it's actually going to be 18 or that sort of thing, because I had to organise three children in a five-week window, and that was from the time I was having surgery. [Emily, patient]
	Patient education on management options, treatment, surgery and post-op care	What happens next? Or what's supposed to happen next? I'll just keep living with painkillers for another for 10 years. [Ace, patient]

	Make prehabilitation available	if you're coming up six weeks and then everything's put in place for that six weeks before you go to all these other things. So you're at your optimum. [Carla, patient] Actually working towards the operation, that's a positive. [Nathan, GP]
	Treatment, right place, right time	So if we're really serious about targeting surgical weight, reducing costs, making care accessible closer to home, patient-centred, then we really have to invest in that. [Health Exec B] The project is really being able to identify that patients are engaging with the health service at the appropriate times for the appropriate care that they need at that point of time. [Health Exec C]
	Look after our most vulnerable	He was an 88-year-old gent. He did have private health fund. But because he couldn't afford the extras, he needs to be referred to the public system. So when I had to refer to him to the public system, he went to the bottom of the list. [2 years ago, Private RFA onto public list] [Suresh, GP] There have been a few [patients] that I have at Interchange, where they've been told by the by the surgeon: 'Yes you would benefit from that but you're not stable enough because of XYZ and there's things that need to be fixed first before'. [Samson, GP]
	Patients seek expert opinion, not necessarily a surgical opinion	They [APPs] really take the load off the clinics, which actually does make you wonder how many of these referrals actually do need to see orthopaedic surgeons [Jill, surgeon] I don't think they need to see specialists most of the time. [George, GP]
Noted tension in 'referral to any surgeon, vs referral to a named surgeon'	Patients should not be referred to a named surgeon	No, I typically say dear, dear doctor, as a generic dear doctor. And so I just leave it as that, the title it 'to the orthopaedic outpatients' or 'TCH orthopaedics'. Choosing a surgeon is pretty luxurious. [Samson, GP]
	Patients should be able to see the same surgeon if they have a history of surgery from that surgeon	So, when I went and saw my GP, knowing the history and knowing the plan that [surgeon] and I had in place. [Melissa, patient]
	Surgeons want to operate on 'their own' patients. They do not	One of the issues with pooling is that surgeons don't want to operate on someone they haven't seen/met. Surgeons have different tolerances for who is appropriate for surgery. [Henry, surgeon]

	want an ‘open’ referral system	

Barriers		
Lack of education – for patients	Belief in TKR as inevitable	We've ingrained within people that they need imaging that they need to see a doctor. They need to go and get a new knee, and that's going to take, I would suggest, probably years to claw back. [Health Exec B] But they said to me, 'you need a knee replacement. There's not much they can do for you.' [Ace, patient]
	Self-management education is needed	I wanted someone to tell me what or how I will be dealing with the pain you know. [Ace, patient]
Lack of education – for health professionals	GPs' awareness of community allied health services, i.e. GLA:D	Is the GLA:D program on Health Pathways? [Samson, GP] I know we've had lots of conversations. But I think there's still more infiltration of information that we need to do. [Health Exec D] No, I wasn't aware of that [GLA:D in the Community Health Centres]. [Suresh, GP]
	Health professional training in trauma-informed care and impacts of poverty	There's a condition among one of my patient groups which translates to 'travelling pain'. It's a particular kind of traumatic pain that goes all through your body. If they turn up at an orthopaedic clinic … with that issue [travelling pain], then whatever is might be an underlying substantive actual issue will be dismissed because the way the pain is described doesn't make any anatomical sense. [George, GP] It was just bizarre. This kind of disconnect. And he's like 'Oh, no, no. I know it's going to be several months. So, you really need to just go privately.' People just don't all have that money saved up, which is not good at all. But it was just odd, kind of like, they hadn't really been in a situation where they had to think about like how it would affect patient health care. [Samson, GP]
	Health professionals need to be taught how to talk about OA	I went to physiotherapy numerous times. And they never would tell me I had arthritis. I would have got the physiotherapist to apply the treatment for an old man with arthritis. [Taj, patient] From my work on the OA knee Clinical Care Standard, that was my biggest bit of feedback. We've got the clinical stuff right on track, but the language! And I would argue that this goes across all conditions we're still talking about. [Health Exec B]

It is very complicated to access community care allied health services	My Aged Care application is an access barrier to community allied health and GLA:D	Seems quite funny to have that as a requirement, but I don't know, just, 65 doesn't seem that old. [Samson, GP]
	Community physio is inaccessible to working people because business hours only	I couldn't do it. I started emailing them and say 'yeah, unfortunately these are the only times we got' and I was even saying, I don't mind if you send me the exercise on the paper. I can scan print one, not do it my home, tell you how I'm going, how I'm progressing. If I'm having issue. But I had to be in there. [Ace, patient]
Service planning is difficult	Fragmentation across divisions is a barrier to coordinated planning	It's a tricky one, isn't it? Because you're trying to touch so many parts of the health system. [Health Exec D] I don't know what more we can do to try and get a seat at the table. [Health Exec B]
	Access to good data	Data reporting is still not the easiest thing out of DHR to do. Even getting fairly basic activity data. [Health Exec C]
We must optimise the distribution of resources	Provision of services vs reasonable wait time vs equity: tension point	As a service provider, when you've got limited resources, sometimes if you open the door in one area, then you're wondering if we're opening the floodgate. And then, can you actually manage and cope with that? [Health Exec C]
	Lack of resourcing for APPs and their training; cannot meet need	But to be able to expand service provision, we basically need [APP] FTE. [Health Exec C} Any time we bring on advanced practice physiotherapists, they are usually on a pathway that takes up to two years to complete. So, there's an investment in those people [Health Exec C]
	Limited resources in the community health sector	if I could scream community in bold letters and as big as I could and every time I'm in a forum where it's hospital centric, of lifting this banner. [Health Exec B] We've had no (bar this GLA:D funding), we've had no growth funding since pre 2012. [Health Exec B]
	Obesity management clinic cannot meet demand	There's not really a service set up for people between [BMI] 30 to 40 to help them manage their weight. [PT2, physio]

	Demand will always outstrip supply	But we all know that's not really possible just because there's not enough surgeons or theatres, and anaesthetists and everything in the world to do that, so. Yeah. [Samson, GP]
Enablers to this model of care?		
Patients are highly motivated to self-manage	Patients have a powerful sense of independence	I am managing myself. [K, patient, Wait 3] I fix my own stuff. (Wolfie, patient)
	Patients like to decide on non-surgical or surgical pathways	I normally found that my pain goes away if I put my knees up. Or if I have a hot shower. Or if it's really bad, I just put an ice pack and it goes away, but that's how I'm dealing with it. So, I think I'm too young to have surgery. Like, no way. [Ace, patient] I usually leave the door open for them to contact us without needing a new referral. [PT1, physio]
Online education provisions	Online would make information on services accessible	Just go online and do your exercises in front of the camera. [Wolfie, patient]
	Online programs appreciated by patients	And I started looking at YouTube and I could see what the next exercise was coming up was going to be, so I stopped going, right, because I knew. And so I just use YouTube now. [Taj, patient] You know, even phones. People seek help on their phone, don't they? [Health Exec D]
APPs are accepted as experts	Enabling development of new models of care	He was really good. He was thorough. [Carla, patient] He was excellent. That was, that was a really good session. [Taj, patient]
	Enabling development of health professionals at top of scope	Find people that are interested in that [Master] course, to really develop those advanced skills. Particularly around primary contact practitioners; so that they are a go-to provider for people with these kinds of conditions. [Health Exec B] I think historically the GPs have been the go-to person and the GPs do the best that they can, but it's not their field of expertise. It is a physio. [Health Exec B]

Sustainability of model of care	Needs evidence to support MoC	From my perspective, the project is really validating what we are doing is actually impactful and is making a positive impact in improving that patient's journey in terms of timeliness and flow. [Health Exec C] Using the Oxford Knee Score, particularly for the ones that come back a second time or they've come back … for review or they've been re-referred and we can do the Oxford and it's been done before, that's a really good way of tracking how they are going. [PT1, physio] It's an ongoing cost for the organisation [data collection], but it's arguably an absolute drop in the ocean to what they're saving in the grand scheme of things with this. [Health Exec B]
	Opportunity to influence system redesign: planned care redesign happening	We know that the pathways of care are GP to specialist. And really, we've got to intersect there and do something different where it goes from GP to a community provider. And look, that will just make a huge difference. [Health Exec D]
Documenting and sharing the study methods, to enable roll out of this MoC elsewhere	Positive and sound methodology	The approach that we took was a really positive and sound approach. The approach is a very sound one and we probably at some point need to document how we did it. [Health Exec D] Well, it's the right way to do it, and it's the consensus building is something which does change practice. [David, surgeon]

Notes: APP = advanced practice physiotherapist; BMI = body mass index; FTE = full-time equivalent; GP = general practitioner; GLA:D = Good Living with osteoArthritis: Denmark, an exercise and education program for hip and knee osteoarthritis; MoC = model of care; OA = osteoarthritis; OKS = Oxford Knee Score; TKR = total knee replacement.

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Key themes

There is now an imperative to expand this model to other conditions in orthopaedics and to other clinics (Table 16). The project demonstrated that patients' experience is much improved with this model of APP clinics. There are much shorter waiting times to clinical consultation since implementation of the APP clinics. Universally, stakeholders have been happily surprised. Indeed, there is now an inequity for those patients with knee osteoarthritis having this accelerated progress to care, while patients with other conditions are not progressing along clinical pathways but are stalled. This has put pressure on the imperative to roll out this model of care to patients with other conditions in orthopaedics and to other clinics across the health services.

To expand the APP clinics for patients with all orthopaedic conditions, the barriers to increasing the APP pathway are the availability of suitably trained APPs, surgeons and non-surgical pathways. For people with knee osteoarthritis, the health service has a clinical care standard and provides a structured exercise and education program (GLA:D) (Ackerman et al., 2020; Barton et al., 2021) in the community health service, however, no program is yet available in the local health service for those with chronic shoulder pain. Elsewhere there are shoulder programs available (Fernández-de-las-Peñas & Lewis, 2022; Powell et al., 2024) and podiatric intervention for foot problems (notably, hallux valgus) (Hurn et al., 2022). However, locally the community health service is at capacity, is under-resourced and has difficulty recruiting podiatrists. There are also insufficient community services for people with obesity, as demand outstrips resourcing.

> *It feels like this group is getting some preferential treatment in terms of access, and to be able to replicate that similar kind of model to different cohorts universally (Health Exec C)*

> *Waiting time for a Category 3 foot patient is 1,400–1,500 days. There's no movement on that list whatsoever, and it is similar for upper limb patients. (PT2, physio)*

> *This model is a template for how the other areas could be managed, with the screening by health professionals – although there is an issue that we don't have a GLA:D for shoulders, or feet. So, there is no clear pathway for evidence-based conservative management. (Henry, surgeon)*

Expanding this model to other specialist clinics in the health service with long wait times is also recommended by participants, including GPs and health executives. Clinics suggested where the model could be used included neurosurgery, sleep clinics, respiratory clinics, ear-nose-and-throat clinics where audiology and speech pathology are needed, and gastroenterology clinics where dietitians are needed, and an advanced practitioner for conducting endoscopy.

APPs are highly regarded and are providing an excellent, expert and efficient service. Patients, GPs, surgeons and the health executive agree that the level of expertise provided by the APPs is exceptional. Barriers to increasing this service are training or recruiting sufficient APPs in this region and resourcing the service. There was no pushback in any of the interviews

or focus groups, that patients ‘just want to see a surgeon’. (It was predicted in the first round of interviews that this would be the case ‘some people just need to hear it from a surgeon’ but it was not demonstrated here).

Systems improvements have been recognised in referral systems, and patient management systems, but there are some systems that still require attention. Health systems implemented concurrently with this project include the HealthLink e-referral system and the DHR. Both have improved patient management and resulted in less issues of referrals being lost. Patients waiting on lists for prolonged periods need to be reassured they have not been lost in the system. A phone text would be sufficient reassurance. The Central Intake System for referrals to the health system is impersonal and convoluted, and GPs would like to be able to telephone a health professional directly for advice and consultation on cases on occasion. GPs encountered barriers to non-surgical management for their patients with osteoarthritis. Barriers included a lack of awareness of community facilities, or difficulty accessing them due to systems and funding barriers. Access to community health services for patients over the age of 65 requires a My Aged Care application. This application is burdensome and appears unnecessary to GPs. Some general practices have nurses expert in the applications to help. ‘We’re lucky that we have a very on the ball nurse, but also a social worker, on our staff as part of our clinic so. So that’s really helpful’ (Samson, GP).

Patients are experiencing better agency and self-determination. Patients and physiotherapists are reporting that they feel supported in self-management and provided with resources to self-manage. The availability of community health programs for osteoarthritis is applauded. The programs are successful, and stakeholders would support expanding them, particularly to outside business hours. Patients and health executives recognise there are gaps in education for patients, particularly in living with osteoarthritis and pain management, yet to be met. There are educational gaps for health professionals also, in confidence to talk about osteoarthritis in a strengths-based, active participation context and avoiding catastrophic language. ‘Our use of language, to not use catastrophising language. Bone on bone; collapsing. It’s all there. Language I think is big’ (Health Exec B). A good model of care is patient-centred, in which patients have access to an expert opinion and can make decisions on their pathways.

There is a difference in expectations between patients, GPs and surgeons on indications for referral to the orthopaedic clinic. Patients are attending for an expert opinion, not necessarily because they want joint replacement surgery. They seek education, expertise and advice. Likewise, GPs are seeking expert advice. Surgeons, however, expect that patients attending the orthopaedic clinic are ready for joint replacement surgery. Surgeons are frustrated if non-surgical care has not been exhausted, particularly self-management tools like exercise and weight loss. Surgeons are very happy that the APP clinics are providing patient education, screening and selection of patients ready for surgery, and that they do this with commendable accuracy, saving surgical clinic time. Patients are also very happy to receive expert consultation from an APP.

There was a tension between improving health systems by having no named surgeon on the referral, and having patients referred to a specific surgeon. This reflects the complexity of the Australian health system with parallel private and public insurance. Expectations of seeing a named surgeon can apply to both systems for some patients and GPs, but some are not

expecting to have a nominated surgeon. Surgeons are reluctant to have no name on referrals as they do not want to operate on a patient they haven't 'seen' themselves. This is part of accepting duty of care. Once a surgeon 'sees' a patient, they accept duty of care. This is evident also as we see waiting lists prior to the surgical clinic are a low priority for surgeons, and there is reluctance to operate on patients assessed by a different surgeon. The challenge for the surgeon is that with current wait times for surgery, they may be operating on a patient seen by a registrar, 3 years ago.

The sustainability of this model of care will be supported by strong evidence, strong commitment by the health executive and a public education campaign that self-management is possible. Data are essential to support the ongoing resourcing of APP clinics. Systems advancements have made good improvements in patient records management, and this has disclosed wait times clearly.

There is a lot of granular detail in the hours of interview recordings, and this detail provides a list of 'quick wins' or suggestions for improvements that could be simply implemented. Some of these quick wins include developing a community health education program, including pharmacist, dietician and physiotherapist education on osteoarthritis and pain management; using the DHR system to text patients of their waiting list position and to establish ongoing reporting of wait times (Table 17).

Table 17. Quick wins identified from stakeholder interviews and focus groups

Avenue to address	Activity
Education	Patient and public education campaign on OA management Patient education on pain management Empower patients in clinical decision-making Develop health professional education on how to talk about osteoarthritis and how to manage it as a chronic condition
Access for most vulnerable	GLA:D program for specific cultural groups, run by people from those communities Identify and prioritise the most vulnerable patients, those with no other option than public care, and those with rapidly deteriorating conditions, or complex comorbid conditions
Establish consistent indications for surgery	Consistent and mandatory use of the Oxford Knee Score or other measures
Communication	Enable tracking of referrals through digital record system Enable notification to patients via text of progress of their referral Provide a telephone number for GPs to contact community allied health services
Clinic booking management	Review bookings in clinics to ensure balanced numbers of patients for manageable clinics
Improve experience of public patients in private hospital	Provide feedback to the private hospital contracted to provide the public total joint replacement program, about the problems in care

Access to data to support the sustainability of the model of care	Use the DHR reporting system to report regularly on waiting times in specialist clinics

Note: DHR = Digital Health Record; GLA:D = Good Living with osteoArthritis: Denmark, an exercise and education program for hip and knee osteoarthritis; GP = general practitioner; OA =osteoarthritis.

Discussion

This study aimed to follow up on the responses of stakeholders to the increased implementation of APP clinics in the orthopaedic surgery service. Overall, we found participants reported improved patient-centred care, wait times and systems. A methodology of stakeholder engagement through the process was attributed to its success. Successful management of wait times by resourcing APP clinics has enabled GPs to refer the 'right patient at the right time'. GPs had in the past listed patients for orthopaedic consultation 'to join the queue', knowing it could be three or four years before the patient was seen, and not because they needed a surgical consultation imminently. Confidence in the orthopaedic clinics for patients with knee osteoarthritis has improved. Patients have a stronger sense of agency and motivation to self-management provided with the advice and education they need.

APP consultation was highly regarded by patients, GPs, surgeons and the health executive. The expertise of the physiotherapists and the thoroughness of their examination, advice, patient education and communication were excellent. For many GPs and patients, this was the consultation that the patient needed, and they did not need to see a surgeon for this. In Victoria the 'Motion' study found mixed reviews, where communication and strong therapeutic alliance were associated with acceptability of advanced physiotherapy consultation, but some patients felt future pathways were not clear for them, and continued to feel surgery was inevitable (Gibbs et al., 2025). Earlier evaluations of advanced physiotherapists in the UK and Ireland have found high acceptability by patients and GPs (Desmeules et al., 2013; Kennedy et al., 2010; Saxon et al., 2014). Recent systematic reviews have likewise found strong support for advanced clinical practitioner roles (Evans et al., 2021; Lafrance et al., 2023; Vedanayagam et al., 2021).

We found there were barriers to GPs referring patients to non-surgical and allied health management of osteoarthritis. This agrees with findings from Victoria (Gibbs et al., 2024), where GPs recognised exercise was important in the management of hip and knee osteoarthritis, but several GPs lacked knowledge of what physiotherapy-led services, including advanced practice services, were available. GPs also reported challenges in managing perceived patient misconceptions (e.g. surgery is the only option; exercise won't help) and funding barriers (Gibbs et al., 2024). Where this qualitative research reported lack of patient motivation to attend physiotherapy, our interviews found patients to be highly motivated to exercise and self-manage. There was still a perception of a TKR being inevitable, even if not needed immediately. This embedded belief is seen elsewhere: Barton et al. (2024) found 62% of patients living with knee osteoarthritis were willing to have a TKR imminently. Qualitative research consistently demonstrates patients hold beliefs of knee osteoarthritis as mechanical wear and tear and uncurable. They have an ambivalence towards medication – 'I need it but I know it is not treating the condition, and it's ultimately bad for me', and likewise ambivalence to surgery, 'I don't want it but I feel it is inevitable' (Darlow et al., 2018). There is cautious optimism about surgery from patients and clinicians (Nissen et al., 2022) but less about exercise interventions

being sufficient to change the deterioration of osteoarthritis, seen in scoping review evidence (Bunzli et al., 2023; Wallis et al., 2019). But there is emerging evidence that knowledge belief and behaviours can be impacted by education at systematic review level of evidence, and encouragement to train health professionals to be able to deliver this (Simick Behera et al., 2024).

Limitations

This is a small qualitative research study with small groups of participants in each group. As a result, data saturation could not be assured, though there is substantial triangulation between the groups of participants that supports validation of some of the experiences. The interviewers were physiotherapists and so there may have been less criticism of physiotherapists than if the interviewers were not health professionals. Being face to face and online, interviews and focus groups may have resulted in less criticism of the health service than might be recorded by an anonymous survey. This project had extensive stakeholder engagement throughout, which makes it vulnerable to the Hawthorne effect (Sedgwick & Greenwood, 2015). The generalisability of results from research to clinical practice is limited by the behaviour of research participants being influenced by observation and measurement. This is however a knowledge translation project, and it is the extensive stakeholder engagement that has purposefully facilitated translation of evidence into practice in this case.

Conclusions

The APP clinics have been well received by the patients and health professional stakeholders. There is now an imperative to expand this model of care to patients with other orthopaedic conditions and to other specialist clinics across the health service. However, there are barriers in recruiting or training sufficient APPs and in resourcing those clinics. For knee osteoarthritis, we found a strong community health service program of allied health care was available as a non-surgical pathway, and such programs are not available for other conditions with long waiting times, particularly shoulder and feet problems in orthopaedics. Community health services will need resourcing if they are to meet demand, particularly in podiatry and dietetics, where it is currently not possible to meet demand. There are some quick wins possible in using the DHR to send notifications to patients of the progress of their referral, and in tracking referrals. There is a widespread request for education in self-management for patients, particularly in pain management. This study is limited to small groups of stakeholders in the local community and may not reflect the experience of all those using this service. Furthermore, the context of interviews and focus groups may have led to more positive reports than an anonymised approach would have. However, there is strong support for expansion of the APP clinics and the health service is encouraged to explore this promptly.

Recommendations

- ✓ Expand the service to other conditions in orthopaedics
- ✓ Expand the service to other specialist clinics
- ✓ Use the DHRs system to notify patients of the progress of their referral

  Develop a patient education program, particularly about pain management, but also generally about managing osteoarthritis.

Paper 4: Costs to patients of living with knee osteoarthritis

Paper 4: Costs to patients of living with knee osteoarthritis

Summary

The costs incurred by patients living with knee osteoarthritis were last recorded in 1995 in Australia; meanwhile, health systems costs and the demand for TKR has been rising. We aimed to describe the out-of-pocket costs for patients living with knee osteoarthritis. Sixteen participants recorded their direct and indirect health costs using the Costs to Patients in Quebec (CoPaQ) tool over a 6-month period following referral by their GP to orthopaedic consultants at a tertiary hospital. Costs and quality of life were compared to financial stress reported by participants. All costs are reported in AUD. Total costs ranged from $5,329 to $83 in 6 months (median $1,355, mean $1,824, standard deviation 1,421). Total costs per day ranged from $16.09 to $0.45 (median $7.42 per day, mean $7.98 per day, SD 4.63). Total costs comprised direct costs (median $921), and indirect costs (median $233) over 6 months. There were no relationships confirmed between financial stress, and income, costs or quality of life metrics. This study is limited by small sample size but given the absence of more recent data, this information provides cost estimates for subsequent economic modelling.

Background

The demand for TKR in Australia is growing, and public and private health insurers alike are worried. The National Joint Registry (Lewis et al., 2024) shows growth in demand for primary TKR increased by 20.7% from 2022 to 2023, to 78,125 TKR, of which 88% were primary TKR. The registry shows that less than 25% of TKRs are performed in the public sector. Cost projections for TKR published in 2019 (Ackerman et al., 2019) estimated 276% growth in TKR by 2030 and estimated a cost of $1.38 billion if the rate of TKR is constant and $3.40 billion if the rate of TKR continues to grow. The most recent registry data indicate Ackerman et al.'s projections may have been conservative. There is plenty of stimulus to consider first-line interventions for TKR such as weight loss and exercise, which are known to be effective (Australian Commission on Safety and Quality in Health Care, 2024; RACGP, 2018).

Avoiding TKR by using first-line interventions shows mixed reports over the long term: some patients do well and do not deteriorate, but some 35% may progress to needing TKR. Of Larsen et al.'s cohort of 100 people ineligible for TKR, 34% had gone onto TKR by 5 years, but those avoiding TKR had improved and maintained Knee Injury and Osteoarthritis Outcome Scores (KOOS) scores (Larsen et al., 2022). Whereas of Gwynne-Jones et al.'s cohort of 120, 37% had gone on to TKR, but those remaining had neither improved nor worsened OKS (Gwynne-Jones et al., 2020). It appears not all knee osteoarthritis progresses to needing TKR. However, there is little literature available on the cost to the patient of continuing without surgery (Ackerman et al., 2019; Laberge et al., 2021; March et al., 2002); most papers are about the cost of surgery.

Economic evaluation of non-surgical and surgical interventions for knee osteoarthritis are frequently limited to health services costs and fail to quantify cost to the patient (Laberge et al., 2021; March et al., 2002). When they do consider costs borne by the patient, they frequently count loss of work, but not loss of economic opportunity and contribution of those who are retired (Lebedeva et al., 2021). Lebedeva's prospective analysis of 383 patients waitlisted for TKR found 60% of the cost was attributable to lost productivity. March et al., however in 2002 found pre-surgery WOMAC (Western Ontario and McMaster Universities Osteoarthritis Index) stiffness and pension status were significant independent predictors of postoperative costs, indicating that those with greater stiffness had greater post-surgery costs and those on a pension had lower costs. This might indicate pensioners are using more public allied health services than private (March et al., 2002). We acknowledge that financial costs are only part of the picture and costs can include experience of pain, stress and depression (Stubbs et al., 2016); costs also include opportunity costs from loss of function and societal connection (Leifer et al., 2022). This paper seeks to fill the gap by concentrating on out-of-pocket expenses incurred due to knee osteoarthritis.

Therefore, we sought to quantify the costs incurred by patients for health utilisation between referral and surgery, or non-surgical journey costs to the patient, of living with knee osteoarthritis.

Method

This observational study was conducted prospectively over a 6-month data collection period.

Participant recruitment

A prospective sample of patients was recruited from patients referred to orthopaedic clinics at Canberra Hospital. Canberra Hospital is a public hospital; in the ACT over 80% of TKRs are carried out privately, and patients referred into the public hospital system are a minority (AIHW, 2022).

Participants were included if they had a diagnosis of knee osteoarthritis, were aged over 40 and referred by a GP to an orthopaedic surgeon between March and September 2023. Participants were at one of three points on the referral pathway: (1) patients redirected to non-surgical care; (2) patients the orthopaedic surgeon had requested admission for TKR; and (3) patients considered unsuitable for surgery due to complex comorbidities or elevated BMI. Health service physiotherapists and the research team asked patients if they wished to participate. If a patient agreed verbally, they were invited to attend a face-to-face interview with the physiotherapist (authors MC, RDM, JS) at the Community Health Centre, where informed consent was formally obtained and initial round of surveys completed.

Data collection

Physiotherapists assisted participants to complete the surveys on the first visit, then followed up the subsequent 3- and 6-month data collection points by telephone. Participants were asked to recall the costs for care of their knee osteoarthritis retrospectively, from the time of the GP referral to Canberra Hospital up to this visit. Participants were provided with a diary to record costs (as required by CoPaQ). At 3 and 6 months following GP referral the diary was returned, and diary and interview used to complete the CoPaQ tool.

Costs information captured the net cost to the patient (out-of-pocket costs) of health care and associated costs using the CoPaQ tool (Laberge et al., 2021; Poder et al., 2022). While the CoPaQ tool was developed for use in Canada (Conombo et al., 2021; Laberge et al., 2021), it has been used widely to report on patient costs for patients elsewhere, and with a range of conditions such as burn injuries and low back pain (Bakaa et al., 2024; Espinoza-Moya et al., 2024). It has moderate reproducibility that is sufficient for confident use in economic analyses (Poder et al., 2022). The questionnaire was designed to be completed by the patient and to take 10–15 minutes to complete.

The listed costs and expenses incurred by patients were associated with the health condition as it related to their daily life. Costs reimbursed by insurance were not included. Items included travel to medical and health appointments, costs of those medical and health visits, costs for home services (e.g. cleaner or gardener if required due to their health condition), tests and examinations such as X-rays, and allied health appointments and carer costs if required due to their health condition. Time spent on their health condition was calculated including waiting time at appointments, loss of income, financial stress and time spent by a caregiver.

Some modifications were made to the tool to reflect costs to patients in Australia, and differences between Australian and Canadian health systems. In Australia there are out-of-pocket costs to attend a GP or other health care professional (such as a dietician, physiotherapist, exercise physiologist or psychologist). Costs for some prescription medicines are supplemented by the Pharmaceutical Benefits Scheme (PBS) and there is a safety net in

place should patient expenses exceed a determined amount. Modifications to the CoPaQ to suit the Australian private health insurance, Medicare and PBS landscape included:

- In Section A, added item 1.0, 'Did you attend any consultations with a GP or medical specialist? If yes what was the net amount you paid out of pocket?'
- Added item 5.9 (previously item 6.3), 'What is the estimated time per week this person (carer) spends performing tasks to help care for you?'
- Removed items 6.1 and 6.2 as the information was duplicated in items 5.3 and 1.5.
- In Section B, added question 10, 'Do you have private health insurance? If yes does this include extras cover?'

Calculations for costs

Costs were adapted to reflect Australian economic conditions in 2023/24 financial year. Travel costs were 85 c/km – Australian Taxation Office vehicle allowance for financial year 2023/24; single rate for all vehicles (ATO, 2024). The wage cost of missed work and waiting for appointments was 0.806 c/min – May 2023 data from the Australian Bureau of Statistics (ABS, 2023), weekly wage rate of $1,838 or $48.37/hour assuming a 38-hour week.

Table 18. Calculations for costs input into data schedule

Calculations for costs	Survey question	Input cost
Vehicle cost	Q 1.3	0.85 cents/km
Waiting time at health centre	Q 1.5	$48.37/hr or $0.806/min unless a wage for the participant was provided
Time spent travelling to appointment	Q 2.1	$48.37/hr or $0.806/min unless a wage for the participant was provided
Lost income	Q 3.2	$48.37/hr or $0.806/min unless a wage for the participant was provided

EQ-5D-5L was collected once only, at the first visit (Rabin & de Charro, 2001). The EQ-5D is used widely and is a valid and reliable indicator of quality of life for economic analyses (Payakachat et al., 2015) though there are some conditions where the tool is less responsive (e.g. alcoholism, mental illness). There are population norms available (Redwood et al., 2024) for Australia, UK and USA and the relationships with sociodemographic characteristics have been described.

Data analysis

Descriptive statistics were used to calculate characteristics of the participants and describe costs. Relationships between financial stress as four independent groups (none, a little bit, somewhat, quite a bit) and income or EQ-5D (as a continuous variable) were analysed with independent samples Kruskal Wallis analysis. Relationships between participant pathway (three independent groups: those referred to non-surgical care, those listed for TKR and complex patients unsuitable for TKR) and costs (continuous variable), were likewise analysed with independent samples Kruskal Wallis analysis.

Results

Participants

Sixteen participants were recruited. Thirteen (81%) participants were female. Their mean age was 64 (SD 8) years, with a range of 53 to 77 years. The three pathway groups were: participants were redirected to non-surgical care (*n* = 4); the orthopaedic surgeon requested admission for TKR (*n* = 9); and participants were considered unsuitable for surgery due to complex comorbidities or elevated BMI (*n* = 3). Participants had experienced symptoms for a mean of 4 years (SD 5), ranging from 3 months to 20 years. Sixteen participants provided thorough data for up to 6 months, while six participants provided 12 months costs, so this analysis is limited to the 6-months data analysis.

Four (25%) participants were employed and 11 (69%) were retired, of these three had retired early due to knee osteoarthritis. One participant was unemployed due to the pain from knee osteoarthritis. Ten (63%) participants had an income of $60 000 per annum or less. Financial stress was reported as *quite a lot* by four participants, *somewhat* by three, *a little* by four and no financial stress was reported by five participants. For example, 11 (75%) participants were experiencing at least some financial stress.

Participants had EQ-5D utility index of 0.60 ± 0.25 (mean ± SD) with a range of 0.15 to 0.92. Their quality of life visual analogue scale from the EQ-5D was 65.78 ± 20.11 (mean ± SD) with a range of 45 to 87.50/100.

Table 19. Participant employment status, financial stress, quality of life and costs

Pt #	Sex	Path	Data collection	Employment	EQ-5D	EQ-State	EQ-VAS	Financial stress	Direct costs	Indirect costs	Total costs
1	F	NS	12 months	Retired	0.92	11121	75	No	$2,450	$128	$2,578
2	F	TKR	–	Employed	0.65	21222	65	No	$55	$28	$83
3	F	NS	–	Retired	0.54	22222	70	Quite a bit	$1,396	$290	$1,686
4	M	TKR	12 months	Retired	0.80	11122	88	No	$1,741	$80	$1,821
5	F	TKR	–	Retired	0.84	21121	70	No	$612	$348	$960
6	F	TKR	–	Unemployed	0.15	22232	40	Quite a bit	$674	$757	$1,431
7	F	US	9 months	Retired	0.38	21231	60	A little bit	$1,016	$1,846	$2,862
8	F	TKR	–	Employed	0.65	21222	50	Quite a bit	$1,094	$176	$1,270
9	F	TKR	12 months	Employed	0.34	21223	45	Somewhat	$785	$454	$1,239
10	M	US	12 months	Retired	0.76	21221	70	No	$575	$48	$623
11	F	TKR	12 months	Retired	0.76	21221	65	Quite a bit	$919	$3,187	$4,106
12	F	NS	9 months	Retired	0.65	22221	65	Somewhat	$5,233	$96	$5,329
13	F	US	12 months	Retired	0.65	22221	75	A little bit	$394	$44	$438
14	M	NS	–	Retired	0.54	22222	60	A little bit	$499	$40	$539
15	F	TKR	12 months	Retired	0.65	21222	75	A little bit	$923	$356	$1,279
16	F	TKR	–	Employed	0.33	21132	80	Somewhat	$2,469	$468	$2,937

Note: EQ-5D = European Quality of Life utility index; EQ-State is mobility, self-care, usual activity, pain/discomfort, and anxiety/depression; EQ-VAS = the visual scale of 'general health'; F = female; M = male; NS = non-surgical care; TKR = listed for total knee replacement; US = unsuitable for surgery due to complex comorbidities. Income level is not shown, to protect privacy.

Table 20. Relationships between financial stress and costs per day were not demonstrated

Participant	Financial stress	6-month total cost	Total cost/day
1	No	$2,578	$4.13
2	No	$83	$0.45
3	Quite a bit	$1,686	$9.24
4	No	$1,821	$9.98
5	No	$960	$5.26
6	Quite a bit	$1,431	$7.84
7	A little bit	$2,862	$15.68
8	Quite a bit	$1,270	$6.96
9	Somewhat	$1,239	$6.79
10	No	$623	$3.41
11	Quite a bit	$4,106	$22.50
12	Somewhat	$5,329	$29.20
13	A little bit	$438	$2.40
14	A little bit	$539	$2.95
15	A little bit	$1,279	$7.01
16	Somewhat	$2,937	$16.09

Costs data

Direct costs for participants ranged from $5,233 to $55 over 6 months, median $921, mean $1,303 (SD 1,250). These costs included medical and allied health, devices and tests and examinations as well as medications. Indirect costs to participants ranged from $3,187 to $28 over 6 months, median $233, mean $521 (SD 841). Total costs ranged from $5,329 to $83 over the data collection period, median $1,355, mean $1,824 (SD 1,421). Total costs *per day* ranged from $16.09 to $0.45, with mean $9.99 (SD 7.78). There were four participants who appeared as outliers with incurred greater costs. When those outliers were removed the remaining participants had median $7.42 per day, mean $7.98 per day (SD 4.63).

Medical expenses were incurred by 8 (50%) participants in the initial 6-month period with median $92.00, mean $144.36 (SD 221.96). Allied health expenses were incurred by 5 (31%) participants in the initial 6-month period with median $80.00, mean $138.33 (SD 242.90). This wide variance may be accounted for by some participants' private health services. Some private health service costs in Australia may be supported in part by private insurance, with wide variation in insurance coverage. Costs recorded are out-of-pocket costs to participants only and do not include costs incurred by insurers or publicly funded state and territory health systems.

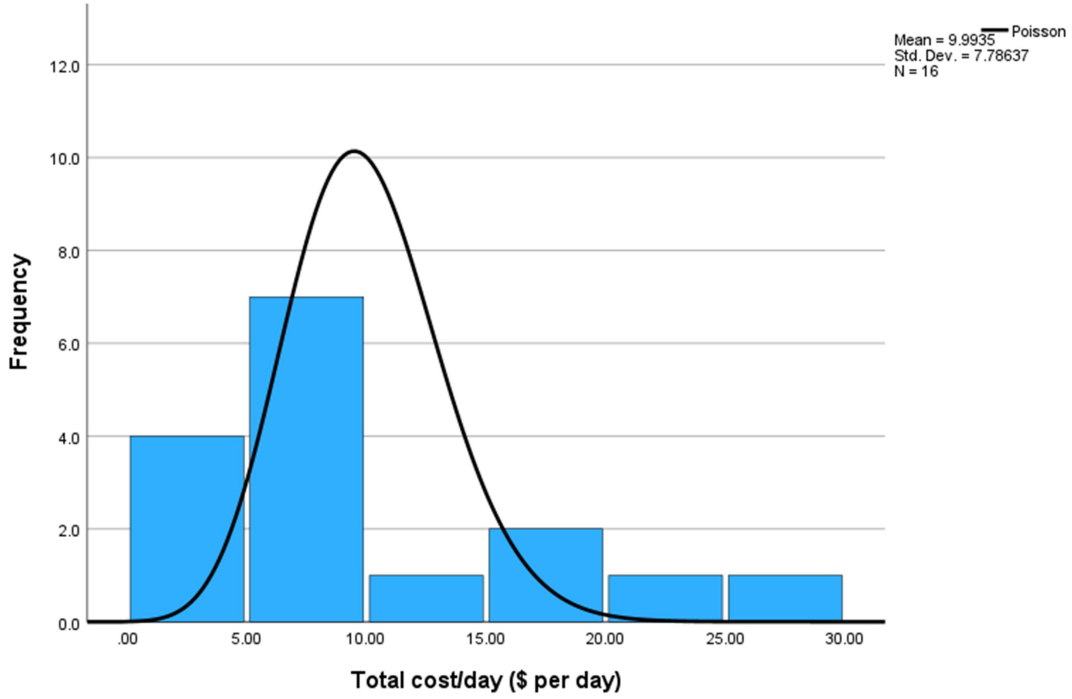

Figure 9. Histogram of total costs per day, with Poisson distribution fitted

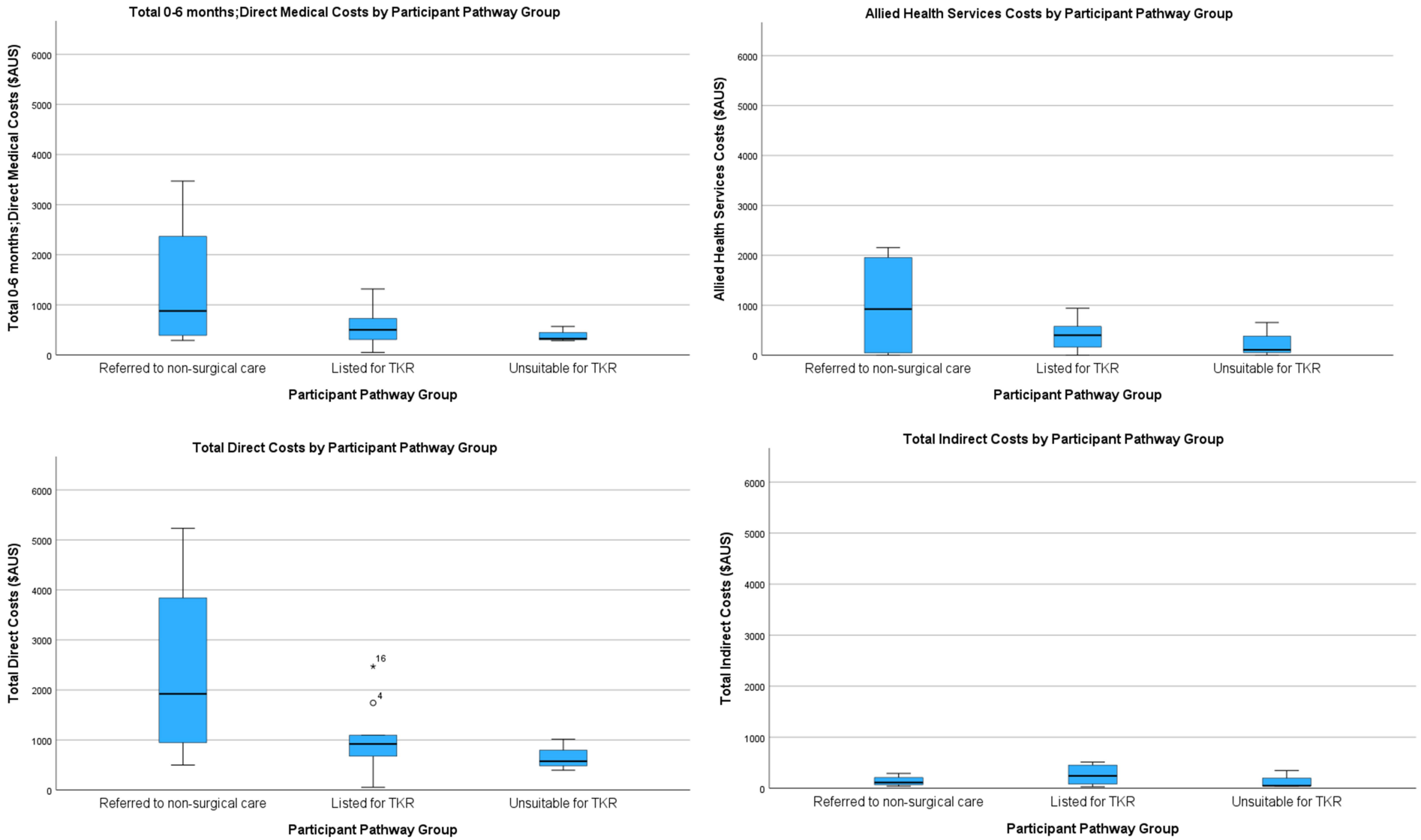

Figure 10. Costs by participant pathway groups

Relationships between costs and care pathway

Table 21. Relationship between costs and care pathways

	Referred to non-surgical care *n* = 4	Listed for TKR *n* = 9	Unsuitable for TKR *n* = 3	Total
Medical costs				
Median	$877.50	$502.00	$325.00	$466.00
Mean (SD)	$1,378.75 (1456)	$580.33 (381)	$393.00 (154)	$744.88 (808)
Allied Health costs				
Median	$924.00	$400.00	$108.00	$362.50
Mean (SD)	$1,000.75 (1117)	$405.00 (329)	$254.00 (351)	$525.62 (638)
Total direct costs				
Median	$1,923.00	$919.00	$575.00	$921.00
Mean (SD)	$2,394.50 (2050)	$1,030.22 (700)	$661.67 (320)	$1,302.19 (1250)
Total indirect costs				
Median	$112.00	$356.00	$48.00	$233.00
Mean (SD)	$138.50 (107)	$650.44 (977)	$646.00 (1039)	$521.63 (841)

Note: SD = standard deviation; TKR = total knee replacement.

Analysis of the relationships between costs and care pathways using independent samples non-parametric pairwise comparisons (Kruskal Wallis) showed no difference between median costs of the three groups for medical costs, allied health costs, total direct costs nor total indirect costs. Although visually it appears that those referred to non-surgical care had higher costs, this is not significant, and this analysis may have had insufficient sample size to determine differences between groups.

Relationships between costs and financial stress

Relationship tests between financial stress on an ordinal scale and neither annual income nor total cost per day showed any relationship.

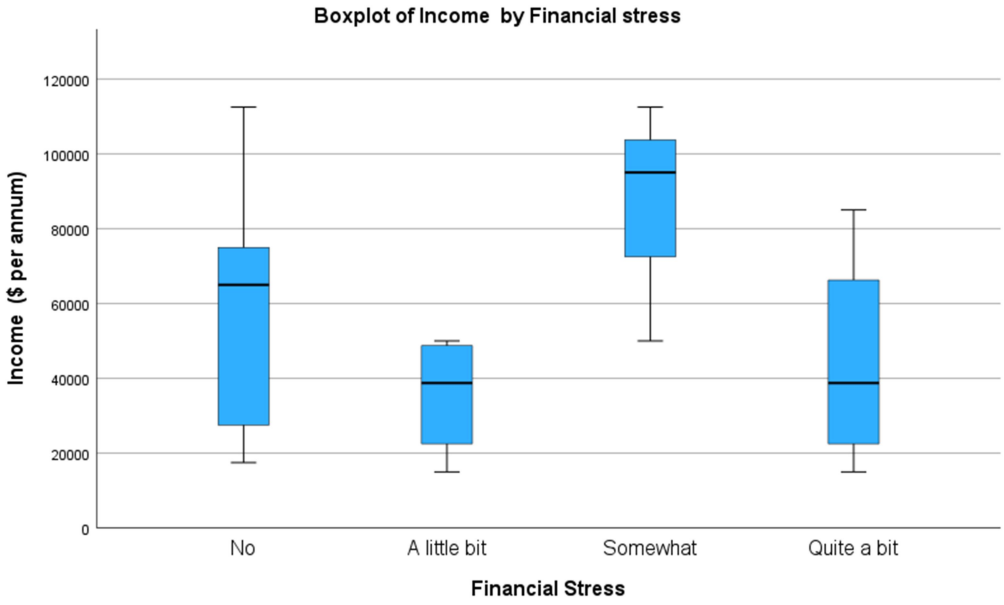

Figure 11. Income per annum (approximate), according to the reported financial stress of participants

There was no relationship apparent between income and financial stress for this cohort seen with independent samples Kruskal Wallis analysis (test statistic 4.36, $p = 0.225$).

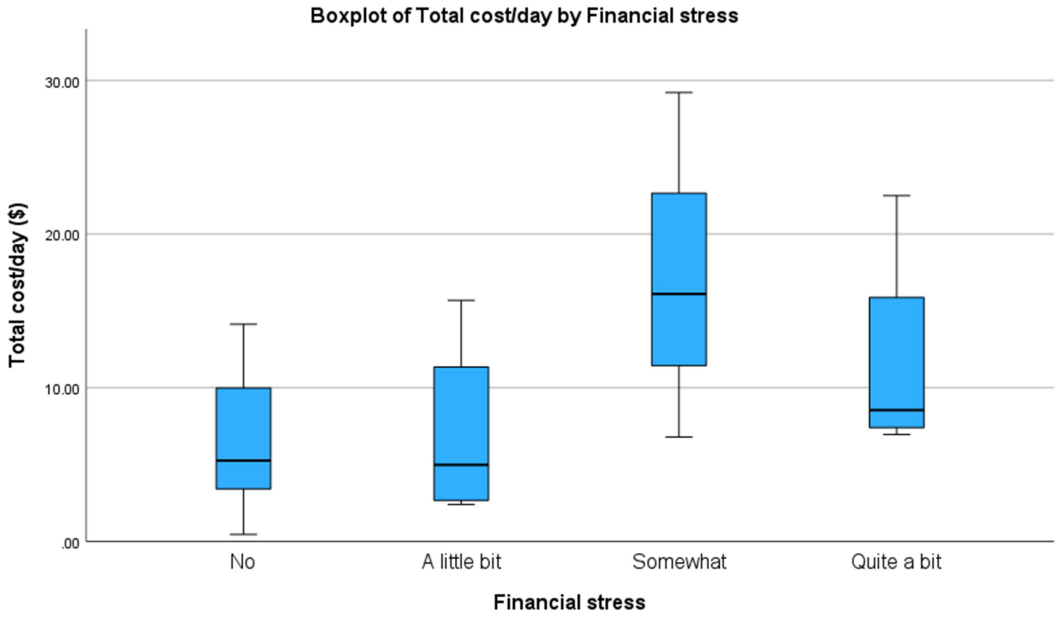

Figure 12. Total cost per day, according to the reported financial stress of participants

There was no relationship apparent between total cost per day and financial stress for this cohort seen with an independent samples Kruskal Wallis analysis (test statistic 3.66, $p = 0.300$), nor total cost over 6 months (test statistic 3.66, $p = 0.300$).

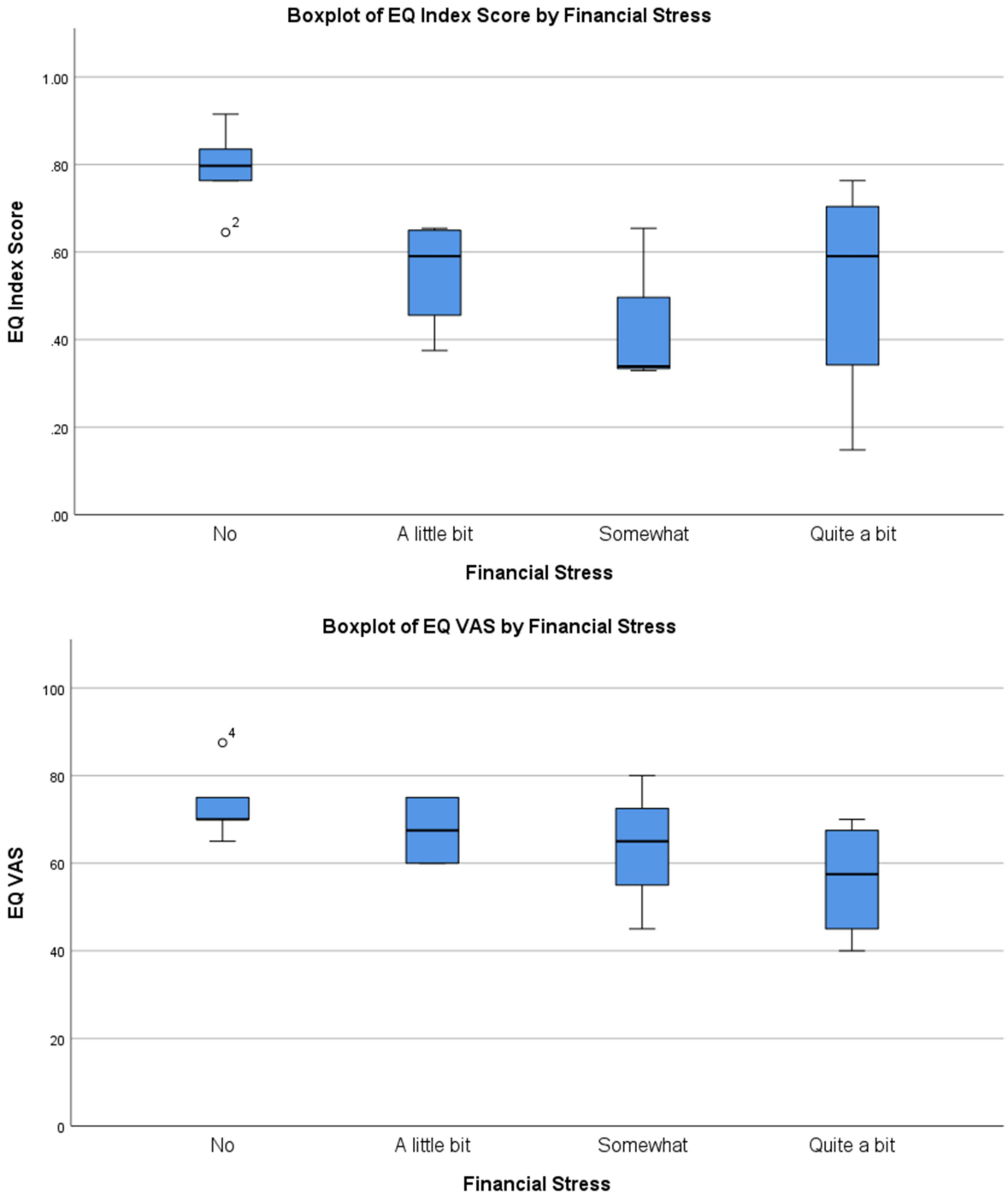

Figure 13. Boxplots of EQ Index score and EQ-VAS, according to the reported financial stress of participants

EQ-5D Index score and EQ-VAS appear visually to be related to financial stress; however, this is not significant (independent samples Kruskal Wallis analysis for EQ-Index score (test statistic 7.15, $p = 0.067$), and EQ-VAS (test statistic 3.59, $p = 0.310$)).

There were four participants who were outliers in the cohort with high direct and indirect costs (participants 2, 12, 13, 16). Two participants required home care services because of their knee osteoarthritis, and spent $2,515 and $3,360 on those services. One participant spent $2,155 on allied health services, and one accumulated a range of costs contributing to high costs overall.

Discussion

The aim of this study was to describe the costs incurred by people living with knee osteoarthritis. This is a small sample of 16 participants, and a short data collection period, that does not include TKR surgery. The participants had been referred to orthopaedic clinics by their general practitioner, which reflects a stage of symptoms at which the GP has decided a specialist consultation is warranted.

The median cost per day of living with knee osteoarthritis was $9.99 for the entire cohort, or $7.42 when outliers were removed. This is similar to the costs reported by March et al. in 2002 when the costs are adjusted for inflation. March et al. reported the daily cost of living with osteoarthritis from 1995 data averaged $4.12 (AUD) per day and at inflation (2.0154) estimated $8.30 in 2023 dollars.[1] The March et al. 2002 cohort is likely to have more severe knee osteoarthritis than our cohort, as they were all listed for TKR surgery, whereas four of our cohort of 16 were assessed as not requiring TKR (March et al., 2002).

Three-quarters of our participants were experiencing at least some financial stress. Most of our participants had an income of $60,000 per annum or less. The Association of Superannuation Funds of Australia recommends retirement income of $51,000 per annum to live comfortably in Australia (Association of Superannuation Funds of Australia, 2024). While our sample is too small for a detailed analysis, the context of living with osteoarthritis on a limited income is a feature of this cohort seeking specialist consultation at the public tertiary hospital. This cohort is not representative of the ACT, or wider Australian population, since 70% of TKRs are performed in the private sector, and just 30% in the public sector (Ackerman et al., 2022).

We have not calculated the loss in productivity for this cohort, nor modelled a relationship between financial stress and the factors of income or costs per day. This modelling will be considered in Paper 5 – Health economic evaluation (below). Arthritis Australia, in *Counting the Cost part 2* (2016), found the greatest indirect costs were in lost productivity of people with arthritis, for people lost to the workforce due to arthritis or caring for someone with arthritis (Arthritis Australia, 2016). They calculated that 7,605 people were out of the workforce in 2015 due to knee osteoarthritis. ‘If these people had received a dietary weight loss plus exercise intervention, 572 of them would have remained in the workforce. By 2030, this number would increase to 716 individuals.’ We have included the costs of allied health interventions in our direct costs analysis.

Limitations

This sample was a small, purposive sample. Sample size of the three groups – those referred to non-surgical care, those listed for TKR and participants unsuitable for surgery – meant between-group comparisons were underpowered. Pathway group is a blunt measure of severity of osteoarthritis, and the study would have been stronger with a more sensitive measure. While these factors limit interpretation and generalisability of the data, this is the only patient-level costs data available at present.

[1] Inflation estimate from Reserve Bank of Australia inflation calculator: https://www.rba.gov.au/calculator/annualDecimal.html

Conclusion

The median cost of living with knee osteoarthritis in this cohort was $7.42 per day. Some participants incurred costs of up to $29.20 per day, particularly when home care support was required to manage everyday tasks for living at home. There were no relationships seen between financial stress and income, costs of living with knee osteoarthritis, nor quality of life. This study is limited to a small sample of patients seeking care in the public hospital and should be interpreted in that context.

Recommendations

There is a wide diversity of costs experienced by patients depending on two dominant factors: their level of private and public services utilisation, and their level of support requirement for home care. Clinicians can anticipate the financial implications for their patients when making such decisions for seeking support for patients.

Paper 4: Costs to patients of living with knee osteoarthritis.

Paper 5: Health economic evaluation I

Wait 2 is a key determinant in the costs and benefits of knee osteoarthritis care for public patients

Paper 5: Health economic evaluation I. Wait 2 is a key determinant in the costs and benefits of knee osteoarthritis care for public patients

Summary

Wait 2 is a key determinant in the costs and benefits of knee osteoarthritis care for public patients.

The Wait 2 duration for patients referred to public orthopaedic clinic review and direction on the most appropriate knee osteoarthritis care is an important factor in the costs and benefits of that care to patients and the public healthcare system. The magnitude of those costs and benefits was explored in response to public healthcare policy settings affecting the Wait 2 duration in 6-month snapshot periods of 2022, 2023 and 2024. These costs and benefits are considered within the context of patients having the potential to seek care through the public and/or private healthcare systems. The policy change impacts of reduced Wait 2 and earlier direction to care pathways which facilitate the exhaustion of conservative care for public patients with knee osteoarthritis decrease public healthcare costs by approximately 36% and indirect patient costs by 24%. It is reasonable to expect that such significant changes will affect the relative demand for, and supply of, knee osteoarthritis care in both the public and private sectors.

Introduction

Beyond the direct costs of knee osteoarthritis patient management and care, there may be significant, unquantified costs to patients arising from the opportunity costs of this illness. In particular, the costs associated with waiting for care across the periods of Wait 1 (from symptoms arising to patient referral for specialist review), Wait 2 (from receipt of referral until patient screening to provide direction on knee osteoarthritis care) and Wait 3 (period from end of Wait 2 to delivery of care). No data is available to support an estimation of Wait 1 costs, where it may be reasonable to presume the costs are significant to patients if their workplace productivity and non-work activities are increasingly impaired as the illness becomes more severe. Studies which cover the combined Wait 2 and Wait 3 periods have placed a value on the productivity loss to workers (DiBonaventura et al., 2011; Kiadaliri et al., 2023; Kingsbury et al., 2014; Savvari et al., 2023). Unfortunately, those evaluations do not account for the effects of knee osteoarthritis on the productive, non-market value provided by retirees as defined by Bloom et al. (2020) and generally do not account for the daily costs to patients of living with this illness (Bloom et al., 2020).

This analysis seeks to quantify the costs and benefits of administrative changes to the way patients are managed through the public orthopaedic outpatient clinic at Canberra Hospital. The clinic services patients with knee osteoarthritis in the ACT and southeast New South Wales. A cost–benefit modelling approach is used to compare the costs and benefits under a business-as-usual scenario (patient administration processes in 2022) to the outcomes of policy setting changes employed by public healthcare managers in 2023 and 2024 – in particular, the extent to which administrative changes alter patient Wait 2 times and the consequential impacts on the costs and benefits for the public healthcare system and the patients. Patient care options for the analysis are limited to surgery (TKR), participation in knee osteoarthritis-specific education/exercise/weight management (EEW) programs or patients being directed back to their general practitioners (discharged back into the community).

Knee osteoarthritis costs in this study include the direct and indirect knee osteoarthritis healthcare costs. The benefits of care are reflected through a reduction in the period for patients to regain a proportion of the foregone economic productivity associated with severity of knee osteoarthritis symptoms. The study will also reflect on how public healthcare policy changes might influence the interactions between the public and private healthcare systems in delivering patient care. That is, the supply and demand for knee osteoarthritis care in the two sectors.

Method

The Best Practice Knee Osteoarthritis project collected data for patients referred to the orthopaedic outpatient clinic at Canberra Hospital by GPs from the ACT and surrounding region of New South Wales. Snapshot period (March to September in 2022, 2023 and 2024) data collection included the number of referrals, patient journeys, Wait 2 times and recommended care option. For the 2023 snapshot, additional data was collected on the cohort employment status – employed full-time or part-time, unemployed or retired. Potential pathways for the patient journeys are provided in the form of a Markov chain (Figure 14), starting from the receipt of a referral for public knee osteoarthritis care. Each step along the pathways is dependent on the previous step (referred to as a state-transition model). The policy changes modelled for this

analysis affect the Wait 2 duration – the period between the receipt of a referral by the clinic and patients being screened for advice on the most effective care option by an APP and/or a surgeon.

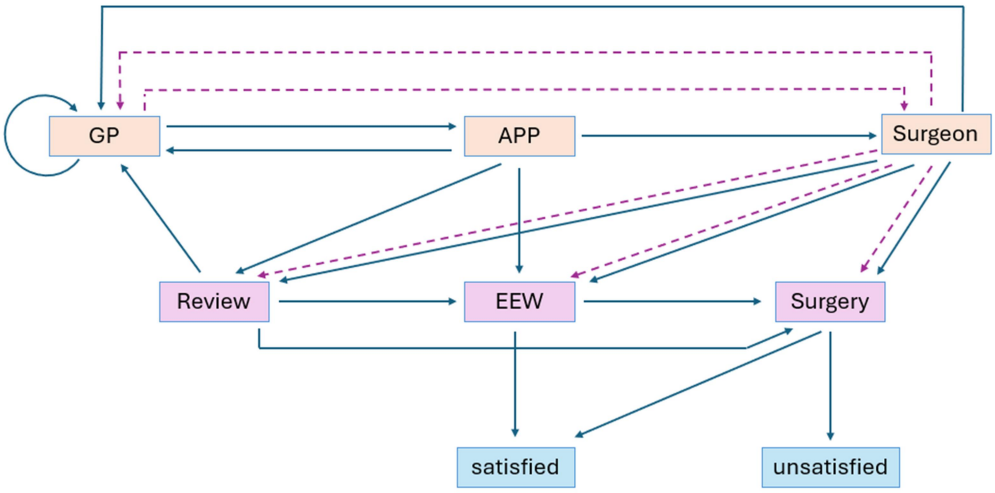

Figure 14. Care pathways for patients referred to Canberra Hospital orthopaedic outpatient clinics, from GP referral to the outcome from care

At the clinics, patients may be seen by an APP and/or a surgeon. Patient care options are: discharged back into the community (problem is not knee osteoarthritis, sent back to their GP), directed to future review (additional information is required to prescribe the most suitable care option), or advised to undertake a community program (EEW) which includes education, exercise and weight management (where appropriate). Dotted arrows in Figure 14 indicate care pathways where patients are screened by surgeons, solid lines for pathways show patients first screened by an APP.

In addition to the Best Practice Knee Osteoarthritis snapshot data collection, modelling inputs to support the cost–benefit analysis are provided in Table 22; that is, the inputs, their values and sources for the data. Daily costs of living with knee osteoarthritis were derived from a separate study within the Best Practice Knee Osteoarthritis project. Estimates of the daily costs of productivity foregone for patients referred to the clinic used the percentage reduction in productivity due to knee osteoarthritis of 16% (DiBonaventura et al., 2011) and a human capital approach (daily costs of labour derived from the average weekly wage rate for Australia, May 2023). This analysis extends the estimation of foregone productivity due to knee osteoarthritis by recognising that the impairment of normal activities (including unpaid work) applies to retirees as well as to workers. That is, the study recognises retirees make a significant, unvalued economic contribution which can be reduced by the effects of knee osteoarthritis. Estimates of the proportion of patients benefiting from EEW were derived from Roos et al. (2018) and patient satisfaction with TKR surgery were derived from Klem et al. (2020).

Table 22. Key economic modelling inputs, values and sources for data used

Input variable	Value	Source
Surgical consult	$317	IHACPA, National Health Cost Data Collection, Public Sector, Appendix 13, Non-Admitted Patients, 2021-22
APP consult	$228	IHACPA, National Health Cost Data Collection, Public Sector, Appendix 13, Non-Admitted Patients, 2021–22
Surgery	$24,000	IHACPA, National Health Cost Data Collection, Public Sector, Appendix 3, Acute Cost Weights, 2021-22
EEW	$860	$400 to $1,500 estimated range
Foregone productivity	16%	DiBonaventura et al. (2011)
Daily productivity loss	$42.14	Derived using average hourly wage rate using average weekly wage rate (seasonally adjusted), Australian Bureau of Statistics (May, 2023)
Daily cost living knee osteoarthritis	$8	CoPaQ survey results
Wait 3 surgery	268 days	Average for 5 years (2018/19 to 2022/23) from Australian Institute of Health and Welfare, Elective Surgery Waiting Times, Table 4.6 (2022/23)

Note: CoPaQ = Costs to Patients in Quebec tool; EEW = education/exercise/weight management programs; IHACPA = Independent Health and Aged Care Pricing Authority.

Wait 2 times, provided from patient hospital records, are best represented as a gamma distribution. For this analysis, the Wait 2 duration used was the time for 50% of patients to be seen by an APP or a surgeon. If patients had been directed to an APP at the time of triage but then directed from an APP to a surgical clinic, the Wait 2 duration covered the time up until the patients were seen by the surgeon (note this is different to Paper 2, in which Wait 2 ends with being seen by ANY clinician). The costs and benefits of patient care were analysed using a constant timeframe, allowing for the Wait 2 differences for the snapshot datasets each year. While assuming patients do not fully recover from any of the knee osteoarthritis care options, the constant time frame for all analyses meant patients directed to EEW spent longer in the period following their expected level of recovery than public patients who had a long Wait 3 (for surgery) and allowing for a 12-month recovery period for productivity after surgery.

Policy settings applied to the economic modelling were compared to the business-as-usual case, being the orthopaedic clinic processes for managing patients with knee osteoarthritis in 2023. Those policy changes were first to allow screening of patients with less severe knee osteoarthritis symptoms by APPs and the second healthcare administrative policy change was to support that role through an increase in funding for APPs from 0.8 to 1.5 FTE positions.

Results

As indicated in Table 23, the average indirect costs of knee osteoarthritis from Wait 2 through to care and recovery are considerably higher if the loss of productivity is recognised for workers and for retirees. Considering the economic impacts on workers only would most likely provide a significant underestimation of the costs of knee osteoarthritis and of the benefits from care. For

all remaining results presented, the productivity impacts for workers and retirees have been included.

Table 23. Average indirect costs of public knee osteoarthritis care for 2023 snapshot cohort directed to surgery or EEW if lost productivity is only applied to workers or to all patients (workers and retirees)

2023 indirect costs ($/patient)	Workers	All
Surgery	$18,266	$35,324
EEW	$14,805	$33,010

Note: EEW = education/exercise/weight management programs.

In the business-as-usual case (2022 snapshot period), 270 referrals from primary care were considered for screening in the public orthopaedic clinic. Of those patients, 141 were discharged back into the community either at triage or following consultation with a surgeon and/or APP. For this cohort, the Wait 2 duration for 50% of patients to be screened was 510 days, with 94 patients recommended for surgery and 45 directed to EEW in community care (Table 24). Direct health costs were $2.17 million for the cohort, with indirect costs of $6.62 million. For this first analysis, the administrative (healthcare policy) changes introduced in 2022 and expanded upon in 2023 were considered with respect to their effects on the patient Wait 2 times for screening. As indicated in Table 24, there is no change to the direct healthcare costs and the number of patients receiving surgery or EEW as the care outcome in each scenario. The lesser Wait 2 with increased patient screening by APPs (Admin 1 change) reduces the indirect costs accruing to patients by over 21%. With the increased resourcing of APPs from 0.8 to 1.5 FTE, the additional decrease in Wait 2 provides a further small reduction in the costs to patients.

Table 24. Patient Wait 2 and indirect cost changes associated with the administrative (healthcare policy) changes

2022 cohort (*n* = 70)	2022 patients	2022 patients with Admin 1 change	2022 patients with Admin 2 change
Wait 2 50% seen (days)	510	227	64
Health care ($m)	–	2.17	–
Indirect costs ($m)	6.62	5.22	5.13
Total costs ($m)	8.79	7.38	5.32
TKR (*n*)	–	94	–
EEW (*n*)	–	45	–

Notes: 2022: physios only screen patients with incomplete referral.

Admin 1 = physios screen lower-severity knee osteoarthritis patients.

Admin 2 = additional APP screening resources + Admin 1 charge.

EEW = education/exercise/weight management programs; TKR = total knee replacement.

Direct healthcare and number of patients receiving surgical or EEW care do not change. The indirect costs of knee osteoarthritis and knee osteoarthritis care are a consequence of a reduction in Wait 2. Wait 2 for 50% of patients being screened was derived for all patients referred to the orthopaedic clinic who were not discharged during the initial triaging process.

If the effects of the healthcare policy changes are considered in terms of both the reduced Wait 2 and increased opportunity for APPs in directing patients towards exhausting non-surgical public care for knee osteoarthritis, benefits were identified for both the public healthcare system

and patient indirect costs (Table 25). The changing proportion of patients receiving care through surgery and EEW, combined with the decrease in Wait 2 duration, suggest the public healthcare costs were reduced by approximately 36% and the indirect costs to patients were lessened by around 25%. Note: the results presented in Tables 22 and 23 represent a single set of costs and benefits. The research article being drafted will contain a sensitivity analysis across all the input variables.

Table 25. Effects of public healthcare policy changes on Wait 2, direct and indirect healthcare costs, and the proportion of patients who receive surgical or EEW care

2022 cohort (*n* = 270)	2022 patients	2022 patients with Admin 1 change	2022 patients with Admin 2 change
Wait 2 50% seen (days)	510	227	64
Health care ($m)	2.17	1.45	1.38
Indirect costs ($m)	6.62	6.19	4.96
Total costs ($m)	8.79	7.64	6.35
TKR (%)	67.6	45.1	40.2
EEW (%)	32.4	54.9	59.8

Notes: Care option % after excluding patients discharged (*n* = 131 out of 270).

Admin 1 = APP screen lower-severity knee osteoarthritis patients.

Admin 2 = additional APP screening resources + Admin 1 charge.

EEW = education/exercise/weight management programs; TKR = total knee replacement.

At a patient level, the policy-induced changes in the average indirect costs of waiting for, receiving and recovering from care differed depending on the type of care received. For the 2022 snapshot patients, those identified as being suitable for surgery and continuing with that care, the policy-induced decrease in Wait 2 reduced the indirect costs by 22.3% (Table 26). For those patients identified as being suitable for EEW and who continued with that care, the indirect costs were reduced by around 10.5%. However, where the policy changes resulted in a shorter Wait 2 duration combined with patient direction to conservative care rather than surgery and patients were satisfied with that outcome, the indirect costs decreased by an average of 28.3%. This is in addition to a decrease of at least $20,000 in direct healthcare costs for each of those patients.

Table 26. Policy change effects on the average indirect costs for the 2022 patient cohort identified for surgery or EEW at screening

Indirect knee osteoarthritis care costs ($ per patient)	2022 patients	2022 patients with Admin 1 change	2022 patients with Admin 2 change
Surgery	$44,107	$34,753	$34,247
EEW	$35,370	$31,732	$31,630

Note: EEW = education/exercise/weight management programs. In addition, it is possible to observe the increased reduction in indirect patient costs for those patients who might have been directed to surgery with the business-as-usual policy settings but pursue and are satisfied with conservative care (EEW).

Discussion

The cost–benefit analysis provides estimates of the benefits for the public healthcare sector and public patients. However, the magnitude of the benefits provided from the modelled public healthcare policy settings would be sufficiently large as to impact on the demand for and supply of knee osteoarthritis care services in both the public and private sector. Figure 15 describes the interactions between three markets – (i) the supply and demand for public screening services, (ii) the supply and demand for EEW, and (iv) the supply and demand for private sector surgery (TKR). These diagrams are briefly described and the results of the modelling then used to demonstrate how the public healthcare policy changes affect the Wait 2 for public patients with knee osteoarthritis and the equilibrium in each of the three markets.

In the market for public sector knee osteoarthritis screening services, the perceived demand curve is a vertical line. There is no price effect on the demand for these services. However, the position of the demand curve is affected by the perceptions of patients and GPs on the expected Wait 2 duration for those referred to the public orthopaedic clinic for screening. For screened public patients directed to EEW, there will be an equilibrium outcome between supply and demand for the available services (Figure 15(ii) at q_{NO}, p_{NO}). The number of patients who benefit from public EEW programs will affect the position of the demand curve (D_{PT0}) for private TKR surgery (Figure 2(iv)), noting that patients also have some capacity to shift their demands for surgery between the public and private healthcare sectors.

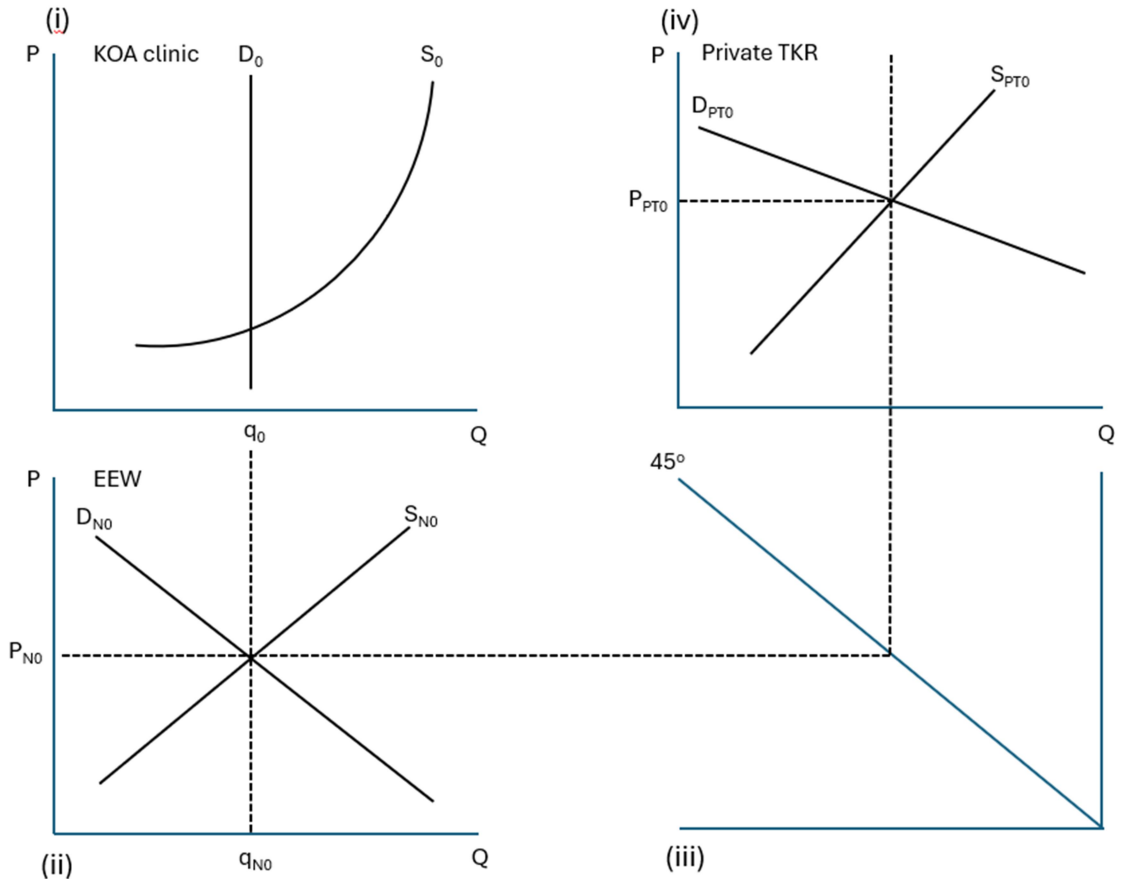

Figure 15. Interrelated markets for knee osteoarthritis care

(i) Supply and demand for public knee osteoarthritis screening services in price–quantity space, (ii) supply and demand for EEW services, and (iv) the supply and demand for private sector TKR surgery. P-price, Q-quantity, D-demand, S-supply,

Given the size of the benefits to the healthcare system and to patients, the policy changes associated with the administration of knee osteoarthritis patient screening and reduction in Wait 2 have the capacity to move the supply and demand curves in each market (Figure 16). The policy-induced changes to the demand curves are represented as a shift to the blue lines in each market. This is a partial equilibrium as it represents the change only in the demand side of the markets. It is reasonable to expect such changes would lead to further changes which shift the supply curve in each market.

With respect to the demand for screening services (part (i) of Figure 16), an observed reduction in public patient Wait 2 would alter the perceptions of patients and their referring practitioners on the availability of public sector screening services. This would include the decrease in the loss of productivity for patients while waiting to be screened (a significant opportunity cost of knee osteoarthritis). The perceived demand curves for public screening services would shift to the right (to D_1). Note there has been no shift in the supply curve. Rather the marginal costs of supplying those services would move along the rising marginal cost (supply) curve.

As indicated in Table 25, the earlier patient screening by APPs and increased proportion of patients directed towards exhausting the use of conservative (non-surgical, EEW) care for knee osteoarthritis would shift the demand curve for EEW services to the right (to D_{N1} in Figure 16(ii)) with an increase in the market price (to P_{N1}) and quantity of services demanded (q_{N1}). In the longer term, if the changes to public patient knee osteoarthritis screening services are retained, it is anticipated the supply curve for EEW would shift to the right and down. Given the increased patient satisfaction through the exhaustion of non-surgical options for knee osteoarthritis, the expected effect would be to shift the demand curve for private sector TKRs to the left (and down in Figure 16(iv) to D_{PT1}). This new partial equilibrium in the market for private surgery would complement an expected reduction in the number of public sector joint replacement surgeries, as indicated from the results in Table 25.

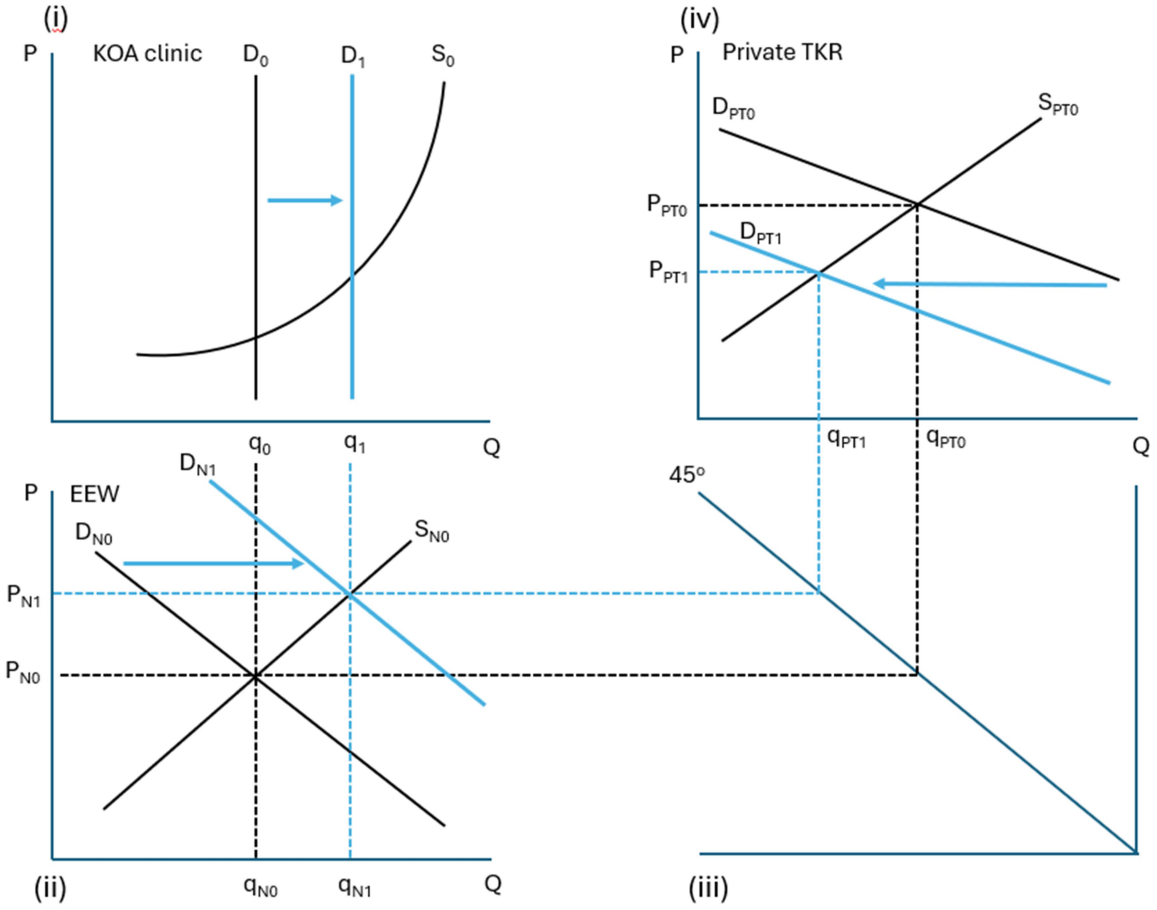

Figure 16. Interrelated markets for knee osteoarthritis care following policy changes

(i) Supply and demand for public knee osteoarthritis screening services in price-quantity space, (ii) supply and demand for EEW services, and (iv) the supply and demand for private sector TKR surgery. The effects of healthcare policy changes which reduce the public knee osteoarthritis patient Wait 2 are indicated by the shift of the demand curve in each of the three markets to indicate new partial equilibria of price and quantity. P-price, Q-quantity, D-demand, S-supply,

The research article being prepared on the modelling of costs and benefits from the policy-induced changes to knee osteoarthritis patient Wait 2 will have a numerical representation of at least some of these curves and the extent to which they shift in price-quantity space.

References are located at the end of the report.

Paper 6: Health economic evaluation II

Optimising public sector knee osteoarthritis care through policy changes affecting patient Wait 2 duration

Paper 6: Health economic evaluation II. Optimising public sector knee osteoarthritis care through policy changes affecting patient Wait 2 duration

Cost–benefit analysis allows an estimation of the costs and benefits from multiple policy settings employed for managing public patients with knee osteoarthritis referred to orthopaedic outpatient clinics at Canberra Hospital. An extension of that analysis supports an exploration of possible knee osteoarthritis care and patient benefits to find the most efficient outcomes for patients and the healthcare system. A brief example of this optimisation modelling is provided using data collected for the Best Practice Knee Osteoarthritis project combined with estimates of expected improvements in patient functionality following care (sourced from the literature). An optimisation modelling platform (GAMS, a general algebraic modelling system) was used to find (solve for) the optimal care solutions in response to a user-defined objective function.

Data inputs

The Best Practice Knee Osteoarthritis project – 2023 cohort (*n* = 206); improvement in KOOS-4 scores following care by TKR or EEW from Roos et al. (2018). A third care option was for patients to be discharged back into the community.

Objective

To maximise the increase in knee-related functionality (KOOS-4 units gained), subject to a total public healthcare budget for knee osteoarthritis care, specified costs of knee osteoarthritis care for TKR and EEW, and patient costs of waiting for care.

Results

The constraint changed for each round of optimisation modelling was the public knee osteoarthritis healthcare budget. As the total public healthcare budget is increased or decreased around $1.95 million (Table 27), the solver seeks to allocate the budget to maximise the functionality gains for the cohort. Reducing the budget has the effect of a small reduction in TKR, but a large reduction in EEW care, with many patients discharged back into the community. Increasing the budget results in a substantial increase in the number of patients directed to EEW for knee osteoarthritis care. Importantly, for a constant change in the budget, the changes to knee osteoarthritis care and functionality gained by the cohort are not linear. In addition, the functionality gain is approaching a limit as the budget is increased. This modelling approach will be expanded to include expected improvements in knee osteoarthritis care and the costs and benefits of care across the breadth of knee osteoarthritis symptom severity.

Table 27. Optimisation modelling results for public knee osteoarthritis care of 2023 Best Practice Knee Osteoarthritis project cohort

Healthcare budget ($m)	TKR (*n*)	EEW (*n*)	Discharge (*n*)	Functionality gain (total units gained)
2.25	88	78	40	2,832
1.95	75	91	40	2,576
1.65	65	27	114	1,853

EEW = education/exercise/weight management programs; TKR = total knee replacement.

References are at the end of the report.

This paper will be provided in the 2026 report.

Discussion

Discussion

Main findings against original aims

The aim of the project as a whole was ‘to sustainably eradicate Wait 2 and ensure that public patients have access to best practice care, including shared decision-making and non-surgical interventions’. To unravel and remove access barriers to best practice interventions, we need to:

1. Use a systems approach to implement expert review that is responsive, cost-effective and follows best practice.
2. Establish strong collaboration between consumers, primary health care, public orthopaedic triage and surgeons, and across public and private sectors.
3. Develop pathways to ensure patients have TKR surgery at the right time.

The project used a knowledge translation approach to engage widely with stakeholders and to use broad inclusive activities for stakeholder engagement. Collaboration between and across divisions in the health service and between community and hospital sectors has been a priority. Ultimately, the patient journey for those with knee osteoarthritis has markedly improved. Over the course of 3 years, wait times to see a clinician (either APP or surgeon) have been addressed, community services expanded and there is a high degree of satisfaction with these changes. Problems remain in the resourcing of community services, and in the resourcing of APPs to be able to see not only people with knee osteoarthritis, but also other conditions. Economic analysis provides a compelling argument to allocate resources to easily accessible, effective non-surgical interventions, prior to considering surgery.

Environment and context changes in 2022, 2023 and 2024 impacted the study as well as deliberate health service changes

Post-COVID Phenomena: At baseline in 2022, the community was emerging from the COVID-19 pandemic. During this time elective surgery had been paused. People had avoided visiting health services, and there was a backlog of patients with health conditions that needed to be addressed (AMA, 2022). This is evident in the post-COVID increase in delays to joint replacement, and in the increase in numbers of people seeking hospital outpatient services nationwide. The Australian Medical Association (AMA) report shows that in 2016–2020, outpatient visits were less than 35 million per year, but in 2020–21 jumped to 47 million, before dropping back down to 41 million in 2024 (AIHW, 2024). After peaking in 2022, the median waiting time for TKR surgery decreased by 43 days, from 308 days in 2022–23 to 265 days in 2023–24. This is 42 days more compared with 5 years ago in 2019–20 (AIHW, 2025). So, in 2022, we could expect a longer wait time to see orthopaedic clinics, as a post-COVID phenomenon.

Countering the post-COVID height in waiting, The Reboot Project was resourced to contact people waiting for orthopaedic consultation and find out how many could be removed from the list and how many were validly waiting. The Reboot Project removed approximately 25% of Category 3 patients from the orthopaedics waitlist. The project ended in November 2022. This meant the list of people waiting for orthopaedic consultation had already been checked and

patients who no longer needed consultation removed, such as those who had sought treatment elsewhere, left the ACT or died.

Implementation of the DHR system: The DHR brought close to 40 different data and administration applications into one system. Importantly, the Clinical Portal and the ACT Patient Activity System (ACTPAS) were incorporated into the DHR. Streamlined administration systems had the impact of losing less patients in transfer between systems, being able to track patients across and between health services and being able to track referrals from GPs into the health service. The HealthLink e-referral system commenced prior to the project, but the impact of it is reported in the GP interviews. It is now possible for GPs and patients to see that a referral has been received and logged, though it does not provide estimated wait time.

In 2023 CHS Community Care received funding to provide GLA:D programs at community health centres. GLA:D had not been available in CHS community health centres previously, and referrals for patients over 65 required a My Aged Care application – issues removed by community care. Ethics approval was achieved, enabling data collection for GLA:D in the La Trobe dataset (Barton et al., 2021), and able to be released to CHS.

In 2024, CHS nominated a team to develop the ACT Osteoarthritis of the Knee Clinical Care Standard, to bring CHS in line with the ACSQHC standards for care (2017 and later 2024) (Australian Commission on Safety and Quality in Health Care, 2024). The working party for the Clinical Care Standard was led by Dominic Furphy and engaged with allied health, nursing and quality and safety in healthcare staff to develop, implement and monitor the standard.

Changes to orthopaedic services between 2022 and 2024: The same number of consultants were offering clinics across the three cohort years. The number of consultation appointments available was not collected; however, we have assumed that this was largely unchanged.

APPs operating the clinic:

- The APP clinic was staffed at 0.8 FTE in 2022, then staffed to 1.5 FTE in 2023 and 1.3 FTE in 2024.
- In 2022, only patients who could not be allocated a triage category based on the GP referral were seen in the APP clinic. Patients with clearly severe symptoms or failed conservative care were given triage Category 2, and those with less severe symptoms (usually based on radiological changes) were given Category 3. All referrals needed to include an X-ray to be accepted for triage and triage decisions were often anchored in the radiological changes/X-ray report.
- In 2023 and 2024, the APP clinic saw all accepted referrals for knee osteoarthritis patients unless the GP referral had clear description of severe symptoms, functional limitations or radiological change and detailed evidence of previous attempts at exercise-based care (e.g. GLA:D completed, or attended 12 weeks of physio and is improving, not just ‘went to physio’).
- APPs placed less emphasis on radiological change, and x-ray was no longer a requirement for the referral to be accepted, in line with clinical standards.

Main findings at baseline

Waiting times to orthopaedic consultation were too long. Patients were likely to have waiting times exceeding recommended clinical timeframes

Of the Category 2 patients with knee osteoarthritis, 42% were likely to have waited longer than the recommended 90 days, and 98% of the Category 3 patients exceeded the recommended waiting time of 365 days if they saw a surgeon directly. If they were first screened by the APP clinic, none of the Category 2 patients and 70% of the Category 3 patients waited longer than recommended times. The ACT performance showed as an outlier, even compared to national data from 'all specialist clinics' reported by the AMA: for example, in Victoria, 89.7% of non-urgent patients were seen in recommended timeframes, and in Tasmania, non-urgent patients had a median wait of 536 days. For orthopaedic clinics Category 3 patients, the 90th percentile wait time was 720 days in Queensland and 800 days in Victoria; in CHS, the 90th percentile wait time was 1,534 days. (Note this is after The Reboot Project validated the orthopaedic clinic waiting lists by telephoning all the patients.)

There was a high degree of satisfaction with the APP clinics

Patients appreciated advice and interventions; surgeons appreciated filtering of patients more suitable for surgery. GPs found the level of assessment, education and advice provided by APP clinics excellent. This is consistent with findings from Australia, the UK and elsewhere, where advanced clinical practitioners have been able to provide very high standards of care (Evans et al., 2021; Evans et al., 2020; Lafrance et al., 2023; Vedanayagam et al., 2021), and very low (none reported) adverse events (Evans et al., 2021).

Quality of surgery was appreciated, but all felt waits were unacceptably long

The waits were felt to be unacceptably long especially for high-risk complex patients unsuitable for EJRP and at risk of deterioration. Where surgery needed to be performed at Canberra Hospital, logistical delays were evident. The ABS reported that across Australia 28% of people found medical specialist waiting times were unacceptable (ABS, 2022). This particularly impacted females, those aged 25–34 years or over 85 years, and those with long-term health conditions. Given knee osteoarthritis is mainly women and a long-term health condition, this may also apply in the context of this study, However, there is no more specific data available for comparison.

At the start of the project the preferred model of care was a community-based program that provided assessment, advice and review

APPs were considered skilled and suitable to conduct this clinic, working at top of scope. They needed to be able to escalate patients rapidly who were deteriorating, have rapid access to surgical clinic bookings, access to medical imaging for patient workup, and access to surgeons for a rapid opinion and regular mentoring. APPs and some health executives recommended APP could refer directly to the orthopaedic list, even write a 'request for admission'. That APPs be able to write requests for admission was not supported by surgeons, but facilitating the right patients having responsive access to surgery was essential for an efficient system. In Queensland, Victoria and New South Wales the model of care for patients with hip and knee osteoarthritis centres on a multidisciplinary community clinic model. In New South Wales this

clinic is managed by a GP and in Victoria and Queensland by an APP, as the state frameworks for APP allow non-medical prescribing (noting that under the *Health Professionals Act 2004* (ACT), an allied health practitioner may not offer even medicines advice, and may not prescribe, supply or administer any medicines). Non-medical prescribing allows for provision of medications advice.

These community clinics have been very successful, though not without some issues – having patients follow through with non-surgical intervention prescriptions such as diet and exercise is one barrier. The Motion Study of Advanced Practice Physiotherapy in Victoria found patient beliefs key to follow through with non-surgical advice:

> *Many participants expressed uncertainty and lacked confidence to self-manage with exercise, and desired ongoing supervision. Many participants expressed frustration with uncertainty regarding future treatment plans and options beyond physiotherapy: 'Where should I [go] – What is my next step for this?' (Gibbs et al., 2025)*

And changing patients belief in their self-efficacy and capability of managing their knee is key (Caneiro et al., 2020); in our study being 'at the hospital' is perceived as endorsed health care somehow, between the lines a risk for a concept of 'less expertise' in not being in the hospital. In 2024 interviews this is expressed as 'the patients feel they have seen the specialist at the hospital'.

APPs did not support a model of an APP clinic located in the community as they preferred to be located with orthopaedic clinics. Collocation with orthopaedic clinics, assisted rapid consultation with orthopaedic specialists, rapid referral of urgent patients to the orthopaedic clinics augmented by specific verbal communication, and mentoring and learning opportunities are all facilitated by being close by. In Victoria's St Vincent's hospital, APP clinics began in close proximity to the orthopaedic team, but moved to community care as the model of care was expanded (Victorian Musculoskeletal Clinical Leadership Group, 2018).

A public education campaign was needed to emphasise the need for first-line interventions for osteoarthritis, before considering surgery, for the best outcomes for patients. This was described like 'Slip slop slap', the campaign that changed perspectives on sun safety. Against the major marketing machines of international multinational health industries that market TKRs, and surgeons who deliver the product for their living, this is an uphill task. La Trobe's 'Motion' study of allied health interventions for hip and knee osteoarthritis has begun publishing key learnings, including that GPs face multi-level barriers to referring to allied health, that patients would be happy to receive a TKR imminently, even though they don't need it yet, as they feel it is inevitable in the process of wearing out of the joint. The evidence that only 10% of people with knee osteoarthritis in Australia need a TKR is lost. Further evidence is building that after GLA:D 70% of people continue to improve, even up to 5 years. Yet, people believe they will need a TKR.

The success of the project hinged on good communication and stakeholder engagement. Stakeholder engagement is a key pillar of knowledge translation, and of impactful implementation science. Adoption and adaptation to local context, and collection of qualitative research on the barriers and facilitators to translation are key tenets of knowledge translation

(Graham et al., 2006), and implementation science measures reach, acceptability and penetration as measures of adoption of changed practices (Forman et al., 2017).

Main findings response to interventions

General practitioners are referring patients to orthopaedics for consultation and advice, not necessarily because they think the patient needs surgery

Our project, like the Bettering the Evaluation and Care of Health (BEACH) project (Bennell et al., 2021; Brand et al., 2014), found that GPs like to refer to orthopaedic surgeons for consultation, and less often refer to allied health practitioners. This is most prevalent for patients without private insurance who may not be able to pay for private physiotherapy and disproportionately impacts our most vulnerable patients. Barriers to accessing allied health interventions for knee osteoarthritis included difficulties with referring to the community care services; My Aged Care applications being required for patients over 65 years were a major impediment. Awareness of GLA:D in community health was limited.

Expansion of the APP clinic model to patients with other musculoskeletal conditions referred to orthopaedics is contingent on having non-surgical and allied health intervention available in community care. Referring patients to community care for non-surgical management was possible because GLA:D programs were available. There is no program like that available in community care currently for foot or shoulder problems. This is a barrier to expanding the clinic to patients with other musculoskeletal problems. There is extensive evidence for non-surgical management of chronic shoulder problems such as impingement, rotator cuff tendinopathy and osteoarthritis, and there are effective interventions such as exercise and education (Doiron-Cadrin et al., 2020; Fahy et al., 2024; Lafrance et al., 2024; Lewis et al., 2021; Lowry et al., 2024) that have been demonstrated to help many patients avoid surgery. There is level 1 evidence in rotator cuff pathology (Fahy et al., 2024) that surgery is no more effective than physiotherapy. Surgery is no longer recommended for subacromial impingement. Lowry's systematic review of clinical practice guidelines (Lowry et al., 2024) found 12 guidelines of high quality. The initial evaluation of shoulder pain should include patient's history, subjective evaluation focused on red flags, and clinical examination. Magnetic resonance imaging is usually not recommended to manage early shoulder pain, and recommendations for X-rays are conflicting. Simple analgesia and rehabilitation including exercises were recommended to treat all shoulder pain disorders. Guidelines on surgical management recommendations differed; for example, six guidelines reported that acromioplasty was recommended or may be recommended in rotator cuff tendinopathy, whereas four guidelines did not recommend it. This level of negligible advantage of surgical over non-surgical approaches suggests that, like knee osteoarthritis, non-surgical options should be exhausted prior to surgical intervention.

There is a lot less evidence for non-surgical management for foot problems, particularly hallux valgus, particularly if it is as advanced as hallux rigidus. A recent Cochrane review (Munteanu et al., 2024) found the evidence suffered from risk of bias and imprecision. They were unable to perform a meta-analysis, reporting that hyaluronic acid injections, shoe stiffening inserts and arch-contouring foot orthoses were unlikely to provide significant clinical benefit. Despite this, individual trials have reported reduction in pain and improvement in function with the use of orthotics/shoes (Fung et al., 2020; Grady et al., 2002), joint mobilisation and exercise (Shamus

et al., 2004) and injection therapies (Pons et al., 2007). There are no comparative studies between surgical and non-surgical interventions, or placebo surgery trials, despite the 88 random controlled trials we located – all were surgery vs surgery. Unloading the orthopaedic clinics depends on having streamlined access to high-quality, accessible non-surgical alternatives for public patients.

The success of this project was founded on strong collaborative stakeholder engagement from the outset. Knowledge translation is an active process that includes the synthesis, dissemination, exchange and implementation (application) of knowledge to improve the health of a defined population. Knowledge translation is anchored in partnerships between those with skills to identify best evidence and collaboration between stakeholders to adapt and adopt that in the local context (Graham et al., 2006). RE-AIM QuEST is a method for evaluation of effective translation, premised on the principles that without strong stakeholder engagement and reach, knowledge translation has no penetration (Forman et al., 2017) – it does not change practice.

Main findings Paper 5 (Economics)

Limitations

The project cannot attribute the changes in waiting time specifically to the increased activity of the APP clinic.

This is a pragmatic and ecological study, observing the journeys of three patient cohorts. There is no control group, though the 2022 group provided baseline comparative data; however, many variables changed between cohorts that were uncontrolled. Relationships can be observed but no attribution is possible. There were significant differences between the years, for waiting time and for proportion of patients seen in the surgical clinic that were listed for surgery. However, analysis of proportion of patients listed for surgery was not maintained when tested by APP clinic attendance. This indicates a multiple-factor effect. Contributions from better records systems, and shorter waiting times may have been covariates.

The problem has been transferred to patients with foot and shoulder conditions

The project has focused on knee osteoarthritis and created an inequality, in which patients with knee osteoarthritis are receiving much faster and more effective care than those with other conditions awaiting consultation in orthopaedic clinics. At the commencement of the project, the ‘Reboot’ data measured median wait time for patients with knee osteoarthritis (*n* = 344) was 741 days (maximum 1,688). For feet and shoulder problems, this was worse (feet problems: *n* = 404, median 920, max. 2,106 days; shoulder problems: *n* = 192, median 896, max. 2,133 days). By 2024, these wait times for patients with shoulder and foot conditions had further deteriorated (feet problems median 1,803 days; shoulder problems median 1,772 days). Like knee osteoarthritis, these conditions do not necessarily need surgical intervention.

Recommendations

Recommendations

Actively manage specialist clinic wait times

Monitor and report wait times and the impact of waiting

1. Develop a report in EPIC-DHR that will report on wait times from GP referral to clinic assessment. Institute monitoring of wait time as a key performance indicator.

The ACT and New South Wales do not report outpatient specialist clinic wait times. Queensland, Victoria, Western Australia and Tasmania do, as they have identified the issues of access to care and are addressing them in a deliberate way. Reporting wait times assists in collection of evidence, and in accountability.

There was a feature of this study from the first interviews, that ‘duty of care’ for a patient was accepted by the surgeons when the patient was ‘seen’. GPs had assumed that on referral, the duty of care was assumed by the specialist. However, surgeons did not see patients on a waiting list as being under their care until after they had seen them in clinic. Once a surgeon assumed that duty of care they became an active advocate for the patient, but while patients were waiting, they were in a neglected space.

2. Adopt the clinically recommended timeframes for specialist clinics.

Queensland has adopted the elective surgery recommended timeframes for specialist outpatient clinics (AIHW, 2022; Queensland Government, 2022). The ACT should be committed to the same timeframes.

3. Embed in EPIC-DHR patient-reported outcomes measures (PROMS). Measures of patient deterioration will facilitate priority setting. These data will examine the impact of waiting on patients.

There is great utility in the data on PROMS and on patient health status. It is used in health economics for priority setting and to understand how patients and clinicians make decisions. But without data, this is unknown.

Expansion of the APP clinic concept in orthopaedic clinics

4. Support resourcing of the APP clinic in orthopaedics to expand to see patients with all chronic conditions.

APPs have been demonstrated to be effective, accurate and reliable assessors of patients with musculoskeletal conditions. Evidence supports expansion of the resourcing of the APP clinics. This shortens wait times and makes surgical clinics more efficient.

5. All patients with knee osteoarthritis should have an APP consultation within the clinically recommended timeframe following GP referral to determine appropriate care pathway.
6. Support resourcing of APP clinics in orthopaedics to be able to see both Category 2 and Category 3 patients. Urgency categories are much more accurately judged by a clinical

assessment, than by the GP referral. (Especially if the GP referral does not contain a validated measure such as Oxford Knee or Oxford Hip score.) Further, if Category 2 patients are seen, the workup preparation for the surgical clinic can be ready, streamlining the efficiency of that clinic. For example, current medical imaging if required, completed hip or knee scores as required, measurement of BMI. These issues were especially pertinent in 2022, when imaging could be 3 years old, and patients had deteriorated considerably since their GP referral due to long wait times.

Expansion of the APP clinic concept in other specialist outpatient clinics

7. Commit to exploring opportunities for use of advanced clinical practitioners in other clinics. In the second round of interviews, GPs recommended respiratory, gastroenterology and neurology clinics as areas of potential application of this model. They were unaware the model was already in place for neurosurgery patients with back pain, and for re-visits of patients referred to rheumatology. It is possible those two clinics need APP clinic expansion to see more patients. As patients referred to healthcare services have more coexisting chronic conditions, allied health services become more important in living a good life with those conditions. There is a body of work to be done in patient education, self-management, self-efficacy and behaviour modification, that advanced allied health practitioners, and nurse practitioners, are skilled in, but thar are not within the scope of practice of medical and surgical specialists, so a more balanced advanced practitioner workforce will be more appropriate.

- The APP clinic has a formal collocated consultation arrangement in place with surgeons to enable same-day consultation for patients appropriate for surgeon consultation.
- Use of standardised assessment within DHR to document best practice, such as collection of BMI and OKS, that ensure evidence-based care.
- Develop KPIs and reporting structure for APP clinic/orthopaedic consultations.
- Develop agreements with specialists to mentor and communicate regularly with APPs

Steps to be taken to improve cross-sector communication

Communication between GPs and the hospital would be improved by deliberate communication with CHN and GP Liaison

8. Planned review of the Capital Health Network (CHN) Health Pathways for GPs to refer to Canberra Hospital orthopaedic clinics.

Collaboration with CHN to update the Health Pathways for GPs to refer to Canberra Hospital orthopaedic clinics was successful in improving the completeness of referrals and appropriateness of referrals. The next step is to support GPs to meet the Osteoarthritis of the Knee Clinical Care Standard (Australian Commission on Safety and Quality in Health Care, 2024) by ensuring non-surgical interventions are exhausted prior to referring to orthopaedic clinics, providing education/advice and recommending exercise and weight loss. There are patients with acute and urgent orthopaedic conditions (outside of the knee osteoarthritis scope of this project) who require orthopaedic consultation, and there are patients with knee

osteoarthritis who have concurrent complex comorbidities with knee osteoarthritis, who require expert consultation. The recommendation to review and revise the Health Pathways instructions to GPs held by the CHN will ensure that clinical standards reflected in the pathways are up to date.

9. Provide information via CHN that will assist GPs to refer to community care services.

CHN instructions on Health Pathways be updated to facilitate referral to appropriate services such as obesity management services, the chronic pain management unit, and allied health services such as the community physiotherapy service who are conducting the GLA:D program and have dietician services and podiatric services.

Communication with patients about wait times

10. Provide simple phone text communication with patients about their waiting position.

Some clinics are able to use DHR to send a phone text message to patients to remind them they are on a waiting list, how long their anticipated wait is, and where to call if they no longer need the appointment. Just like a service call in any other customer-facing industry. Patients interviewed consistently asked for this communication.

Expansion of the advanced clinical practitioner workforce

11. Train more advanced clinical practitioners. Resources should be specifically allocated to recruit and train advanced clinical practitioners.
12. Address gaps in training pathways for advanced clinical practitioners. ACT Health and CHS are commended for their work to establish a Framework of Advanced Practice in the Territory. We encourage the continuation of this work. The framework will support parallel development of training pathways, currently practitioner-specific, context-specific and patient-specific (for example, a physiotherapist, in the emergency department, treating patients with musculoskeletal conditions; as opposed to ‘an advanced practice physiotherapist’). This three-degrees-of-specificity makes training very boutique and difficult to sustain. A broader and more consistent approach to the fundamental pillars of the training would provide workforce recognition by the community, transferability of key skills and workforce mobility.
13. Address issues in recruitment of advanced clinical practitioners. Barriers exist in recruitment, and these need to be addressed to meet workforce demand. The details are beyond the scope of the project. Particular recruitment barriers for physiotherapy and podiatry practitioners were noted.

Community care health services be resourced sufficiently to meet rising demand

14. Community care services need increased resourcing to provide the services that will: (1) meet the demand of patients living with complex chronic conditions requiring allied health services, and (2) take the strain from specialist clinics for treatment of those chronic conditions.

It appears GPs were referring patients to orthopaedics for consultation, not for surgery, as they relied on the expert advice of those people with an in-depth knowledge of musculoskeletal conditions. They were happy that an APP provide this advice. But they were not able to access this level of expert advice from community physiotherapy, because of difficulties and barriers to referral to community care, and because the advanced practitioners with this expertise were located in the hospital, in the orthopaedic team.

15. Address barriers to GPs referring patients to community care. My Aged Care, Central Health Intake and long wait times all present barriers to GP referral.
16. Develop services in community care to meet emerging demand.

Examples of services not able to meet demand are obesity management services, podiatry and services. The GLA:D program for patients with hip or knee osteoarthritis is available, but there is no ‘GLA:D back’ program available yet, nor ‘Shape up your Shoulder’, nor foot and ankle exercise and education programs. Those are all high demand points with strong evidence for effective non-surgical intervention.

17. Develop patient education programs for managing osteoarthritis.

Community care already offers programs in ‘Living well with Chronic Disease’ but there was call from patients, GPs and physiotherapists for patient education. One area patients sought specific education was pharmaceutical and non-pharmaceutical pain management. They also sought education on management of other aspects of osteoarthritis management, such as how to exercise safely. Health practitioners and primary care providers recognised that patients needed education in current evidence on osteoarthritis to break down established myths. Myths such as exercise increased wear and tear, and a worn-out joint needs a joint replacement, are entrenched, despite contrary evidence: 90% patients with knee osteoarthritis do not need a TKR, and exercise is good for joints; 65–75% patients will find clinically meaningful pain relief from exercising regularly. Education is the mechanism to dispel these myths.

References

References

Ackerman, I. N., Bohensky, M. A., Zomer, E., Tacey, M., Gorelik, A., Brand, C. A. & de Steiger, R. (2019). The projected burden of primary total knee and hip replacement for osteoarthritis in Australia to the year 2030. *BMC Musculoskeletal Disorders, 20*, 90. DOI: 10.1186/s12891-019-2411-9

Ackerman, I. N., Skou, S. T., Roos, E. M., Barton, C. J., Kemp, J. L., Crossley, K. M., Liew, D. & Ademi, Z. (2020). Implementing a national first-line management program for moderate-severe knee osteoarthritis in Australia: A budget impact analysis focusing on knee replacement avoidance. *Osteoarthritis and Cartilage Open, 2*(3), 100070. DOI: 10.1016/j.ocarto.2020.100070

Ackerman, I. N., Soh, S. E., & de Steiger, R. (2022). Actual versus forecast burden of primary hip and knee replacement surgery in Australia: Analysis of data from the Australian Orthopaedic Association National Joint Replacement Registry. *Journal of Clinical Medicine, 11*(7), 1883. DOI: 10.3390/jcm11071883

Agency for Clinical Innovation. (2013). *Understanding program evaluation. An ACI framework*.

Arthritis Australia. (2016). *Counting the cost: The current and future burden of arthritis.*

Association of Superannuation Funds of Australia. (2024). *The ASFA retirement standard*. ASFA Research and Resource Centre. https://www.superannuation.asn.au/wp-content/uploads/2025/03/ASFA_Retirement_Standard_Budgets_Dec-24_quarter.pdf

Atkins, L., Francis, J. & Islam, R. (2017). A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems. *Implementation Science, 12,* 1–18.

Australian Bureau of Statistics. (2022). *Patient experiences. Contains data on access and barriers to, and experiences of healthcare services including GPs, specialists, dental professionals, hospitals and EDs*. https://www.abs.gov.au/statistics/health/health-services/patient-experiences/latest-release#barriers-to-health-service-use

Australian Bureau of Statistics. (2023). *6302.0 Average Weekly Earnings, Australia Table 3. Average Weekly Earnings, Australia (Dollars).* Average Weekly Earnings, Australia. https://www.abs.gov.au/statistics/labour/earnings-and-working-conditions/average-weekly-earnings-australia/may-2023

Australian Commission on Safety and Quality in Health Care. (2024). *Osteoarthritis of the knee clinical care standard*.

Australian Institute of Health and Welfare. (2022). Elective surgery. *My Hospitals*.

Australian Institute of Health and Welfare. (2024). *Measures of health and health care for Australia and similar countries.* International comparisons. https://www.aihw.gov.au/reports/international-health-data-comparisons

Australian Institute of Health and Welfare. (2025). *Waiting times overview.* Elective surgery. https://www.aihw.gov.au/hospitals/topics/elective-surgery/waiting-times

References

Australian Medical Association. (2022). *Shining a light on the elective surgery 'hidden' waiting list.* https://www.ama.com.au/sites/default/files/2022-09/Shining%20a%20light%20on%20the%20elective%20surgery%20'hidden'%20waiting%20list.pdf

Australian Taxation Office. (2024). *Cents per kilometre method.* Motor vehicle and car expenses. https://www.ato.gov.au/individuals-and-families/income-deductions-offsets-and-records/deductions-you-can-claim/cars-transport-and-travel/motor-vehicle-and-car-expenses/expenses-for-a-car-you-own-or-lease#Centsperkilometremethod

Bakaa, L., Al-Mosawi, F., Bakaa, N., de Oliveira, L. A., Laberge, M. & Macedo, L. G. (2024). Content validation of the COST for patient questionnaire (CoPaQ) for patients with low back pain: A qualitative study. *International Journal of Technology Assessment in Health Care, 40*(1), e46. DOI: 10.1017/s0266462324000515

Bandura, A. (1998). Health promotion from the perspective of social cognitive theory. *Psychology & Health, 13*(4), 623–649. DOI: 10.1080/08870449808407422

Barton, C. J., Gibbs, A., Dowsey, M., Smith, A., Ackerman, I., Wallis, J., Bunzli, S., Kemp, J. L., Ademi, Z. & de Oliveira Silva, D. (2024). A high proportion of people with knee osteoarthritis newly referred for orthopaedic assessment are willing to undergo total knee replacement imminently. *Osteoarthritis and Cartilage, 32*, S536–S537. DOI: 10.1016/j.joca.2024.02.798

Barton, C. J., Kemp, J. L., Roos, E. M., Skou, S. T., Dundules, K., Pazzinatto, M. F., Francis, M., Lannin, N. A., Wallis, J. A. & Crossley, K. M. (2021). Program evaluation of GLA:D® Australia: Physiotherapist training outcomes and effectiveness of implementation for people with knee osteoarthritis. *Osteoarthritis and Cartilage Open, 3*(3), 100175. DOI: 10.1016/j.ocarto.2021.100175

Bennell, K. L., Bayram, C., Harrison, C., Brand, C., Buchbinder, R., Haas, R. & Hinman, R. S. (2021). Trends in management of hip and knee osteoarthritis in general practice in Australia over an 11-year window: A nationwide cross-sectional survey. *Lancet Regional Health Western Pacific, 12*, 100187. DOI: 10.1016/j.lanwpc.2021.100187

Bloom, D. E., Khoury, A., Algur, E. & Sevilla, J. P. (2020). Valuing productive non-market activities of older adults in Europe and the US. *De Economist, 168*, 153–181. DOI: 10.1007/s10645-020-09362-1

Brand, C. A., Harrison, C., Tropea, J., Hinman, R. S., Britt, H. & Bennell, K. (2014). Management of osteoarthritis in general practice in Australia. *Arthritis Care & Research, 66*(4), 551–558. DOI: 10.1002/acr.22197

Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. DOI: 10.1191/1478088706qp063oa

Briani, R. V., Pazzinatto, M. F., Waiteman, M. C., de Oliveira Silva, D. & de Azevedo, F. M. (2018). Association between increase in vertical ground reaction force loading rate and pain level in women with patellofemoral pain after a patellofemoral joint loading protocol. *Knee, 25*(3), 398–405. DOI: 10.1016/j.knee.2018.03.009

References

Briggs, A. M., Page, C. J., Shaw, B. R., Bendrups, A., Philip, K., Cary, B. & Choong, P. F. (2018). A model of care for osteoarthritis of the hip and knee: Development of a system-wide plan for the health sector in Victoria, Australia. *Healthcare Policy, 14*(2), 47–58. DOI: 10.12927/hcpol.2018.25686

Bunzli, S., Taylor, N. F., O'Brien, P., Wallis, J. A., Caneiro, J. P., Woodward-Kron, R., Hunter, D. J., Choong, P. F., Dowsey, M. M. & Shields, N. (2023). Broken machines or active bodies? Part 2. How people talk about osteoarthritis and why clinicians need to change the conversation. *Journal of Orthopaedic & Sports Physical Therapy, 53*(6), 325–330. DOI: 10.2519/jospt.2023.11880

Caneiro, J., O'Sullivan, P., Roos, E., Smith, A., Choong, P., Dowsey, M., Hunter, D., Kemp, J., Rodriguez, J., Lohmander, S., Bunzli, S. & Barton, C. J. (2020). Three steps to changing the narrative about knee osteoarthritis care: A call to action. *British Journal of Sports Medicine, 54*(5), 256–258. DOI: 10.1136/bjsports-2019-101328

Conombo, B., Coulibaly, L., Dragomir, A., Guertin, J., Idriss-Hassan, A., Laberge, M. & Poder, T. G. (2021). *CoPaQ: Measuring health care costs for patients*. Université de Sherbrooke.

Dalzell, S. (2023, 20 April). Specialist wait times data show patients are waiting years for crucial appointments. *ABC News*. https://www.abc.net.au/news/2023-04-20/specialist-wait-times-blow-out-years-waiting-list/102232032

Darlow, B., Brown, M., Thompson, B., Hudson, B., Grainger, R., McKinlay, E. & Abbott, J. H. (2018). Living with osteoarthritis is a balancing act: An exploration of patients' beliefs about knee pain. *BMC Rheumatology, 2*, 1–9. DOI: 10.1186/s41927-018-0023-x

Desmeules, F., Roy, J.-S., MacDermid, J. C., Champagne, F., Hinse, O. & Woodhouse, L. J. (2012). Advanced practice physiotherapy in patients with musculoskeletal disorders: A systematic review. *BMC Musculoskeletal Disorders, 13*, 107–128. DOI: 10.1186/1471-2474-13-107

Desmeules, F., Toliopoulos, P., Roy, J.-S., Woodhouse, L. J., Lacelle, M., Leroux, M., Girard, S., Feldman, D. E. & Fernandes, J. C. (2013). Validation of an advanced practice physiotherapy model of care in an orthopaedic outpatient clinic. *BMC Musculoskeletal Disorders, 14*, 162–172. DOI: 10.1186/1471-2474-14-162

DiBonaventura, M. d., Gupta, S., McDonald, M. & Sadosky, A. (2011). Evaluating the health and economic impact of osteoarthritis pain in the workforce: Results from the National Health and Wellness Survey. *BMC Musculoskeletal Disorders, 12*, 83. DOI: 10.1186/1471-2474-12-83

Doiron-Cadrin, P., Lafrance, S., Saulnier, M., Cournoyer, É., Roy, J.-S., Dyer, J.-O., Frémont, P., Dionne, C., MacDermid, J. C., Tousignant, M., Rochette, A., Lowry, V., Bureau, N. J., Lamontagne, M., Coutu, M.-F., Lavigne, P. & Desmeules, F. (2020). Shoulder rotator cuff disorders: A systematic review of clinical practice guidelines and semantic analyses of recommendations. *Archives of Physical Medicine and Rehabilitation, 101*, 1233–1242. DOI: 10.1016/j.apmr.2019.12.017

Espinoza-Moya, M. E., Laberge, M., Bélanger, L., Chang, S. L., Poder, T. G., Moulin, V. J., Germain, L., Beaudoin Cloutier, C. & Guertin, J. R. (2024). Adaptation of a standardized self-reported cost questionnaire specific for the severe burn injury population (BI-CoPaQ). *Burns, 50*(9), 107204. DOI: 10.1016/j.burns.2024.07.008

Evans, C., Poku, B., Pearce, R., Eldridge, J., Hendrick, P., Knaggs, R., Blake, H., Yogeswaran, G., McLuskey, J. & Tomczak, P. (2021). Characterising the outcomes, impacts and implementation challenges of advanced clinical practice roles in the UK: A scoping review. *British Medical Journal Open, 11*, e048171. DOI: 10.1136/bmjopen-2020-048171

Evans, C., Poku, B., Pearce, R., Eldridge, J., Hendrick, P., Knaggs, R., McLuskey, J., Tomczak, P., Thow, R., Harris, P., Conway, J. & Collier, R. (2020). Characterising the evidence base for advanced clinical practice in the UK: A scoping review protocol. *British Medical Journal Open, 10*(10), e036192. DOI: 10.1136/bmjopen-2019-036192

Fahy, K., Galvin, R., Lewis, J. & McCreesh, K. (2024). 'If he thought that I was going to go and hurt myself, he had another thing coming': Treatment experiences of those with large to massive rotator cuff tears and the perspectives of healthcare practitioners. *Clinical Rehabilitation*, *38*(6), 824–836. DOI: 10.1177/02692155241235338

Fennelly, O., Blake, C., Fitzgerald, O., Breen, R., Brennan, A., Ashton, J. & Cunningham, C. (2017). THU0767-HPR Advanced practice musculoskeletal physiotherapy services: A national evaluation. *Annals of the Rheumatic Diseases, 76*(supplement 2), 1493. DOI: 10.1136/annrheumdis-2017-eular.4300

Fernández-de-las-Peñas, C. & Lewis, J. (2022). *The shoulder: Theory and practice*. Jessica Kingsley Publishers.

Forman, J., Heisler, M., Damschroder, L. J., Kaselitz, E. & Kerr, E. A. (2017). Development and application of the RE-AIM QuEST mixed methods framework for program evaluation. *Preventive Medicine Reports, 6,* 322–328. DOI: 10.1016/j.pmedr.2017.04.002

Fung, J., Sherman, A., Stachura, S., Eckles, R., Doucette, J. & Chusid, E. (2020). Nonoperative management of hallux limitus using a novel forefoot orthosis. *Journal of Foot and Ankle Surgery, 59*(6), 1192–1196. DOI: 10.1053/j.jfas.2019.11.008

Gibbs, A., Barton, C. J., Taylor, N., Kemp, J. L., Wallis, J. & Ezzat, A. M. (2024). General practitioners struggle to facilitate recommended care for hip and knee osteoarthritis due to multi-level barriers: A qualitative study. *Osteoarthritis and Cartilage, 32*(supplement 1), S218. DOI: 10.1016/j.joca.2024.02.315

Gibbs, A., Ezzat, A. M., Wallis, J., Kemp, J. L., Taylor, N., Low, J. & Barton, C. J. (2025). What matters to patients? Experiences, barriers, enablers and acceptability of attending advanced practice physiotherapy assessments and physiotherapy-led osteoarthritis care in community settings. *Osteoarthritis and Cartilage*, *33*, S501–S502. DOI: 10.1016/j.joca.2025.02.736

Grady, J. F., Axe, T. M., Zager, E. J. & Sheldon, L. A. (2002). A retrospective analysis of 772 patients with hallux limitus. *Journal of the American Podiatric Medical Association, 92*(2), 102–108. DOI: 10.7547/87507315-92-2-102

Graham, I. D., Logan, J. & Harrison, M. B. (2006). Lost in knowledge translation: Time for a map? *Journal of Continuing Education in the Health Professions, 26*(1), 13–24. DOI: 10.1002/chp.47

Gwynne-Jones, D. P., Gwynne-Jones, J. H. & Wilson, R. A. (2020). The functional outcomes of patients with knee osteoarthritis managed nonoperatively at the joint clinic at 5-year follow-up: Does

surgical avoidance mean success? *Journal of Arthroplasty, 35*(9), 2350–2356.e2351. DOI: 10.1016/j.arth.2020.04.087

Harding, P., Prescott, J., Sayer, J. & Pearce, A. (2015). Advanced musculoskeletal physiotherapy clinical education framework supporting an emerging new workforce. *Australian Health Review, 39*(3), 271–282. DOI: 10.1071/AH14208

Health Canada. (2017). *Knowledge translation planner*.

Hinman, R. S., Nicolson, P. J., Dobson, F. L. & Bennell, K. L. (2015). Use of nondrug, nonoperative interventions by community-dwelling people with hip and knee osteoarthritis. *Arthritis Care & Research, 67*(2), 305–309. DOI: 10.1002/acr.22395

Holman, H. & Lorig, K. (1992). *Perceived self-efficacy in self-management of chronic disease*. Taylor and Francis.

Hurn, S. E., Matthews, B. G., Munteanu, S. E. & Menz, H. B. (2022). Effectiveness of nonsurgical interventions for hallux valgus: a systematic review and meta-analysis. *Arthritis Care & Research, 74*(10), 1676–1688. DOI: 10.1002/acr.24603

Kennedy, D. M., Robarts, S. & Woodhouse, L. (2010). Patients are satisfied with advanced practice physiotherapists in a role traditionally performed by orthopaedic surgeons. *Physiotherapy Canada, 62*(4), 298–305. DOI: 10.3138/physio.62.4.298

Kiadaliri, A., Lohmander, L. S., Ignjatovic, M. M., Nero, H. & Dahlberg, L. E. (2023). Digital self-management of hip and knee osteoarthritis and trajectories of work and activity impairments. *BMC Musculoskeletal Disorders, 24*, 207. DOI: 10.1186/s12891-023-06322-z

Kingsbury, S. R., Gross, H. J., Isherwood, G. & Conaghan, P. G. (2014). Osteoarthritis in Europe: Impact on health status, work productivity and use of pharmacotherapies in five European countries. *Rheumatology, 53*(5), 937–947. DOI: 10.1093/rheumatology/ket463

Klem, N.-R., Kent, P., Smith, A., Dowsey, M., Fary, R., Schütze, R., O'Sullivan, P., Choong, P. & Bunzli, S. (2020). Satisfaction after total knee replacement for osteoarthritis is usually high, but what are we measuring? A systematic review. *Osteoarthritis and Cartilage Open, 2*, 100032. DOI: 10.1016/j.ocarto.2020.100032

Laberge, M., Coulibaly, L., Berthelot, S., Borges da Silva, R., Guertin, J., Strumpf, E., Poirier, A., Zomahoun, H. & Poder T. (2021). Development and validation of an instrument to measure health-related out-of-pocket costs: The cost for patients questionnaire. *Value in Health, 24*(8), 1172–1181. DOI: 10.1016/j.jval.2021.03.016

Lafrance, S., Charron, M., Dubé, M.-O., Desmeules, F., Roy, J.-S., Juul-Kristensen, B., Kennedy, L. & McCreesh, K. (2024). The efficacy of exercise therapy for rotator cuff-related shoulder pain according to the FITT principle: A systematic review with meta-analyses. *Journal of Orthopaedic and Sports Physical Therapy, 54*(8), 499–512. DOI: 10.2519/jospt.2024.12453

Lafrance, S., Vincent, R., Demont, A., Charron, M. & Desmeules, F. (2023). Advanced practice physiotherapists can diagnose and triage patients with musculoskeletal disorders while providing effective care: A systematic review. *Journal of Physiotherapy, 69*(4), 220–231. DOI: 10.1016/j.jphys.2023.08.005

Larsen, J. B., Roos, E. M., Laursen, M., Holden, S., Johansen, M. N., Rathleff, M. S., Arendt-Nielsen, L., Rasmussen, S. & Skou, S. T. (2022). Five-year follow-up of patients with knee osteoarthritis not eligible for total knee replacement: Results from a randomised trial. *British Medical Journal Open, 12*(11), e060169. DOI: 10.1136/bmjopen-2021-060169

Lebedeva, Y., Churchill, L., Marsh, J., MacDonald, S. J., Giffin, J. R. & Bryant, D. (2021). Wait times, resource use and health-related quality of life across the continuum of care for patients referred for total knee replacement surgery. *Canadian Journal of Surgery, 64*(3), e253–e264. DOI: 10.1503/cjs.003419

Leifer, V. P., Katz, J. N. & Losina, E. (2022). The burden of OA-health services and economics. *Osteoarthritis and Cartilage, 30*(1)*,* 10–16. DOI: 10.1016/j.joca.2021.05.007

Lewis, J. S., Stokes, E. K., Gojanovic, B., Gellatly, P., Mbada, C., Sharma, S., Diener, I. & O'Sullivan, P. (2021). Reframing how we care for people with persistent non-traumatic musculoskeletal pain: Suggestions for the rehabilitation community. *Physiotherapy, 112*, 143–149. DOI: 10.1016/j.physio.2021.04.002

Lewis, P., Gill, D., McAuliffe, M., McDougall, C., Stoney, J., Vertullo, C., Wall, C., Corfield, S., Du, P., Holder, C., Harries, D., Edwards, S., Xu, A., Lorimer, M., Cashman, K. & Smith, P. (2024). *Hip, knee and shoulder arthroplasty: 2024 annual report*. Australian Orthopaedic Association.

Lowry, V., Lavigne, P., Zidarov, D., Matifat, E., Cormier, A.-A. & Desmeules, F. (2024). A systematic review of clinical practice guidelines on the diagnosis and management of various shoulder disorders. *Archives of Physical Medicine and Rehabilitation, 105*(2)*,* 411–426. DOI: 10.1016/j.apmr.2023.09.022

Lukersmith, S., Woods, C., Salvador-Carulla, L., Niyonsenga, T., Mohanty, I., Gutierrez-Colosia, M. R., Diaz-Milanes, D., Garcia-Alonso, C. R. & Büsst, C. J. (2025). A comparative evaluation of 23 projects on mental health and wellbeing for veterans and first responders. *Comprehensive Psychiatry, 141*, 152599. DOI: 10.1016/j.comppsych.2025.152599

March, L., Cross, M., Tribe, K., Lapsley, H., Courtenay, B. & Brooks, P. (2002). Cost of joint replacement surgery for osteoarthritis: The patients' perspective. *Journal of Rheumatology, 29*, 1006–1014.

Michie S., van Stralen, M. M. & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science, 6*, 42. DOI: 10.1186/1748-5908-6-42.

Morris, J., Grimmer, K., Gilmore, L., Perera, C., Waddington, G., Kyle, G., Ashman, B. & Murphy, K. (2014). Principles to guide sustainable implementation of extended scope-of-practice physiotherapy workforce redesign initiatives in Australia: Stakeholder perspectives, barriers, supports, and incentives. *Journal of Multidisciplinary Healthcare, 7*, 249–258. DOI: 10.2147/JMDH.S59473

Morris, J., Twizeyemariya, A. & Grimmer, K. (2018). What is the current evidence of the impact on quality of life whilst waiting for management/treatment of orthopaedic/musculoskeletal complaints? A systematic scoping review. *Quality of Life Research, 27*, 2227–2242. DOI: 10.1007/s11136-018-1846-z

Morris, J. H. & Grimmer, K. (2014). Non-medical prescribing by physiotherapists: Issues reported in the current evidence. *Manual Therapy, 19*(1), 82–86. DOI: 10.1016/j.math.2013.04.003

Morris, J. H., James, R. E., Davey, R. & Waddington, G. (2015). What is orthopaedic triage? A systematic review. *Journal of Evaluation in Clinical Practice, 21*(1), 128–136. DOI: 10.1111/jep.12260

Munteanu, S. E., Buldt, A., Lithgow, M. J., Cotchett, M., Landorf, K. B. & Menz, H. B. (2024). Non-surgical interventions for treating osteoarthritis of the big toe joint. *Cochrane Database of Systematic Reviews*. DOI: 10.1002/14651858.CD007809.pub3

Musculoskeletal Network. (2019). *Osteoarthritis chronic care program*. Model of Care. NSW Agency for Clinical Innovation.

Naik, L., Reid, D., White, S. & Neville, S. (2023). Drivers and barriers to the development of musculoskeletal advanced physiotherapy practitioner roles in New Zealand. *New Zealand Journal of Physiotherapy, 51*(2), 125–137. DOI: 10.15619/nzjp.v51i2.356

Nancarrow, S. & Borthwick, A. (2021). *The allied health professions: A sociological perspective*. Bristol University Press.

National Health Service (UK). (2017). *Elective care transformation NHS England: Transforming musculoskeletal and orthopaedic elective care services. A handbook for local health and care systems.*

National Institute for Health and Care Excellence. (2020). *Osteoarthritis: Care and management*. Clinical guideline CG177.

Nelson, J. (2017). Using conceptual depth criteria: Addressing the challenge of reaching saturation in qualitative research. *Qualitative Research, 17*(5), 554–570. DOI: 10.1177/1468794116679873

Nilsen, P. (2015). Making sense of implementation theories, models and frameworks. *Implementation Science, 10*, 53. DOI: 10.1186/s13012-015-0242-0

Nissen, N., Holm, P. M., Bricca, A., Dideriksen, M., Tang, L. H. & Skou, S. T. (2022). Clinicians' beliefs and attitudes to physical activity and exercise therapy as treatment for knee and/or hip osteoarthritis: A scoping review. *Osteoarthritis and Cartilage, 30*(2), 260–269. DOI: 10.1016/j.joca.2021.11.008

Panunzi, S., Maltese, S., De Gaetano, A., Capristo, E., Bornstein, S. R. & Mingrone, G. (2021). Comparative efficacy of different weight loss treatments on knee osteoarthritis: A network meta-analysis. *Obesity Reviews, 22*(8), e13230. DOI: 10.1111/obr.13230

Payakachat, N., Ali, M. M. & Tilford, J. M. (2015). Can the EQ-5D detect meaningful change? A systematic review. *Pharmacoeconomics, 33*, 1137–1154. DOI: 10.1007/s40273-015-0295-6

Poder, T. G., Coulibaly, L. P., Hassan, A. I., Conombo, B. & Laberge, M. (2022). Test-retest reliability of the Cost for Patients Questionnaire. *International Journal of Technology Assessment in Health Care, 38*(1), e65. DOI: 10.1017/s0266462322000460

Pons, M., Alvarez, F., Solana, J., Viladot, R. & Varela, L. (2007). Sodium hyaluronate in the treatment of hallux rigidus. A single-blind, randomized study. *Foot & Ankle International, 28*(1), 38–42. DOI: 10.3113/fai.2007.0007

Powell, J. K., Lewis, J., Schram, B. & Hing, W. (2024). Is exercise therapy the right treatment for rotator cuff-related shoulder pain? Uncertainties, theory, and practice. *Musculoskeletal Care, 22*(2), e1879. DOI: 10.1002/msc.1879

Queensland Government. (2022). *Queensland reporting hospitals, Specialist outpatient*. https://web.archive.org/web/20221209060619/http://www.performance.health.qld.gov.au/Hospital/SpecialistOutpatient/99999

Rabin, R. & de Charro, F. (2001). EQ-5D: A measure of health status from the EuroQol Group. *Annals of Medicine, 33*(5), 337–343. DOI: 10.3109/07853890109002087

Redwood, L., Currow, D., Kochovska, S. & Thomas, S. J. (2024). Australian population norms for health-related quality of life measured using the EQ-5D-5L, and relationships with sociodemographic characteristics. *Quality of Life Research, 33*, 721–733. DOI: 10.1007/s11136-023-03558-z

Roos, E., Barton, C., Davis, A., McGlasson, R., Kemp, J., Crossley, K., Lin, J. & Skou, S. (2018). 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, 52,* 1544–1545. DOI: 10.1136/bjsports-2017-098904

Royal Australian College of General Practitioners. (2018). *Guideline for the management of knee and hip osteoarthritis.* https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/knee-and-hip-osteoarthritis

Salvador-Carulla, L., Fernandez, A., Sarma, H., Mendoza, J., Wands, M., Gandre, C., Chevreul, K. & Lukersmith, S. (2021). Impact of Ed-LinQ: A public policy strategy to facilitate engagement between schools and the mental health care system in Queensland, Australia. *International Journal of Environmental Research and Public Health, 18*(15), 7924. DOI: 10.3390/ijerph18157924

Salvador-Carulla, L., Lukersmith, S. & Woods, C. (2024). *The Global Impact Analytics Framework: Brief overview*. University of Canberra. https://www.canberra.edu.au/content/dam/uc/documents/research/hri/GIAF-framework-and-taxonomy%20-brief-overview-20241113.pdf

Salvador-Carulla, L., Woods, C., de Miquel C. & Lukersmith, S. (2024). Adaptation of the technology readiness levels for impact assessment in implementation sciences: The TRL-IS checklist. *Heliyon, 10*(9), e29930. DOI: 10.1016/j.heliyon.2024.e29930

Savvari, P., Skiadas, I., Papadakis, S., Psychogios, V., Argyropoulou, O., Pastroudis, A., Skarpas, G., Tsoutsanis, A., Garofalakis, A. & Katsifis, G. (2023). The impact of moderate to severe osteoarthritis on the physical performance and quality of life: a cross-sectional study in Greek patients (PONOS study). *BMC Musculoskeletal Disorders, 24*, 651.

Saxon, R. L., Gray, M. A. & Oprescu, F. I. (2014). Extended roles for allied health professionals: an updated systematic review of the evidence. *Journal of Multidisciplinary Healthcare, 7*, 479–488. DOI: 10.2147/jmdh.S66746

Sedgwick, P. & Greenwood, N. (2015). Understanding the Hawthorne effect. *BMJ, 351*, h4672. DOI: 10.1136/bmj.h4672

Shamus, J., Shamus, E., Gugel, R. N., Brucker, B. S. & Skaruppa, C. (2004). The effect of sesamoid mobilization, flexor hallucis strengthening, and gait training on reducing pain and restoring function in individuals with hallux limitus: A clinical trial. *Journal of Orthopaedic & Sports Physical Therapy, 34*(7), 368–376. DOI: 10.2519/jospt.2004.34.7.368

Simick Behera, N., Duong, V., Eyles, J., Cui, H., Gould, D., Barton, C., Belton, J., Hunter, D. & Bunzli, S. (2024). How does osteoarthritis education influence knowledge, beliefs, and behavior in people with knee and hip osteoarthritis? A systematic review. *Arthritis Care & Research, 76*(11), 1511–1531. DOI: 10.1002/acr.25391

Skou, S. & Roos, E. (2017). Good Life with osteoArthritis in Denmark (GLA:D™): Evidence-based education and supervised neuromuscular exercise delivered by certified physiotherapists nationwide. *BMC Musculoskeletal Disorders, 18,* 72. DOI: 10.1186/s12891-017-1439-y

Smith, J., Flowers, P. & Larkin, M. (2012). *Interpretative phenomenological analysis: Theory, method and research*. SAGE.

St Vincent's Hospital Melbourne. (2018). *Facilitating osteoarthritis management in the community.* Innovation Fund Project.

Stanhope, J., Grimmer-Somers, K., Milanese, S., Kumar, S. & Morris, J. (2012). Extended scope physiotherapy roles for orthopedic outpatients: An update systematic review of the literature. *Journal of Multidisciplinary Healthcare, 5*, 37–45. DOI: 10.2147/JMDH.S28891

Strengthening Medicare Taskforce. (2022). *Unleashing the potential of our health workforce: Scope of practice review* [Final report]. Department of Health and Aged Care. https://www.health.gov.au/resources/publications/unleashing-the-potential-of-our-health-workforce-scope-of-practice-review-final-report

Stubbs, B., Aluko, Y., Myint, P. K. & Smith, T. O. (2016). Prevalence of depressive symptoms and anxiety in osteoarthritis: A systematic review and meta-analysis. *Age and Ageing, 45*(2), 228–235. DOI: 10.1093/ageing/afw001

Tong, A., Sainsbury, P. & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care, 19*(6), 349–357. DOI: 10.1093/intqhc/mzm042

Vedanayagam, M., Buzak, M., Reid, D. & Saywell, N. (2021). Advanced practice physiotherapists are effective in the management of musculoskeletal disorders: A systematic review of systematic reviews. *Physiotherapy, 113*, 116–130. DOI: 10.1016/j.physio.2021.08.005

Verhagen, A. P., Ferreira, M., Reijneveld-van de Vendel, E. A. E., Teirlinck, C. H., Runhaar, J., van Middelkoop, M., Hermsen, L., de Groot, I. B. & Bierma-Zeinstra, S. M. A. (2019). Do we need

another trial on exercise in patients with knee osteoarthritis? No new trials on exercise in knee OA. *Osteoarthritis and Cartilage, 27*(9), 1266–1269. DOI: 10.1016/j.joca.2019.04.020

Victorian Musculoskeletal Clinical Leadership Group. (2018). *Victorian model of care for osteoarthritis of the hip and knee*. MOVE Muscle Bone & Joint Health. https://muscha.org/wp-content/uploads/2018/07/MoC_Final-report.pdf

Wallis, J. A., Taylor, N. F., Bunzli, S. & Shields, N. (2019). Experience of living with knee osteoarthritis: A systematic review of qualitative studies. *British Medical Journal Open, 9*(9), e030060. DOI: 10.1136/bmjopen-2019-030060

Woods, C. E., Lukersmith, S. & Salvador-Carulla, L. (2024). Mapping review of 'proof-of-concept' in mental health implementation research using the TRL framework: A need for a better focus and conceptual clarification. *British Medical Journal Open, 14*(8), e080078. DOI: 10.1136/bmjopen-2023-080078

Further reading

Implementation science

Alonso-Trujillo, F., Salinas-Pérez, J. A., Gutiérrez-Colosía, M. R., González-Caballero, J. L., Pinzón Pulido, S., Jiménez González, S. … & Salvador-Carulla, L. (2021). Evaluación del impacto de un plan multisectorial de promoción de la salud y el bienestar social en Andalucía [Impact assessment of a multisectoral plan for the promotion of health and social wellbeing in Andalusia]. *Gaceta Sanitaria, 34*(6), 615–623. DOI: 10.1016/j.gaceta.2019.01.001

Chung, Y., Salvador-Carulla, L., Salinas-Pérez, J. A., Uriarte-Uriarte, J. J., Iruin-Sanz, A. & García-Alonso, C. R. (2018). Use of the self-organising map network (SOMNet) as a decision support system for regional mental health planning. *Health Research Policy and Systems, 16*(1), 1–17. DOI: 10.1186/s12961-018-0308-y

Glasgow, R. E., Vogt, T. M. & Boles, S. M. (1999). Evaluating the public health impact of health promotion interventions: The RE-AIM framework. *American Journal of Public Health, 89*(9), 1322–1327. DOI: 10.2105/AJPH.89.9.1322

Holtrop, J. S., Estabrooks, P. A., Gaglio, B., Harden, S. M., Kessler, R. S., King, D. K., Kwan, B. M., Ory, M. G., Rabin, B. A., Shelton, R. C. & Glasgow, R. E. (2021). Understanding and applying the RE-AIM framework: Clarifications and resources. *Journal of Clinical and Translational Science*, *5*(1), e126. DOI: 10.1017/cts.2021.789

Lukersmith, S. (2017). *A taxonomy of case management: Development, dissemination, and impact* [PhD thesis, University of Sydney]. Sydney Digital Theses. http://hdl.handle.net/2123/17000

Nilsen, P. (2015). Making sense of implementation theories, models and frameworks. *Implementation Science,10,* 53. DOI: 10.1186/s13012-015-0242-0

Romero-Lopez-Alberca, C., Alonso-Trujillo, F., Almenara-Abellan, J. L., Salinas-Perez, J. A., Gutierrez-Colosia, M. R., Gonzalez-Caballero, J.-L., Pinzon Pulido, S. & Salvador-Carulla, L. (2021). A semiautomated classification system for producing service directories in social and health care (DESDE-AND): Maturity assessment study. *Journal of Medical Internet Research, 23*(3), e24930. DOI: 10.2196/24930

Salinas-Perez, J. A., Gutiérrez-Colosia, M. R., Romero Lopez-Alberca, C., Poole, M., Rodero-Cosano, M. L., Garcia-Alonso, C. R. & Salvador-Carulla, L. (2020). Todo está en el mapa: Atlas Integrales de Salud Mental para la planificación de servicios. Informe SESPAS 2020 [Everything is on the map: Integrated mental health atlases as support tools for service planning. SESPAS Report 2020]. *Gaceta Sanitaria, 34*(supplement 1), 11–19.

Project protocol

Improvement and Innovation Team. (2018). *Behaviour change theory*. Choosing Wisely Project. Peninsular Health. https://www.choosingwisely.org.au/assets/COM-B_model.pdf

National Health Service (UK). (2017). *Elective care transformation NHS England: Transforming musculoskeletal and orthopaedic elective care services. A handbook for local health and care systems.*

Richardson, J. R. J., Peacock, S. J., Hawthorne, G., Iezzi, A., Elsworth, G. & Day, N. A. (2012). Construction of the descriptive system for the assessment of quality of life AQoL-6D utility instrument. *Health and Quality of Life Outcomes, 10*(1), 1–9. DOI: 10.1186/1477-7525-10-38

Tan, B. Y., Pereira, M. J., Yang, S.-Y., Hunter, D. J., Thorgaard Skou, S., Thumboo, J. & Car, J. (2020). Collaborative model of care between orthopaedics and allied healthcare professionals in knee osteoarthritis (CONNACT): Study protocol for an effectiveness-implementation hybrid randomized control trial. *BMC Musculoskeletal Disorders, 21*(1), 684.

Appendices

Appendix 1: Definitions

Canberra Health System (CHS): A range of publicly funded health services provided for people across the Australian Capital Territory (ACT) and surrounding New South Wales region.

Advanced practice physiotherapist (APP): Master-level trained expert physiotherapist with at least 5 years' experience in this field of practice. An APP must complete a credentialling program within CHS to work in an advanced scope of practice. An example is APP providing care to patients with musculoskeletal conditions, in the emergency department, walk-in clinics or orthopaedic clinics.

Advanced scope of practice describes clinical practice characterised by a high degree of autonomy and complex decision-making in the context of complexity, uncertainty and varying levels of risk. Physiotherapists working with an advanced scope have extensive experience underpinned by further education and training, and competency assessment to achieve the essential capabilities and specific skills required in the clinical setting. Advanced scope of practice is usually undertaken in a defined clinical setting and often includes practices that another professional group has traditionally undertaken.

Date received: The date at which CHS has registered a referral on the data records system.

Date of surgeon clinic: The date on which the patient has their initial face-to-face consultation with an orthopaedic surgeon.

Date of APP clinic: The date on which a patient is seen either face to face or via telehealth in the orthopaedic APP clinic by an AMP.

Discharged: The clinician and patient arrived at a shared decision that no further specialist care was required, and the patient's care is returned to the GP.

Review: The decision was made to trial an intervention or conduct an investigation and return to discuss the outcome with the health professional in a predetermined timeframe.

Cancelled referral: No record could be found regarding an appointment attended with no further follow-up records, referrals or requests for an appointment found.

Referral: A referral sent by a GP to CHS Orthopaedics by letter, fax or online HealthLink requesting an orthopaedic consultation.

Number of referrals received: The number of separate referrals sent by a GP to CHS Orthopaedics for the same condition in the same patient with separate date received entries.

Triage category: The category assigned by the AMP who has read and triaged the referral. The triage category reflects the time in which an appointment should be offered.

Table 28. Australian Institute of Health and Welfare orthopaedic triage categories

Triage category	Description
Urgent	Acute conditions which may require urgent surgery
1	Conditions for which an outpatient review is indicated within 30 days
2	Conditions for which an outpatient review is indicated within 90 days
3	Conditions for which an outpatient review is indicated within 365 days

Appendix 2: Data management

Data management of identifiable and re-identifiable data

- All identifiable data will be managed with CHS security requirements.
- **All identifiable data will be housed at Canberra Hospital** in the Trauma and Orthopaedic Research Unit or Physiotherapy Department servers, respectively.
- **For statistical analyses, a dataset will be maintained at University of Canberra**. This is a re-identifiable dataset, from which all names and date of birth are removed, and the unique identifier for the DHR is exchanged for a re-identification code in our dataset.
- University of Canberra. All data will be maintained under research security protocols at University of Canberra, with accessing the system requiring passwords and opening the files requiring passwords for limited (named) researchers to access these data.
- Canberra Health Services. All data will be maintained under patient records security protocols at CHS, with accessing the system requiring passwords and opening the files requiring passwords for limited (named) researchers to access these data.

List of people with access to project data at Canberra Health Services:

- Tom Ward, Jo Morris, Paul Smith;
- Joe Lynch, Nick Brown, Judy Stone;
- Project manager, Danealle Gilfillan;
- Michael Ceravolo, Renai de Marco, Tahlia Stewart.

List of people with access to project data at University of Canberra:

- Jennie Scarvell, Angie Fearon, Theo Niyonsenga.

List of people with access to grouped, de-identified summary data only:

- Itismita Mohanty, health economist, University of Canberra;
- Christian Barton, Kirsty Douglas, Rebecca Davey.

Appendix 3: Stakeholder interviews and quotes 2023

Working well now	Themes	Quotes	Participant
Triage process, for those referred to orthopaedic surgery at CHS	Triage assessment is accurate	Not a very long wait because I'm old	Penny, patient
	APP conducting triage from referrals generally able to identify people needing priority review.	First and foremost, that the physios are the right people to be the gatekeepers, if you like, of that list. So, I think they have the right skills and from a cost point of view for the organisation, it's the, you know, the most efficient and economical way we can do it.	Leo, exec
		So physios are doing the triage system, so they will follow the triage tool and then they will determine who's appropriate generally to come in to, to be reviewed in clinic, who needs to be seen or reviewed by an orthopaedic consultant	August, exec
		Where we do OK at the moment is during Wait 1. So when the patient gets referred by their GP into the service. We tend to do that bit, OK.	Leo, exec
		is it something that clearly does not fit the criteria for surgical input and we would return it to the referrer? Or is this something we should have a look at	Cathie, physio
		one of my ladies who had really severe knee osteoarthritis and she had done her physio that was covered by her NDIS actually. But when we did all the knee scores and stuff, she had a knee replacement within, I don't know, 6, 6 months publicly.	Green, primary care
Screening clinic provided by APPs provides an expert consultation	Face-to-face appointment in clinic with APP is thorough	It seemed appropriate and the consultation was quite extensive	Sally, patient
		the ones when we see the physio screening notes. They're fantastic	Max, surgeon
		kind of always felt that, you know, people were actually quite thoughtful about who they refer on, and they did filter out people who really didn't have anything relevant to a surgeon. So I haven't, had any complaints or issues about it	Charles, surgeon
		I think the screening clinic works quite well because I had a family member go through the clinic and it was very smooth and quite timely.	Rose, physio

Working well now	Themes	Quotes	Participant
	Screening by APP is well accepted	I think it's helpful that people then come to our clinic because we have a chance to assess them properly and see where they are and what treatment they need.	Penny, physio
		I think it's pretty good because most people, whatever they're referred for, would probably get in to see us within 6 weeks.	David, physio
		physios really speak a language that patients can understand … getting the patient to understand their condition and education and what steps they can take to so empower them	Petra, primary care
		So I went away feeling that she had a good handle on my situation. I didn't feel that, you know, I was being shunted down the line by not seeing an orthopaedic surgeon.	Sally, patient
		They do good work. They do.	Cath, surgeon
		I think that seeing the physio is a big relief to people because: A they've got something to do and. B. They feel like someone's paying attention to them, you know	Petra, primary care
		I think that having preliminary physiotherapy screening is very reasonable.	Ryan, primary care
		And when I heard about that. I thought that was fabulous.	Petra, primary care
		Well, I think it's really good because I think it really, really helps to set those patients' expectations.	Green, primary care
	Advanced PT training enables specialist high-level assessment	I think in the screening clinics is hopefully they send it to us and we, with our experience and training and then unpack the problem and direct therapy a little bit better than you know. I would hope that the generalist physio on the on the street corner like on the, in the local shop.	Cathie, physio
		For them to go and talk to someone that really knows what they're doing and that's what I love about those specialist physio and nurse clinics and because they go and see someone that really, really knows what they're talking about.	Green, primary care

Working well now	Themes	Quotes	Participant
	Recommending non-surgical strategies is an acceptable outcome after referral	When I go down to the physio again, maybe two- or three-weeks' time. I'll see what she's got to say. But she said, you know you can come back. You know that sort of thing. I was saying we got this.	Bill, patient
Confidence with CHS Health Care	Equity and access to patients	it starts with having a public clinic like that's important. Because I've been to places without public clinics, obviously, and I think that's the biggest important thing that we do is actually being able to see people who need to be seen with no cost to them	Cath, surgeon
		I don't think that's the case in the in the rest of Australia, necessarily. And so, I think that that service is actually really good.	Charles, surgeon
		in the ACT, with the EJRP and with the fact that we actually have a lot of the surgeons here doing hip and knee replacements, that waiting list is a lot less than it used to be. It has come down significantly	Bart, surgeon
	High quality of care in orthopaedics	we do a good job of actually doing the surgery, right?	Charles, surgeon
		it's well supervised. It's not like some of the areas and Wild West parts of Australia where registrars are unsupervised doing unsupervised joint replacements. Like it's all actually very safe. Like, I don't think public patients are having unsafe operations.	Charles, surgeon
		the standard of treatment once it occurs, is good	Leslie, Exec
	Elective Joint Program is working well	we have the lowest infection rates for our program in the country, so you know it's a very good … in the country!	Pete, exec
		OMG I am so lucky!	Penny, patient
		we have an extremely well-run elective joint replacement program for the inpatient surgery. Which is highly efficient	Leslie, exec
		let's say the last three, maybe four years, I've probably only referred two people into the public system, and they've both just gone … like I just wait till their Oxford Knee Score's high enough and send them through. and one of them got them done at John James	Green, primary care
	Great emergency department	they were great the medical professionals were amazing	Eliza,

Working well now	Themes	Quotes	Participant
	Obesity service is excellent	Anyway, it's the whole process. It's a 12-month process. So you go through the process with dieticians, psychologists. Everything.	patient Pete, exec
Confidence in broader health care	Positive response to the GLA:D program	No, it's [GLA:D] a wonderful program. I recommend it to people all the time. And to myself, Well basically just trying to be looking after myself, and with the exercise I guess, and knowing that I think it's manageable at this stage. Having access to the GLA:D program in the community centres is actually really good. So it was really good when GLA:D became part of the public	Sally, patient Bill, patient Charles, surgeon Green, primary care
	Great GPs	My GP is brilliant, he is very caring	Penny, patient
Referral to surgeons as a last resort	Accessing excellent allied health services first	So having GLA:D publicly available was really terrific and really if I've referred them through GLA:D publicly, then, if they still are symptomatic, then I'll refer them publicly, for something surgical. I think the resources available in the community are pretty good. So physiotherapy resources, there seems to be an abundance and certainly you can get in a timely appointment with the physiotherapist. I send everyone to that, or to Arthritis ACT, cause with the GP management plan you can draw an Arthritis ACT for 40 to 60 dollars And then their EP, their dietitian, their physio, yeah, they're all $40 each	Green, primary care Siobhan, primary care Petra, primary care
My Aged Care is excellent for people with complex needs		My Aged Care has a role for people who need multiple services, but for fit and well older people, it is unnecessary. Yes, we've just got an ACAT assessment. I've got a gardener, so that. So that was my biggest problem, my garden because I love gardening, and I love my garden. So now every fortnight we have a guy from uniting care, Jason, who's	Rose, physio Penny, patient

Working well now	Themes	Quotes	Participant
		brilliant.	
Administration	Online referral system through HealthLink to orthopaedics has streamlined systems	I recommend go, you know, do the community health intake referral and that's really, now that it's all on HealthLink, smart forms. It's really kind of, you get feedback straight away that they've got your referral, and it hasn't been falling into the ether.	Petra, primary care
		well, because we've got this system called HealthLink	Ryan, primary care
Once listed for surgery, the wait time is published	Wait 3 is reported and monitored	Once we've seen the surgeon and then they're on the waiting list to have surgery. We've got vision of that and we know how long people are waiting	Leo, exec

Needs improving now	Themes	Quotes	Participant
Optimal use of non-surgical options, is not happening	Non-surgical options under-utilised	but even when I rang the Belconnen Health Service. They were 'GLA:D program? We've never heard of that. You sure you've got the right number?'	Sally, patient
		I did go to a [private] physio couple of years ago. Pretty much the same sort of thing. And it didn't seem to work at all, so I didn't really continue with it. Yeah, there was only one visit or two visits. Oh, that was in no way [an exercise program]	Bill, patient
		I hadn't done GLA:D at that time [of the referral to orthopaedics]. I did all that after, cause that she sent me off to that physio at the same time.	Eliza, patient
	Not exhausting all non-surgical options first	That's what's happened in the past. It's just settled down in a few days	Bill, patient
		No [I haven't done formal exercises], I do try and walk when I can.	Katie, patient
		5 to 10% probably [have exhausted non-surgical options]. I think a lot have trialled something	Max, surgeon
		we can book a patient on and they'll do nothing. But you know their diet or their fitness or their muscle tone and strength. Expect the surgery to do the whole thing, which is clearly suboptimal.	Charles, surgeon
		osteoarthritis of the knee as their first presentation and they then should be referred to appropriate care in mind with you know, clinical standards at that point	Cathie, physio
	Patients referred to surgery, sit and wait, instead of taking up first-line chronic disease management strategies like education, exercise, nutrition, etc.	A lot of them, their BMI is still too high, you know. Unfortunately, they see surgery as a solution to a multifactorial problem, which is to do with lifestyle and diet and things like that.	Charles, surgeon
		I've just been waiting (since I saw the GP and had an X-ray 2 years ago)	Katie, patient
		They're not, as far as we know, anyway, having any intervention. Or if they are we don't know what it is and we have no line of sight of that intervention.	Leo, exec

Needs improving now	Themes	Quotes	Participant
	Non-optimal medication management	I have done. I take Panadol Osteo. I used to just take three at nighttime just to help me sleep. And then the chemist said to me one day, 'now you're not taking any more than six of those a day, are you?' I said, proud as punch. 'No, no, I just take my three at nighttime'. And he looked at me and went crook. Said 'no', they're made to take two every, eight or six hours or eight hours or whatever. Right? So that's what I do now.	Felicity, patient
		Which I took for a while [NSAIDs], but then, well, I read up about them. They're not real good for your body.	Katie, patient
Public messaging campaign that surgery is a last resort: not happening	Attitude that joint replacement is inevitable	a trajectories problem, like the GP might not realise how they've set in motion this almost, this trajectory of a person through their referral.	Penny, physio
		This patient then has this expectation that they require surgery and it's almost like you've set the destiny in order for them.	Penny, physio
		Until we teach the community that this is what we need to do. They still believe 'I go to my GP. I go to the surgeon, I get the surgery. I go away.'	Rachel, primary care
		I think not everybody. Some people think they need a knee replacement whereas are keen to avoid surgery as much as possible	Petra, primary care
		a lot of patients believe osteoarthritis must always equal joint replacement and that's not necessarily the case.	Siobhan, primary care
Health professionals not following ACSQHC standards	Considering that X-rays are necessary for diagnosis	She didn't say much at all. She gave just basically said we'll get some scans, and get all that done and so forth. And we looked at them. And she said, 'right you know they're not the worst in the world, but we can see how we go from there' and basically that's it.	Bill, patient
	Primary care team not exhausting non-surgical options prior to referral to surgeon	we could do a lot, we could improve the amount of education we give our GPs and the amount of liaising and outreach that we do for our GPs to inform them of the kind of people that we see and the kind of patients and symptoms who need arthroplasties.	Cath, surgeon

Needs improving now	Themes	Quotes	Participant
		that's not a criticism of GPs. From my perspective, it feels like the GPs see these people, they're very busy, and then they just refer on without exhausting the preoperative options.	Max, surgeon
Referred for surgery too early	Anticipating a long wait, so referring early	Definitely not [ready for surgery]	Bill, patient
		And , I know it's [TKR] not going to happen immediately. I know it's going to be a long wait. And that's why I thought I'd get him [GP] to start the process. Probably because I know by the time I get there, I'll probably really want it or need it.	Eliza, patient
		I'd had in mind that I might not be ready, but I could go on the waiting list. Because of course that can be quite extended.	Sally, patient
		might be thinking this person needs a replacement in six or seven years, so I'll refer them now because it may be six or seven years before they get their replacement. And then people are fearful of dropping off the list, not being part in the system of uh, feeling like I don't need a replacement now.	Penny, physio
		I think it's to get the patients onto the list so that they can start waiting.	Cath, surgeon
		There are patients who do turn up and their arthritis certainly has not reached the stage where they need a knee replacement	George, surgeon
		patients know that the wait list is huge. So in terms of getting in to see us and getting on the list, since I've had some patients come and they go 'oh! I just want to go on the list just in case I need a knee replacement down the track'.	Max, surgeon
	Dual referrals public + private surgical pathways, or allied health + surgeon. Creates inefficiencies and mixed messages for patients	that might then, make it hard to get people to commit to the non-surgical options	Penny, physio
		Sometimes the patients coming to me are already on a wait list to see a surgeon and sometimes they're on a wait list for surgery.	David, physio

Needs improving now	Themes	Quotes	Participant
		So, if they've been seen by one of the public orthopaedic surgeons, I'd refer them to them privately as well because the vast majority of them work privately as well, right. So, the patient at least knew who they were seeing rather than starting afresh.	Siobhan, primary care
Health systems improvements needed	Gap in care responsibility for those in Wait 2	Where do I start? I think this is really valuable, what you've identified, because I've been saying this for years about the silent waiting list. I think we're all aware of it that it is completely unmeasured. And it is a pool of people with significant morbidity who are kind of, there's nobody looking out for them, speaking out for them because they are, they are hidden in the community.	Bart, surgeon
		the enormous penalty for someone who needs surgery, it's time and disability, and that means that by the time they have surgery, they'll be significantly worse than people who are not in the public system.	Leslie, exec
		So, the question is, is it then on the hospital system and their responsibility to break down the barriers as to why these wait time are so huge.	Cath, surgeon
		People have been referred and hopefully seen in triage and then referred on to an orthopaedic surgeon's waiting list and they just sit on that forever and ever, waiting to be seen by an orthopaedic surgeon.	Leo, exec
		by the time that person eventually gets to see an orthopaedic surgeon in a clinic that waiting time, and may be several years	Leslie, exec
	Accountability and monitoring of patients waiting	First of all, it's taking ownership of a patient, which I think there's a lack of that sometimes in the public system. People don't actually own, like they don't take ownership of the patient. And the best way to treat someone appropriately is, first of all, to take ownership of them. And have their best interests in mind	Bart, surgeon
		It's terrible that the government's only … I mean I can understand that it's difficult to measure that pool [waiting], It's easier to measure something when you've got an identified patient who's on a waiting list.	Charles, surgeon

Needs improving now	Themes	Quotes	Participant
		I don't think they want that data to be discovered because it's a waiting list to get on the waiting list and they being you know, whoever the government statisticians amongst the government don't want it to be better because it's huge.	Charles, surgeon
		key performance indices are sadly lacking.	Leslie, exec
		So that data is not collected or reported anywhere!	Leo, exec
		that waiting time is never, never appears on any official waiting list statistic or anything like that. That's a hidden waiting time.	Leslie, exec
Imperative for change	We need systems to change	It's utterly hopeless. So, you know, when I did clinics to do catch up, we were seeing people been waiting for years.	Charles, surgeon
		Because the wait time are getting the public clinic are so long that my patients end up in the private clinic. Their arthritis is very advanced.	George, surgeon
	Patients deteriorating in Wait 2	the enormous penalty for someone who needs surgery, it's time and disability, and that means that by the time they have surgery, they'll be significantly worse than people who are not in the public system.	Leslie, exec
		all their comorbidities become much worse. They're sicker. They're deconditioned. A day of operating in the public system is like stepping into a boxing room with paper bag over your head. You don't know where you're going to get hit. Because those people have been languishing on the waiting list, for years. They're anaesthetically unwell and surgically unwell.	Leslie, exec
		people who did need to be seen, and their pathology had progressed significantly.	Charles, surgeon
		You know, it's just like, it's not at all ideal,	
	Communication on wait time and expectations needs improving	There hasn't even been, not even an acknowledgement they received it. I don't think.	Eliza, patient
		Yeah, I just tell them 'it's me', I'm still waiting on the list. I'm good and they've been really lovely every time I've called them. And yeah, roughly every 6 months, 'just checking. I'm still making my way up the list'. She said. 'Oh, it's not a list'. She said you get prioritised in relation to your need and how long you've been waiting, and yes, the categories, of you know, where you are on three categories.	Felicity, patient

Needs improving now	Themes	Quotes	Participant
		If they just have that little feedback mechanism, I think that the wait suddenly becomes much more tolerable, and it could be automated like that.	Ryan, primary care
		I have had patients who think they have been on the public waiting list for 3 years for a joint replacement only to find out that their referral was never received and/or processed and they have to start again at the bottom of the waiting list	Petra, primary care
	Referring in to community care is very difficult	No one sends them to Canberra Health Services because nobody really knows how to refer them. It's this big mystery that you can never get in and no, nobody actually has.	Eric, primary care
		But it's just, you know a long, long wait for each and every service right? And if they're over 65, it has to be done through 'My Aged Care', which is then a whole lot of new forms and I don't know that I've even ever successfully got anyone to get services.	Green, primary care
		I don't know, I don't know the last time I tried it.	Green, primary care
	Medicare is not set up to manage people with chronic or complex conditions	people very rarely come in with one issue. They usually come in with a shopping list.	Petra, primary care
		I've only got five allied health services per 12 months, and they're out of pocket.	Green, primary care
Acute hospital resources	Clinics lack space and available time	we have a few surgeons who have requested extra clinics but there is no time.	Max, surgeon
		there's a massive waitlist [for clinics]	Cath, surgeon
		say if you see a patient in a clinic and you need more tests or investigations, you can't see them for another 4 weeks. That's the like, that is the next time	Cath, surgeon
	Inefficiencies in clinics	sometimes it will be that the first four patients you see don't have any appropriate imaging. So you have to then send them off to X-ray. That whole process takes another hour for those patients to be in clinic. So big waste of clinic space and time and resources and everything.	Cath, surgeon

Needs improving now	Themes	Quotes	Participant

Model of care	Themes	Quotes	Participant
Key principles – First-line care	First-line care avoids surgery	In Queensland, we had to make a few categories of time, and certain characteristics of disease for osteoarthritis, it would have to be documented failure of allied health, particularly physiotherapy	Siobhan, primary care
	Educating the community on management of osteoarthritis	Chronic conditions, one of the most key things, when you step back from it, is getting the patient to understand their condition with education about what steps they can take to so empower them. The physio empowers the patient and provides sensible suggestions for treatment.	Petra, primary care
		So, yes, if we change people's kind of mindset from, 'yes, I've got knee arthritis. I need a knee replacement'. To 'I've got knee arthritis. I need to see my physio and lose weight.'	Petra, primary care
	Public relations campaign for 'I've got this'	We need to teach the community why we have this program. And we need to take that education of it right out wide. You know it's got to be global and we've got to keep talking about it. Because we've got to teach the community that 'this is why we do these things'.	Rachel, primary care
		When I go down to the physio again, maybe two- or three-weeks' time. I'll see what she's got to say. But she said, you know you can come back. You know that sort of thing. I was saying we got this.	Bill, patient
	MoC commences pathway in community and self-efficacy, realigning the pathway (from surgery to self-management)	they're discharged with the understanding like, look, this is, you've made a great start and you've felt the benefits and continuing and exercise program at home will maintain the benefits … If things change down the track, then just refer yourself.	David, physio

Model of care	Themes	Quotes	Participant
		Maybe de-threatening the problem, from something that needs some kind of drastic intervention, that can be managed at a community centre. It's a manageable problem that, you know, may be less serious than what it may have been projected as.	Penny, physio
		People need to have that shift in their understanding of what the problem is in order to start managing it well,	Penny, physio
Key principles – Acute services in hospitals, chronic care in the community	Right time, right place to see our patient	what we're actually trying to do is get people out of the acute campus really … what you've potentially could do is uplift the whole thing and put it in the community and have a multidisciplinary clinic	Mary, exec
		So the population and what they need can be planned, you know, to be seen in the right place at the right time	Mary, exec
	Expert consultation and advice in the community	The person needs to be assessed and then explain to them what their problem is and how it works.	Penny, physio
		So if I referred to a knee osteoarthritis clinic and it provided access to the dietitian and the chronic pain and the podiatrist, in a time-effective way. Yep, that would be awesome.	Green, primary care
Key principles – equity	Support and equity for vulnerable	there are people on that waiting list that don't have the choice, yes. They really don't have the choice. And they're the people I tend to refer when they're severe enough to be triaged	Green, primary care
		a lot of people we included, will happily see anyone on the GP send along to the rooms and book them on either public or private lists and that can, you know. I am well aware that some people will therefore jump the queue to see a surgeon right by paying, you know, a couple of 100 bucks or whatever. And there's an equity issue with that.	Charles, surgeon

Model of care	Themes	Quotes	Participant
		And so and the cost is prohibitive, to fund it themselves. They can't afford it. So then they end up in the public system.	Bart, surgeon
		I think if it's going to be covered by public health then it should be free.	Max, surgeon
		Some people can't afford to see a specialist in the rooms cause it's $220.00 for an initial consultation with me. It's a lot of money for some people	George, surgeon
		Which is where I actually personally think, the way we should order the list is by need. So not actually by time at all. We need to be able to order it based on symptoms and priorities.	Leo, exec
Transitions to surgical services are efficient and fast			
Responsive system that will respond if patient deteriorates, e.g. capacity for patient to phone in, capacity for regular review	Keeping in touch with patients for 12-month review	Yeah, well that would be good (in response to 12-month review model)	Eliza, patient
		When it's the right time and hopefully they'll do it..	Katie, patient
		Oh, that'd be good. There's a lot of people, I think, would want to see somebody before then, maybe in 6 months' time or whatever. To follow up to see if they're getting worse. I think that'd be great idea. So you'd know then, righto, this person is getting worse. You say, put them on the program for surgery.	Bill, patient
		when if someone does exhaust [AH intervention], is ready for surgery, and you know they go 'right. OK. It's time to see the surgeon'.	Charles, surgeon
		I guess a way to be able to identify the patients that are more severe or … they've had an acute deterioration … there [is] a way to effectively flag those patients for review.	Siobhan, primary care

Model of care	Themes	Quotes	Participant
		Is this a person that has already maximised whatever therapy they can use in the community, and has adhered to that as well, and so therefore, you know, we could, we can't really afford to sit and wait for as long as what we have	Siobhan, primary care
	An exception – occasionally a surgeon is needed to say 'no' to a patient	we see people like that in clinic who are entirely unsuitable for an arthroplasty. Don't get referred, and I think that's because we're the only people who can tell them no.	Cath, surgeon
	Timely and appropriate care	If they have a medium Oxford Knee Score, then that person may well benefit from a much more structured, non-surgical approach in terms of filtering people initially. And then appropriate triage could occur by that musculoskeletal physiotherapist	Leo, exec
		the integration of each of these things with each other. So for example, if someone gets seen, say by screening and they go on, oh, this person is ready and they're like their pain is horrendous and they really need it, that we can facilitate getting them in quickly. So having that kind of closed loop where, you know, you can refer	Max, surgeon
Knee replacement is performed for patients who have exhausted non-surgical alternatives	Patient is 'ready for surgery'	My main utility to the healthcare system is to do operations. So, they should come to my clinic when they are ready to have a knee replacement done.	George, surgeon
		Then trialling all of that non operative stuff. And then by the time they get to us the majority of patients we see, should be booked for surgery. Because they're at that point by the time they get to us.	Max, surgeon
Key principles – All patients need assessment, and good care	Patients need to be seen and assessed, not wait, without having been assessed	The push is to obviously be reviewing all of these patients, irrespective of whether they need surgery, or it's thought that they need surgery or not, to make sure that they're best prepared for surgery or perhaps they can avoid surgery, and they get getting the best management care in the interim.	August, exec

Model of care	Themes	Quotes	Participant
		And you get that initial benchmark and then you know what you're working for, don't you?	Eliza, patient
Needs map	Patients need support to manage ongoing self-management	But even when I rang the Belconnen Health Service to book in for it, too. Because the physio was really helpful with all of that. She just sat there with me and did all the paperwork with me, which was such a relief, because otherwise I could have put off and not done it.	Sally, patient
		I think sometimes, we don't think enough. But by that training like you say, you're getting that the people to come in, you know, every 6 months, 12 months or whatever it is, I think and then. Watching them each year or whatever I think is a good idea.	Bill, patient
		if you really work on the exercises and because things kind of fell apart for me after I broke my wrist. Yeah, I didn't continue with the exercises which I do hope to get back to.	Sally, patient
In any model the clinic needs to be able to	Direct referrals to allied health	I really like your idea of community-based centres, where if people don't have to do the whole program. If they're supported with allied health. Yes, while they're on the surgical waiting list, but there's not a time delay to getting on the surgical waiting list.	Green, primary care

Model of care	Themes	Quotes	Participant
	Direct referrals to surgical team	we'd be able to write the, you know, physio to orthopaedic surgeon referral directly,	David, physio
		It wouldn't be so much as a multidisciplinary knee management pathway, but it will also have that other pathway as well, the surgical pathway.	Petra, primary care
	Capacity to review, monitor and act if patient deteriorates	When it's the right time and hopefully they'll do it.	Katie, patient
		So, I would probably see if I can go back for another assessment [with a physio] at the orthopaedic clinic at the hospital.	Sally, patient
	Identify complex patients who need case management – e.g. psychosocial assessment, carer support, discharge planning, anaesthetic workup	So he has a lot of falls, so you know the one thing that I was worried about when I had my knee. Least. Hmm, what was going to happen after? You know what I mean? I don't know what happens. I can't remember.	Penny, patient
		Gosh, I'm terrified of having it because of my heart attack and strokes. I'm terrified of having it done. But this is not going to go away. Do you know what I mean?	Penny, patient

Model of care	Themes	Quotes	Participant
Strong support for APP Screening of patients with a referral to the orthopaedic surgical team	APPs experts at thorough assessment	it would be good to be able to triage people [by seeing them] because it's hard when some of the referrals that we get don't have a lot of information and people symptoms aren't necessarily reflected in their X-rays.	Max, surgeon
		So I went away feeling that she had a good handle on my situation. I didn't feel that, you know, I was being shunted down the line by not seeing an orthopaedic surgeon.	Sally, patient
		For them to go and talk to someone that really knows what they're doing and that's what I love about those specialist physio and nurse clinics and because they go and see someone that really, really knows what they're talking about.	Green, primary care
		I think that having preliminary physiotherapy screening is very reasonable.	Ryan, primary care
	Expertise of advanced practitioners in appropriate	this is where the role of something like a dedicated orthopaedic advanced practice nurse or physio that was assigned to that kind of 'scope' would be invaluable.	Max, surgeon
		I think in the screening clinics, hopefully they send it to us, and we with our experience and training, then unpack the problem and direct therapy a little bit better than, you know. I would hope that the generalist physio in the local shop.	Cathie, physio
		First and foremost, that the physios are the right people to be the gatekeepers, if you like, of that list. So I think they have the right skills and from a cost point of view for the organisation, it's the, you know, the most efficient and economical way we can do it.	Leo, exec
	APPs make good referral decisions	Really, you do not want surgeons to be the initial triaging people necessarily, because surgeons are trained to see who needs surgery. And get that, get that operation done.	August, exec
		or whether people just need triaging and then sending to another multidisciplinary clinic	Leo, exec

Model of care	Themes	Quotes	Participant
		physios really speak a language that patients can understand … getting the patient to understand their condition and education and what steps they can take to so empower them	Petra, primary care
	APPs communicate well with patients	I think that seeing the physio is a big relief to people because: A they've got something to do and. B. They feel like someone's listening to them,	Petra, primary care
		They've felt really nurtured and really supported. A few of them have gone on to GLA:D. They've been really happy with the process.	Rachel, primary care
Support for community location of a clinic	Happy to have clinic outside the hospital	If there was a community clinic that's associated with the hospital? Yeah, I'd be happy to meet outside.	Eliza, patient
		Actually, I think that's a good idea [to base the screening clinic in the community]	Felicity, patient
		In the community is access. You could possibly have a couple of sites around Canberra, which in community health environments which should be absolutely suitable as long as the physical space was available and of reasonable quality	Mary, exec
		what we're actually trying to do is get people out of the acute campus really … what you've potentially could do is uplift the whole thing and put it in the community and have a multidisciplinary clinic	Mary, exec
		if you had it somewhere in the community and you had some kind of agreement even with a, with a private X-ray provider that they would both bill people and it was, you know, all done without thousands of people milling around and a lot of noise	Bart, surgeon
		outside the hospital is more practical and reduces the burden on, you know, the already overflowing resources that we have.	Max, surgeon

Model of care	Themes	Quotes	Participant
A community multidisciplinary clinic role would be different to the APP clinic role	Assessment and review, education	My vision of what would work, and make things better, would be a well-funded multidisciplinary team that dealt with a large proportion of referrals for what's presumed to be hip or knee arthritis, or knee arthritis in this case. That service was based in the community in a number of different places. They had access to evidence-based programs such as GLA:D. And such as bariatric clinic referrals, all that kind of stuff.	Charles, surgeon
	Multidisciplinary team	Something to do with the kind of obesity side. So nutritionist, dietitians, things like that, looking at kind of the whole patient psychology.	Max, surgeon
		having a having a more multidisciplinary set-up would be helpful with people like a dietitian in a perfect world it would be a psychologist and a social worker as well.	Eric, primary care
		There is a range of BMI, sort of around 40 or over. And they may well not progress that well just with one uni-modal treatment, you know for referring for an exercise program. Even if it's a really good program like GLA:D, they still may not be set up to get a lot of success if those other factors aren't addressed	Penny, physio
		I think that sounds, like that sounds excellent to have all of those different professions you know available, that can refer to each other. That would be a really valuable service [NSW chronic care model]	Ryan, primary care
		sometimes I think that my public people do better than my private people, because they do get access to the multidisciplinary care, and I really believe that makes a huge difference.	Green, primary care
		Team members, physio, EP, dietician, OT and pain psychologist	Petra, primary care
		So, if I referred to a knee osteoarthritis clinic and it provided access to the dietitian and the chronic pain and the podiatrist, in a time-effective way. Yep, that would be awesome.	Green, primary care

Model of care	Themes	Quotes	Participant
Model of two activities: 1. APP for the orthopaedics list 2. RACCS advanced physios run the chronic care model	A model in which APP assessment of patients referred to surgery is conducted by APPs in CHS, but the community chronic care is managed by RAACS physios, who refer onto various allied health teams	the GLA:D team can take carriage of identifying if somebody who's got a need for psychology, or social work. But I just think you don't want to duplicate effort.	Leo, exec
		if we can make GLA:D a really robust multidisciplinary program, then that seems to me to be a better approach.	Leo, exec
		Managing the Cat 3 patients could sit with ours [RACCS] service. We could feed them straight into GLA:D	Rose, physio
Differences of opinion on a community clinic having medical staff	Yes registrar, no surgeon	Then it should have a probably a registrar, cause I don't think a surgeon would have the time and it would be easy. Enough to have a registrar. Hmm. Or, or someone with like some kind of medical arthritis knowledge?	Cath, surgeon
	No surgeon Yes GP	in terms of medical support, I think it should have a GP. Because a GP is so much better at managing multiple issues	Cath, surgeon
		a musculoskeletal specialist. So, it certainly doesn't have to be a surgeon. The, I mean, if there was a surgeon who was not operating and wanted to continue with patient care in some way then that might be a model where they could be involved in that process. So yes, as a billing model, yes, you would need to have some, you would need to have a medical person there	Leslie, exec
	No to a GP in the clinic	I would say in general, that was my job. That chronic care was my job.	Green, primary care
		Then that would be another mechanism of actually getting people to go to their GPs and be reminded, you know, 'what about conservative management?'	Ryan, primary care

Model of care	Themes	Quotes	Participant
Access to GLA:D for all patients		Whether they're having surgery or not. I sell it to my patients as prehab that they will get better surgical outcomes even if they know they're going to have surgery.	Green, primary care
		I tend to try and have that conversation when they're actually holding the form in their hand. Because, if you don't, there's still fighting for what? Yes, they want. But when they've got it and I say so, 'you can have that X-ray. However, these are the reasons why I don't think you should. That form is valid for 12 months, have a think about it?' then mostly they don't.	Green, primary care
		So even for that group, I think it's essential for the prehabilitation because we don't see the great outcomes if we don't get that that happening prior and that understanding.	Rachel, primary care
Extension of current role of APP	APP enabled to refer patients back into surgical team	when if someone does exhaust [AH intervention], is ready for surgery, and you know they go 'right. OK. It's time to see the surgeon'.	Charles, surgeon
		we'd be able to write the, you know, physio to orthopaedic surgeon referral directly,	David, physio
		if we're still struggling, getting those [PROMS] numbers up and you're still having, you know, your ADL disruption and your night pain, then we can loop in a surgeon.	Eric, physio
		what could be improved and you're talking about being able to do direct referrals to other orthopaedic surgeons?	David, physio
		I'd be more than happy to send them off for an x-ray myself and interpret those findings with them to then make a decision whether a referral to an orthopaedic surgeon would be warranted.	Eric, physio
		If the person's finished GLA:D or didn't complete GLA:D because they were having a lot of pain or a lot of dysfunction. And for some reason, they already weren't on an ortho wait list. We would like do a referral to an orthopaedic surgeon.	Cathie, physio

Model of care	Themes	Quotes	Participant
		It could well be that the gatekeeper of that for musculoskeletal medicine, musculoskeletal medicine isn't in the tertiary service.	Cathie, physio
		even from talking to the clinicians on the ground, since this project started, that perhaps there's been some adjustments and change in terms of how we're referring.	August, exec
	Could an APP write an RFA?	could an advanced practice or extended scope practitioner write that, write that RFA and you know yeah. Save all that	Leo, exec
		Can someone else write, you know, the pathway. If it's fairly black and white.	Mary, exec
	Co-location of APP with surgeons	this is where a multidisciplinary team where you know you're dividing the task. So the surgeon said 'no you don't need an operation' or something and so then you bring in somebody who can discuss with them the non-surgical management.	Bart, surgeon
		you'd want to sort of not be self-defeating and almost keep it a bit secret that the surgeons are there. Because otherwise, you know, you just want to have them come at the end, into a different room	Charles, surgeon
		they have a regular meeting that they've established … the physios will present and take whatever cases they want the doctors to, to the neurosurgeons to review	August, exec
		The advantages of having you know that co-location when the consultants are running their clinics and you're close by or you're running a clinic concurrently … it just means they've got access to the neurosurgeon	August, exec
		Part of the challenge also has been from an orthopaedics support perspective, is trying to have reasonable access to orthopaedic consultants to flag cases for discussion.	August, exec
		but sometimes it seems to you get a better buy-in with that [co-location with a surgeon]	Penny, physio
		The clinic could sit anywhere, but you'd want the orthopods on hand in the decision-making. So that would sit better with acute.	Cathie, physio
		it is quite helpful to have access to imaging to for different reasons	Penny, physio

Model of care	Themes	Quotes	Participant
Infrastructure and resourcing			
Systems administration – data systems that report	Reporting and monitoring of wait time	I think we certainly should be reporting on *internally,* whether we need to report on it externally or not, look I don't know the answer to that?	Leo, exec
		At the moment my understanding is anyway, or unless it's changed, which I don't think it has, is that we have no way of reporting on it. So that data is not collected or reported anywhere!	Leo, exec
Funding model through activity-based funding		see Enablers.	
Implementation advice – stepwise changes	Test pilot	it change-manages it as well. I'm all about the small pilot study. You can get a lot done right? whereas if you go too big and it's … I think you change-manage it	Mary, exec
	Step one – relocate screening to community	JS: [are you saying the] first thing to do is for us to expand our current advanced physio clinic, rather than try and build a multidisciplinary clinic in the community in the short term? Leo: yeah	Leo, exec
Improvements to CHS communication	Communication about place on the waiting list, e.g. text message updates	even a text message that went out and said, you know, we are still aware that you're waiting. We're moving you up or, we're arranging for you to come in. Something like that. But you just think, well, I've been in there for 18 months and I don't know if I'm still there.	Eliza, patient
	Clear, well communicated pathways	we're not very mature … in how we select patients that have joint replacement.	Leo, exec
		If someone has an Oxford score which is terrible, then clearly they need to be moved into an appropriate pathway.	Leo, exec

Barriers to a model of care	Themes	Quotes	Participant

Barriers to a model of care	Themes	Quotes	Participant
Barriers to full optimisation of allied health interventions prior to seeing a surgeon	Fatalism about knee replacement as inevitable	I think it's bone to bone cause Professor Smith said, Oh yes, well, on his advice, you know,	Penny, patient
		I don't have to go and get it done tomorrow, you know, but that's the way it is.	Katie, patient
		The knees are bone and bone. You just hear it go *chreeeshseee* [crunching noises]	Katie, patient
		But I'm also cognisant of the fact that it may well deteriorate.	Sally, patient
		It seems to be the case if they are coming with a kind of diagnosis, it's specifically for GLA:D. Sometimes the patients coming to me are already on a wait list to see a surgeon and sometimes they're on a wait list for surgery.	David, physio
		But you know, if you've, if you've spent, you know, two years waiting, thinking that you need a surgery and then you're told you don't, you go well, where does that leave me?	Penny, physio
		patient expectations come from family members, some, but not all GPs. What they have heard along the grapevine. It's like, the whole you did your ACL. It's what's in the media that gets out there.	Rose, physio
		A lot of patients believe osteoarthritis must always equal joint replacement and that's not necessarily the case.	Siobhan, primary care
		No, it's also patients believing in it, thinking it's a good idea. 'I've got a broken knee. Fix it.'	Green, primary care
		Until we teach the community that this is what we need to do. They still believe 'I go to my GP. I go to the surgeon; I get the surgery. I go away'.	Rachel, primary care
	Language around knee OA is negative, it's progressive, inevitable	I have had many patients coming with the language that's been used particularly does come from the medical world of, you know … 'all that sport you played years ago', just lots of negative I guess.	Rose, physio
	Mechanistic view, rather than biological (It is worn, replace it)	been in the building game for 54 years. A lot of stress on my knees.	Katie, patient
		some of the early heavy machinery was pretty hard on the legs	Bill, patient

Barriers to a model of care	Themes	Quotes	Participant
		because they were all like old gear shifts with very heavy clutches and brakes. I mean, you're talking about machinery 15-, 20-, 30-tonne machines driving along. So I've, I was on that for 35-odd years and yeah, I guess that was a lot of work, on my knees and so.	
		All that on the machinery sort of thing there was, I think, was a lot of it to do with my knees and me back and I've also got arthritis in the hips as well	Bill, patient
		I've had knee pain for many years into a lot of sports, starting with football, basketball, water skiing. I used to run a lot.	Penny, patient
		I think that a lot of community perception there is, you know you've still got arthritis. But that's sort of the opposite of what we know is helpful in terms of exercise being disease-modifying for the problem.	Penny, physio
	Sometimes they just need to hear it from a surgeon	I think it would allay patients' concerns. Rightly or wrongly, it doesn't matter. But I think sometimes they want to hear it from a surgeon	Max, surgeon
		I think part of the problem as well is that people want to hear it from the surgeon, yeah, whether they need an operation or not.	George, surgeon
		There still is, I think, particularly from older patients, that hangover of the medical model of care and the authority and expertise resting with the orthopaedic surgeon. So, they can be reluctant to fully engage in conservative management because they don't appreciate necessarily the value, particularly before they engage in it.	David, physio
		The community expectation, whether that would be I think something we'll have to work through. We've done a lot of work in this space for the Territory already with the clinics and the roles of the physios that we've got, but there's always that pushback of. 'I want … I'll only see the doctor'. You know we are working through that. But we have to be conscious of that	Leo, exec
	Lack of public education/health literacy about success of allied health interventions	it's bone on bone, she's been told. But she gets up sometimes in the morning and she has problems walking. But last week and so, she hasn't been too bad because she's been given specific exercises to do.	Bill, patient

Barriers to a model of care	Themes	Quotes	Participant
		In terms of equity, the way people are brought up, their health literacy affects things. Their ability to understand how exercise, how weight, how diet, how muscle strength and everything affects their health.	Cath, surgeon
		hopefully their health literacy is good enough that they can present to a good physio and they've done a bit of reading and they know surgery is not the first-line care for these things	Eric, primary care
		I think education around pain not being harmful. You know, in the sense that it doesn't equate more damage, it's really difficult to get into patients' head sometimes despite a lot of education	Siobhan, primary care
	Poor self-efficacy	if I can't sort of kick start myself. That would be something that I'll look at doing.	Sally, patient
		I find this is a really hard, it's, I mean I could do it I, but I you know, I just can't, you know	Eliza, patient
		I know it's like tell me a kilo off your belly is [11 off your feet]. It's hard to do, especially when you're retired	Penny, patient
		We're seeing people whose often have a lot of psychosocial stress and some financial hardship and other things, and so they might not have basic the basic, uh, self-efficacy to set them up well, to progress with, you know, progress on from an ex, from a supervised exercise program to actually then maintaining that independently.	Penny, physio
		we see the ones that … had the surgery years ago, and it's never got going. And you ask them, well, what have you done in the interim? 'Ah, nothing, I've continued to sit in my recliner and eat my chocolate and keep my feet up and not do a lot'.	Rachel, primary care
	Pushback from patients	I don't like to. [go to physio]	Bill, patient
		Not dietician. I've lost about 4 kilos. But I can't seem to get that off, because I can't walk too far	Penny, patient
		She sent me to [physio practice]. It was in [suburb] and for it to do some work. And that's the one I didn't like. I didn't feel like they were listening to me	Eliza, patient
		No. I don't think it would work. What will happen is that you'll get the	Charles, surgeon

Barriers to a model of care	Themes	Quotes	Participant
		odd one where like they get kicked around in physio. They really needed to see someone [surgeon] earlier and that's my experience in the UK, like you have you have people who are pretty bitter.	
		[What are the barriers to best practice?] Patient expectations	Rose, physio
		It's not as appreciated, so there's not as much value in the advice you're giving, so that contributes to the disengagement of patients.	David, physio
		I know this is a physio, that 9 out of 10 exercise interventions that are given to patients are just abandoned within the first week.	Ryan, primary care
		patients will attend one or two appointments; they won't do the exercises that they're given and they expect their physio to have waged their magic wand and fix their problem.	Siobhan, primary care
	Health professionals giving mixed messages	Does every orthopod in Canberra insist on, you know, at the maximum conservative therapy before proceeding to a joint replacement? No, they don't.	Ryan, primary care
Barriers to patients accessing health care	Family/social responsibilities	So he has a lot of falls, so you know the one thing that I was worried about when I had my knee. Least. Hmm, what was going to happen after? You know what I mean? I don't know what happens.	Penny, patient
		my husband's not well at the moment. So that's another thing, you know, slows me down a bit about doing things.	Eliza, patient
	Model of care needs to consider patient circumstance to enable equity	And then even when you get to the day of your operation, right? Whether there's someone to drop you off, whether there's some way for you to go after your operation once you've done like your operation and you're safe to go home. Who's going to look after you when you go home.	Cath, surgeon
		The ability to, the ability to take time off work. To take 6 weeks off work around your knee replacement. And to get the care that you need so that you can go back to work. Some people can't do that.	Cath, surgeon
		There might be finance barriers that prevent them from continuing on.	Penny, physio
Barriers that prevent referral of patients to surgery at the right time (instead of too early)	Legend of the long wait lists	It doesn't inhibit my life at the moment, but I know that I've got a long wait. So that's why I've sort of got in early, to get into the system, so that when it does, when my turn does come, I might be ready for it	Eliza, patient

Barriers to a model of care	Themes	Quotes	Participant
		there's a lot of anxiety around the waiting and people want to be on the list rather than not on it.	David, physio
Barriers to monitoring and being accountable for hidden wait time	Health service does not want to expose this	I think the powers that be are not necessarily interested in pulling that unmeasured waiting list and putting it onto the real waiting list	Bart, surgeon
		They don't want to know this yet. [Max refers to Wait 2]	Max, surgeon
		because of the DHR as well that is that has been a little bit of a hiccup for us.	Pete, exec
		We haven't done anything about it because we haven't really looked at what's required. It's not necessarily on their notes.	August, exec
		We are kind of stuck a little bit in the last couple of years we've not been able to do a lot of prediction and stuff which we were able to do beforehand.	Pete, exec
		The percentage of that's actually referred directly from the surgeon to, for example the GLA:D program, or to physio, I don't have visibility on that.	August, exec
		to make the system – a health system that does not pay lip service to standards. So for instance, the Australian Commissioner for Safety and. Quality and healthcare standard. I mean it should be part of hospital system accreditation. So do you make the standard? And if you don't meet the standard, then is there a stick to apply?	Leslie, exec
		Well, see this part [private–public crossover] I'm not 100% sure of. So I don't have oversight. So I can't really comment, but I can tell you from here onwards	Pete, exec
Barriers to provision of better care by the health service	Limited budget/resources for elective surgery	There's only a certain amount of that you can expect one person to do. Yeah. And even if you have all of the other things lined up like the surgeons will be become overworked if we try to cut down our waitlist	Cath, surgeon
		I think a lot of it is just dollars and cents. A lot of it comes down to money.	Bart, surgeon
		won't necessarily be popular if it's more expensive.	Mary, exec
		It's a reflection of suboptimal system design, but also, overall system under resourcing. So how do we make a better system? So we make	Leslie, exec

Barriers to a model of care	Themes	Quotes	Participant
		it more efficient. We drive the dollar that we have further, but also actually invest the money that's required.	
	Limited budget/resources to establish a community-based multi-disciplinary team OA clinic	What about sustainability? So a lot of these things you get your pilot and you run it one of them and then it has two years' funding, then stops.	Petra, primary care
		We've really been fighting with ACT government to get that same sort of model up whether it was with us or through public health or whatever.	Rachel, primary care
		I think it resourcing will be the main one.	Ryan, primary care
		obviously, finance	Siobhan, primary care
	Limited access to allied health	So that then poses the availability. There's the obesity clinic that we can refer to. The wait time to get into that is quite large. The program itself is quite long.	Max, surgeon
		The ongoing funding. Often, we get people coming through GLA:D for the 12 weeks or six weeks, sorry for the 12 classes, and loving it and wanting it and getting it, but where do they go from there. They want to stay on, and that's ongoing management. So, maybe long-term management	Rose, physio
	Limited personnel, expert trained staff in the ACT	The screening clinics itself, I think … It comes in ebbs and flows, so we've had issues with clinics in terms of availability of clinics, also from outside our staffing has fluctuated, it's gone up and down in waves and that's around having sufficiently skilled clinician.	August, exec
		Advanced physios because we've got the training and but also the push and the pull between emergency department and orthopaedics.	August, exec
		It's gone up and down in waves and that's around having sufficiently skilled clinicians.	August, exec
		You know it will be the people too, right? Are you going to have enough physios that have got the skills to do this?	Mary, exec
		The services are already pumped and so you have to magic these	Siobhan, primary

Barriers to a model of care	Themes	Quotes	Participant
		people from somewhere, which would then decrease their ability to do their current role	care
Barriers for primary care providing best practice	Medicare is not set up to support chronic health management, which relies on time spent on patient education and lifestyle/behaviour change	I think for some people referred to us it could just be the time, so they don't have a lot of time with the patient to get a big history, don't have a lot of time with the patient to then have the sort of almost motivational interview that you require to send them in the right direction for more self-management strategies. They also probably have hardly any time to actually write the referral.	Cathie, physio
Barriers to advanced practice roles, instead of surgeons seeing patients early on	Resistance to expanding the role of physio from patients, GPs, surgeons, wider community	If we were to try and stretch the scope of practice of the of the physios, there'll be the barriers that you'd expect, I think. Like if we wanted the physio to directly list for surgery that'd be the barrier that you can imagine. The fact that relates to that pushback from the surgeons.	Leo, exec
		The community expectation, whether that would be I think something we'll have to work through. We've done a lot of work in this space for the Territory already with the clinics and the roles of the physios that we've got, but there's always that pushback of. 'I want … I'll only see the doctor'. You know we are working through that. But we have to be conscious of that	Leo, exec
		There still will be your naysayers and you know it took us … perhaps if I may, I know you said you've got a lot of GP stakeholders, but you know to get a GP to refer a patient who they really want to have surgery to a clinic that's not going to have a surgeon there.	Mary, exec
		There would be one. I would think that you just can't assume that everybody's in the same place as you on the on this journey.	Mary, exec
		And there will always a percentage of people who don't want to [see an advanced PT] and may wish to remain on the wait list and wait to see who they've been referred to.	August, exec

Enablers of a new model of care	Themes	Quotes	Participant
Enablers of full optimisation of allied health interventions prior to seeing a surgeon	Effective use of non-surgical interventions gives patients confidence to delay TKR	So, we worked, we've worked on strength and I still go to the gym and have a PT and maybe I'll see an exercise physiologist once every 6 months or something to do a bit of an assessment of how I've progressed, and it's made a massive difference. Just having that strength, I can do stuff now that I couldn't do when he first asked me.	Felicity, patient
		And what was nice about it was all the people there [at GLA:D] were about the same age, so. You didn't feel intimidated at all that you couldn't perform like everyone else, you know	Eliza, patient
		Where I felt the GLA:D program, was listening to what I was saying and what I wanted to get from it.	Eliza, patient
		I was saying 'we got this.'	Bill, patient
	Widespread education stakeholders, public	the visibility of those programs and being aware of the access through the public health care.	Max, surgeon
		And I don't think that's well accepted yet by anyone. Not by GPs, by patients or by surgeons. And so, you know, I think the wider public. A better understanding the evidence is important amongst all of those parties.	Charles, surgeon
		We've had some really pleasing experiences with GLA:D and people seeing the value, feeling the value, people changing their expectations, people building that self-efficacy, people appreciating, shifting their expectations from improvements in function as opposed to the elimination of all pain and being really pleased with that.	David, physio
	Physiotherapy services of known high quality	And probably greater availability of, you know, standardised physio services is a worthwhile thing to do.	Charles, surgeon
		They seem appropriate. Like I said, more of the referrals are starting to come in with better sense of expectations around the role of physio and also the role of surgery and where they fit in on that continuum of best practice.	David, physio

Enablers of a new model of care	Themes	Quotes	Participant
Enablers of patients accessing non-surgical health care	Easy access to GLA:D	Don't know whether that's expensive. That's free.	Bill, patient
		the Kingston one is good because I work in [workplace]. So I was able to get there in like 2 minutes, you know, park the car running, and then it was convenient.	Eliza, patient
Enablers of referral of patients to surgery at the right time (instead of too early)		the way like to make this work, Jennie, I reckon it just has to be timely. People won't resent it if they get seen within 6 weeks	Charles, surgeon
		if you're going to make it mandatory or near mandatory right then I think you have to make sure that people, that it's responsive. Yeah. And so that way people will feel that, OK, should be made to do this, but. At least they haven't been made to wait for very long.	Charles, surgeon
Enablers of monitoring and being accountable for hidden wait time	Establish structures in DHR	DHR will help with a lot of things. We're still getting used to it. Yeah, there's a lot, lot of positives from it and being able to see all of that information and especially if someone is seeing in the community, we can see that now and that it's much easier	Max, surgeon
	Leverage the clinical standards	If there's a political drive to make something accountable. Yeah. Then it will become part of the standard. OK, this is what we do. Because this is the standard.	Leslie, exec
		It's a bit like the fractured neck of the femur care standards. OK, where did those standards come from, well, actually came out of a lot of work that was done many years ago to improve the care pathway for neck of femur fracture patients, OK. And then that metamorphosed into the, to the strategy fracture registry, which then determined standards more rigidly, and then lobbied for those standards to be part of hospital accreditation.	Leslie, exec

Enablers of a new model of care	Themes	Quotes	Participant
		what's the point of having a standard if there is no real driver do adopt that standard and make it happen	Leslie, exec
		a health system that does not pay lip service to standards. So, for instance, the Australian Commissioner for Safety and Quality and Healthcare standard. I mean it should be part of hospital system accreditation. So, do you make the standard? And if you don't meet the standard, then is there a stick to apply?	Leslie, exec
Enablers of provision of better care by the health service	Demonstrate cost-effectiveness	you might actually avoid some of the people going on to that waiting list by actually treating them appropriately using non-surgical means	Bart, surgeon
		The study out of the Joint Registry that's shown the demand for total knee is going to go up by 230% by 2030, right? Like it's, if we don't do something now we're going to be drowning.	Max, surgeon
		Well knee replacements are really expensive. You know the, just the implants are probably $10,000. Then you've got, you know, time in hospital time, time in rehab, time off work. All these costs line up. And if someone can be effectively treated and surgery either prevented, or deferred, then those are huge cost savings.	Leslie, exec
		how many, if you can stop them having one [TKR] for three years, don't even have to have one?	Mary, exec
		I think now we should, you know, set things up, so that you can have someone in as a private physio working in a, you know, under some kind of [contract].	Mary, exec
		having a visiting physio. Under a contracted arrangement … it's a model that works for the doctors. So I don't see why we couldn't translate it.	Mary, exec

Enablers of a new model of care	Themes	Quotes	Participant
		it's not going to cost you any more to have the private person there than the public person there. The pain is just in the how you contract them	Mary, exec
		First and foremost, that the physios are the right people to be the gatekeepers, if you like of that list. So I think they have the right skills and from a cost point of view for the organisation, it's the, you know, the most efficient and economic way we can do it.	Leo, exec
		so could be it could work, couldn't it? If you had that kind of economic justification.	Petra, primary care
	Surgeons will be pleased to be seeing patients who have exhausted non-surgical opportunities and are ready for surgery	But there's all these things that people can work through, before they get to see me, you know? And so when they see me, it should be all ready for surgery and we can just consent them	Bart, surgeon
		I'd like to see a patient who has been screened, who comes to my clinic, who's ready to have the operation that because that's my, that's my main purpose. I'm, I'm a surgeon. Yeah, that's my main utility.	George, surgeon
		steps prior to them getting to us or more robust review of those patients to make sure that by the time they get to us, that's kind of where they're at is that they're ready for surgery	Max, surgeon
		They [surgeons] should still rationally be on board. With the idea that you know you are seeing only people who genuinely need an operation, or a much higher proportion. And the people you see actually need an operation because they've already exhausted nonoperative actions. That pretty much gets everyone in the surgical community over the line.	Charles, surgeon

Enablers of a new model of care	Themes	Quotes	Participant
		I think you need buy-in from all of the stakeholders. So you need the surgeons on board so that if someone gets referred to them from one of those kind of areas that they're very receptive to that	Max, surgeon
		if you're going to make it mandatory or near mandatory right then I think you have to make sure that people that it's responsive. Yeah. And so that way people will feel that, OK, should be made to do this, but. At least they haven't been made to wait for very long.	Charles, surgeon
	Good communication is needed from CHS back to pts and GPs	So it's kind of like so they don't feel like they've been forgotten, whether that's a text or a, a biweekly message that says you're still on the wait list.	David, physio
Enablers for primary care providing best practice		we could do a lot, we could improve the amount of education we give our GPs and the amount of liaising and outreach that we do for our GPs to inform them of the kind of people that we see and the kind of patients and symptoms who need arthroplasties.	Cath, surgeon
Enablers of advanced practice roles, instead of surgeons seeing patients early on	Well-trained advanced practitioners	… so long as the people who are doing it are properly trained. I don't think it really matters [where the clinic is]	George, surgeon
		I think in the screening clinics, hopefully they send it to us and we, with our experience and training, then unpack the problem and direct therapy a little bit better than, you know, I would hope that the generalist physio on the on the corner.	Cathie, physio

Enablers of a new model of care	Themes	Quotes	Participant
	GPs trusting APPs	I think it's a flow on effect from GPs being really under pressure and not having time for appointments and that kind of thing that we're seeing the flow on effects of that where possibly at some other stage in the past they might have done a lot more of a workup or more of a detailed referral and now they're trusting us to do that groundwork.	Penny, physio
	Surgeons trusting APPs	We've got some criteria based on how we should triage that's been established with our surgery colleagues.	Penny, physio
Enablers of a community-based MDT OA knee clinic	Simple access	If it's easy for them they go, right? Suppose with OA, we don't need to have lengthy discussions about public, private or whatever. You just sort of can refer them straight to a multidisciplinary clinic. I think they'll be on board with that.	Charles, surgeon
	Take time, go steady and stepwise, but keep on pushing	it change-manages it as well. I'm all about the small pilot study. You can get a lot done right? whereas if you go too big and it's … I think you change-manage it	Mary, exec
		the community will take a while to kind of get their head around the idea. But I think it will eventually come	Charles, surgeon
		But it wasn't always like that. It took a while to get to that work.	August, exec
		I think we have to look at the research that's been done, and to push, push hard for what we think is the right approach.	Leo, exec
		A good transition plan and sometimes you can't achieve everything all in one step and it, it's then perhaps, OK, well, you know the big picture end goal might be this. This is what we can do in phase one. This is what we might do in phase two. This is what we might do with in phase three	August, exec

Enablers of a new model of care	Themes	Quotes	Participant
	Invest in communication with community and stakeholders	Consult, consult, consult, consult, consult and then communicate. And I mean, you will evaluate. That, you know, along the way too so. That if there are things they're addressed at the time. We even found this in Ed, you know, if we got a complaint as 'I thought I was coming to see a doctor, and I only got to see you', you know, we took the approach that we just rang that person up and said, let's talk. Why do you feel like that? What happened, you know? And in the. End, they said. 'Look, I had a really good experience. I'm not saying. But it's just that. It didn't meet my expectations because I thought this is.'	Mary, exec
		consultation with all stakeholders.	Siobhan, primary care
		We need to teach the community why we have this program. And we need to take that education of it right out wide. You know it's got to be sort of global stuff and we've got to keep talking about it.	Rachel, primary care
		Because we've got to teach the community that 'this is why we do these things'.	
		You'd have to undertake a very good education process to make sure GP physios, EPs, dietitians were aware of it [the knee clinic] so that would be really important.	Petra, primary care
		You have to have buy-in from everyone. That's the hard part	Max, surgeon
		And I think in any of the services where we've tried, we've newly established a service and we're having physio take on part of a service which was historically provided by a medical officer, you do need that sort of clear education and expectation.	August, exec
	Widespread support from healthcare professionals involved in care of potential elective surgery patients	I think the idea of a multidisciplinary-like clinic in the community is really good.	Siobhan, primary care

Enablers of a new model of care	Themes	Quotes	Participant
		if we could send just a generic referral into, you know, 'orthopaedic surgeon' or 'physiotherapist' at a clinic like that, there would be precious little of us that would have a problem with that.	Siobhan, primary care
		my vision of what would work, and make things better, would be a well-funded multidisciplinary team that dealt with a large proportion of referrals for what's presumed to be hip or knee arthritis, or knee arthritis in this case. That service was based in the community in a number of different places. They had access to evidence-based programs such as GLA:D. And such as bariatric clinic referrals, all that kind of stuff.	Charles, surgeon
		the ones when we see the physio screening notes. They're fantastic	Max, surgeon
	Rapid effective referrals into clinic, and back to surgeons when timely	the ability to refer a patient direct from that clinic in for surgical management, that's awesome.	Siobhan, primary care
		helping to sort through the priority of patients	Siobhan, primary care
Resources to enable any model we propose	Enable any model by careful planning of resources	I think the key with any system we set up is to resource it for success	Leslie, exec
		Well, ultimately, I guess it's an argument about which pocket, you pay out of. I mean the, the, the ultimate plan being it's the ACT public Health budget. There are other options in the community too, so you could actually run a community-based screening program and you could run it as a bulk billed clinic	Leslie, exec
		(And what do you think we need to do to make this happen?) Clearly, clearly business case.	Leslie, exec

Enablers of a new model of care	Themes	Quotes	Participant
		Yes, it's a tough one because the funding pot is not bottomless. So we've recognised a hole in the system and the question is, can we build the system, the way of dealing with this problem which is cost-effective, doesn't bankrupt the entire health system. How do we how do we do this? But whatever you build can't be set up to fail because, you know, all that effort goes for nothing, right?	Leslie, exec
	Activity-based funding model	I think activity-based funding is potentially going to give us an avenue to get more funding. I think we need to make sure that we're set up and ready to go for activity-based models and that's where actually multidisciplinary clinic is better.	Leo, exec
		If you have the doctor and then two others, you'll get the maximum amount of revenue	Leo, exec
		Then we set up the clinics that we set them up with the with the physio as a doctor-substitute, so that can then attract a different type of revenue or rebate the clinic. So, we need to make sure we do that.	Leo, exec
		A multidisciplinary clinic attracts much more funding from the clinic. So, we probably need to think that that do that a little bit and I think you have to have a minimum of three professions to make it a, a multidisciplinary clinic and you get a 50% loading on what you can what you can charge for that.	August, exec
	Medicare supported model	(Would we be able to resource these clinics if they if there was no specialist in them?)	Leslie, exec
		Because there would be no revenue. you are right there.	Leslie, exec
		What about under some of the chronic care programs	Leslie, exec
		The ultimate plan being it's the ACT public Health budget. There are other options in the community too, so you could actually run a community-based screening program and you could run it as a bulk billed clinic	Leslie, exec

Enablers of a new model of care	Themes	Quotes	Participant
		A knee triaging system staffed by someone who was, a specialist of some kind, a medical specialist, doesn't have to be a surgeon, it could be rehabilitation specialist,	Leslie, exec
		Medical specialist as a staff specialist sort of role employed In that manner. Because it's a clinic offsite, an offsite clinic, you can actually run it as a bulk billed service.	Leslie, exec
		Medicare is going to be a problem. I mean, whether we can find ways around that, and it might be having a specialist in the clinic or running some sort of virtual imaging clinic or something that is under a under a doctor's name to get through that Medicare issue in the first instance. That might be one avenue.	Leslie, exec

Note: ACAT = Aged Care Assessment Team; ACL = anterior cruciate ligament; ADL = activities of daily living; AH = allied health; APP = advanced practice physiotherapists; BMI = body mass index; CHS = Canberra Health Services; DHR = Digital Health Record; EJRP = Elective Joint Replacement Pathways; EP = exercise physiologist; GLA:D = Good Living with osteoArthritis: Denmark, an exercise and education program for hip and knee osteoarthritis; MoC = model of care; NSAIDs = non-steroidal anti-inflammatory drugs; OA = osteoarthritis; OT = occupational therapist; PROMS = patient-reported outcomes measures; PT = physical therapist; RACCS = Rehabilitation, Aged and Community Services; RFA = request for admission.

Appendix 4: Evaluation of impact

GiAF: Global Impact Analytics Framework

Many characteristics that make an intervention efficacious in a controlled research environment can work against its being effective in a real-world setting. Implementation science is the study of methods that promote the systematic uptake of research findings and other evidence-based practices into routine practice to improve the quality and effectiveness of health care. It uses theories, models and frameworks to gain insights into the mechanisms by which implementation is more likely to succeed (Nilsen, 2015).

This project used impact evaluation frameworks to triangulate the findings of the qualitative and quantitative data collected with the actions of best practice implementation conducted by the project to arrive at key recommendations.

The Global Impact Analytics Framework (GiAF) is a novel approach and a toolkit for impact analysis of health and social services implementation research. GiAF has been developed by the UC team in partnership with a consortium of international topic experts (Salvador-Carulla, Lukersmith & Woods, 2024).

In traditional impact analysis of implementation research, the resources (inputs) and the results (outputs including individual outcomes) are often measured. In the analysis of impact, the *process components* are sometimes considered with qualitative information, but typically not measured and transformed into quantitative information. The GiAF Taxonomy and Toolkit was created, tested and validated to fill this gap in implementation research and impact analysis (Salvador-Carulla, Lukersmith & Woods, 2024; Woods et al., 2024).

GiAF impact evaluation: Which ladders were used

Impact analysis using GiAF is customised to the project. This project used the GiAF planning, engagement and dissemination ladders to evaluate the effectiveness of the HCF Best Practice Pathways in Knee Osteoarthritis project with respect to the identified barriers to best practice care for knee osteoarthritis. This method has been used extensively in mental health policy research (Lukersmith et al., 2025; Salvador-Carulla et al., 2021; Salvador-Carulla, Lukersmith & Woods, 2024; Salvador-Carulla, Woods, et al., 2024; Woods et al., 2024).

The level of the ladder reached provides insight into how effective this project has been in achieving its aim and contributes to the effectiveness section of the impact evaluation. Further, the level achieved on the ladder highlights how future projects might utilise the experience of this project when considering planning, engagement or dissemination activities, to reach a higher level on the rating scale.

Planning ladder

GiAF defines a development plan as a document which provides guidelines to follow during the implementation process. It is the collection of milestones and goals with quantifiable objectives that a person or organisation plans to meet within a certain period of time, which helps measure progress. Using the KT Canada Knowledge Translation framework (Health Canada, 2017), the

project included a plan to evaluate the implementation activities. This is represented by collecting the 2024 data snapshot and repeating the snapshot interviews.

Engagement ladder

Engagement is defined by GiAF as a two-directional interaction and relationship between the sender and recipient for the development and implementation of the project. It should increase the understanding of the project by the recipient and advance its implementation in the real world.

Dissemination ladder

Dissemination is the act of making best practice care of knee osteoarthritis 'known and making it used' by all stakeholders in the knee osteoarthritis care pathway to facilitate awareness, uptake and use. Dissemination is a planned process that involves consideration of:

- The target audience
- The geographic spread of the target audience
- Communication channels and tools
- The approach (personalised or non-personalised)
- Actions to facilitate uptake or adoption
- The intensity of the dissemination actions

RE-AIM QuEST

RE-AIM is an evaluation framework used to evaluate a project's implementation endeavours and discuss implications for public health research (Forman et al., 2017). While GiAF is useful to evaluate specific aspects of a defined implementation and can also focus on the planning and development stages of a project, RE-AIM has advantages in that multiple target audiences can be identified. Using RE-AIM QuEST provides a mixed methods evaluation. Forman et al. (2017) proposed that open-ended companion questions be used to explain the quantitative results in each of the RE-AIM dimensions to understand different levels of fidelity achieved.

Dimension	
Reach	Number, percentage and representativeness of eligible patients who participated in the intervention. •Is the intervention reaching the target population? Those most in need?
Effectiveness	Intervention effects on targeted outcomes, •Does the intervention accomplish its goals?
Adoption	Number, percentage and representativeness of participating settings and providers. •To what extent are those targeted to deliver the intervention participating?
Implementation	The extent to which the intervention was consistently implemented by staff members.
Maintenance	The extent to which an intervention becomes part of routine organizational practices, and maintains effectiveness.

Glasgow, www.re-aim.org

Figure 17. RE-AIM QuEST evaluation framework

Source: Forman et al. 2017.

Last words

Advanced Physiotherapists provide expert care
Widespread happiness with physios in that role
Access to Community programs is key
Not everyone needs a knee replacement

I went away feeling that she had a good handle on my situation. I didn't feel that I was being shunted down the line by not seeing an orthopaedic surgeon.
– Patient

Physios are the right people to be the gatekeepers, if you like, of that list. So, I think they have the right skills and from a cost point of view for the organisation
– Health Exec

More of the referrals are starting to come in with better sense of expectations around the role of physio and also the role of surgery and where they fit in on that continuum of best practice.
– Physio

A lot of patients believe osteoarthritis must always equal joint replacement and that's not necessarily the case.
– Primary Care GP

Having access to the GLAD program in the Community centres is actually really good.
– Surgeon