Supplemental materials

Interview questions on surgical wait times

Introduction:
On behalf of Alberta Health, we're surveying individuals involved in surgical care in Canada. You recently indicated you would be willing to participate in a survey regarding approaches to improve access to elective surgical care. We are especially interested in successes and challenges you've experienced in reducing wait times for elective surgeries such as joint replacements, cataract removal, and general surgical procedures.

The information we collect will be kept confidential. It will be summarized and no individual will be identifiable from the results. We'll be happy to share the findings with you once the report is complete.

1. What is your role in addressing access to elective surgical procedures in your jurisdiction?

2. How are wait times for elective surgeries measured in your organization? Do you measure any other factors that might influence wait times?

3. How are wait times for elective surgeries such as joint replacements, cataract removal, etc. defined in your jurisdiction? Do you think there are hidden wait times impacting access to surgery that are not actively measured?

4. What approaches have been developed and/or implemented that aim to reduce wait times and improve access to elective surgery in your jurisdiction? If applicable, please answer the following questions:

    a. What was the timeframe for development and implementation of the approaches?

    b. Who was responsible for initiating, developing, and implementing the approaches?

c. What were the factors contributing to long wait times that these approaches were intended to address?

d. Was the approach tailored to the procedure? For example, was a different approach used to reduce wait times for joint replacements vs. cataract removal?

e. Are marginalized populations taken into consideration (e.g., indigenous peoples, low socioeconomic status, etc.)? Are there any other ways in which your jurisdiction works to ensure improved access to surgery for marginalized populations specifically?

f. Has any formal evaluation of these approaches been done? Were the approaches successful? Why or why not?

g. If the approaches have been successful in reducing wait times, how will they be sustained long term?

h. Based on your experience, can you provide any "lessons learned" for jurisdictions that may be considering similar approaches?

5. Are you aware of any other issues in your jurisdiction that contribute to limited access and increased wait times that are not being addressed through any formal approach?

6. Is there anything else about your experiences with addressing wait times that you would like to share?

7. Is there anyone else that you think we should talk to for more information on initiatives in your jurisdiction or elsewhere?

Thank you for your time!

Table S1. Central intake

Example	Healthcare setting (year implemented)	Specialty area	Purpose	Centralized referral and triage	Pooled waiting list	Screening	Other components	Impact
Australia								
Auburn Elective Surgery Pilot Project(1)	Pilot (Not reported)	General (laparoscopic cholecystectomy and hernia repair)	To increase rates of day surgery, reduce elective surgical waiting lists give patients a guaranteed date of surgery and improve operating theatre utilization	Yes	Yes	No	• Part of a standardized care pathway • Project manager and nurse coordinator hired to manage the project - Nurse coordinator negotiates dates for surgery and data and time for preadmission clinic and surgical review appointment with patients on the phone • Patient choice of first available surgeon or specific surgeon surgeon for both consultation and surgery • Preadmission clinic - Review by nurse and resident medical officer - Seen by post-acute community care - Review by admitting specialist surgeon scheduled to operate • Cancellation list • Nurse-initiated discharge on day of operation (if stable) or after - Usually seen by resident, but no discharge summary/script required • Post-acute community care nurses review patient in their home • Wounds reviewed 28 days post-discharge in surgical outpatients clinic	*Peer reviewed literature:* • In one evaluation of the pilot, the overall cost of elective surgery fell by 25% • The reduction in cost was mainly due to decreased length of stay, decreased time taken to perform procedures, and increased efficiency of theatre utilization • 57% of patients were able to be discharged on the same day • No recorded surgical complications • 91% of patients felt the program had been clearly explained • 65% reported that a definite date of surgery was the most important aspect of the project • 40% reported that they did not mind having a different surgeon to the one they originally consulted • 35% of patients objected travelling to Auburn • The most popular feature of the project from the patient's perspective was knowing their surgery would not be cancelled
Sunshine Coast Hospital and Health Service Musculoskeletal Pathway of Care(2, 3)	Regional (2014)	Orthopedic	To reduce orthopedic surgery wait times through outpatient assessment and streaming non-operative and operative patients into separate pathways	Yes	Yes	No	• Part of a standardized care pathway for surgical and non-surgical patients - Patients are placed into a pathway at triage - Non-surgical patients are referred to the Musculoskeletal Pathway of Care for assessment and development of a care plan by an Advanced Physiotherapy Clinician • Priority criteria: urgency - Category 1: should have surgery within 30 days of being added to list - Category 2: should have surgery within 90 days of being added to list Category 3: should have surgery within 365 days of being added to list	*Grey literature:* • In a government report, of 1325 Category 2 referrals, 46% were triaged as non-surgical and referred to the Musculoskeletal Pathway of Care • In 2015, it was reported that over the previous 18 month, 60% of patients were triaged to the Musculoskeletal Pathway of Care • This reduced orthopedic surgery wait times for those remaining on the operative pathway to care • 85% of those triaged to the Musculoskeletal Pathway of Care, 85% were assessed as being able to proceed with treating their condition with non-

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								operative care and 4% were referred by their family doctor back to the surgical wait list
New service model in Orthopedic Unit, Repatriation General Hospital(4)	Hospital (2006)	Orthopedic	To optimize conservative management of hip and knee arthritis and ensure that joint replacement surgery is completed in an appropriate and timely manner	Yes	Yes	No	• Standardized referral form • Prioritization criteria for triage: potential need for surgery based on pain, limitations to daily activities, psychosocial health effects, economic effects and recent deterioration - Multi-attribute Prioritisation Tool (MAPT) is used • Patient choice of first available surgeon or specific surgeon • Dedicated clinic to assess only patients accessing this service • Extended physiotherapist-led additional assessment clinics for patients identified as unlikely to require surgery during triage • Education and counselling programs to support self-management and conservative management options for both surgical and non-surgical patients • Pre-habilitation and discharge planning • Data management system - Orthopedic Patient Management Information Technology program to collect and report accurate and timely data • Targeted funding was received to support the new service model	*Peer reviewed literature:* • In one study, wait times for initial outpatient assessment decreased from 10 to 3 months between 2005-06 and 2009-10 • During this same period, wait times for surgery also decreased from 18 to 8 months • Arthroplasty surgery throughput increased from 396 to 548 procedures • Participation in preoperative education sessions increased from 31 to 81% • LOS decreased from 6.3 to 5.3 days for hips and 5.8 to 5.3 days for knees • The use of inpatient rehabilitation decreased from 44 to 8%
Hospital and Health Services(5)	State (2017)	Various	Not reported	Yes	Yes	Not reported	• Patient choice of first available surgeon or a specific surgeon • Treat-in-turn	Not reported
Outpatient in Focus project, Southern Adelaide Local Health Network (SALHN)(6)	Hospital (2013)	Not reported	To change the profile of outpatients and improve the way services are delivered across the SALHN	Yes	Not reported	Not reported	• Wait list validation	Not reported
Central Referral Services(7)	Regional (Not reported)	Not reported	Not reported	Yes	Not reported	Not reported	Not reported	Not reported
Canada- Alberta								

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Example	Healthcare setting (year implemented)	Specialty area	Purpose	Centralized referral and triage	Pooled waiting list	Screening	Other components	Impact
Caleo Health Spine Partnership(8)	Regional (Not reported)	Orthopedic/ neurosurgery	To address the delay in access to multi-disciplinary assessment and management of patients with spinal diseases and injuries	Yes	Yes	Yes	• Standardized referral form • Multi-disciplinary team (spine-focused physician, physiotherapist, chiropractor, and rehabilitation coordinators) - Triage and assessment performed by non-specialist team • Patient choice of first available surgeon or specific surgeon • Data management system	*Grey literature:* • Approximately 44% of spine assessment patients are surgical candidates, while 56% are deemed non-surgical
Alberta Bone & Joint Health Institute hip and knee clinics(9-12)	Provincial (Not reported)	Orthopedic	To provide excellent bone and joint care, and help patients to relieve arthritis pain	Yes	Yes	Yes	• All services (other than family doctor visits and in-hospital care) provided in or through a hip and knee clinic (Edmonton, Calgary, Red Deer, Camrose, Grande Prairie, Lethbridge, Medicine Hat, Westlock) • Part of a standardized care pathway • Standardized referral form • Multi-disciplinary team (bone & joint specialists, nurse, rehabilitation team, administrative staff, and research assistants) - Screening assessments performed by nurses • Prioritization criteria for triage: appropriateness, medical fitness, and urgency • Patient choice of first available surgeon or specific surgeon • Care plans for patients identified as non-surgical • Case manager to support patient through surgical journey • Data management system • Established evidence-based criteria for screening, referral to home care following surgery, and when considering transfer to sub-acute care following surgery	*Grey literature:* • In a pilot randomized controlled study* (performed by the Alberta Bone & Joint Health Institute) in which 1700 patients were allocated to the new care path and 1700 patients were allocated to the traditional care path, patients who followed the new care path had significantly greater improvement in general health, less pain after surgery, and greater ability to perform normal daily activities than those who received conventional care • Waiting times for consultation with a specialist and for surgery declined dramatically • New continuum: - Wait from referral to first consultation: 21 - Wait from first consultation to surgery: 7.5 weeks - LOS 4.7 days - 85% mobilized day of • Current approach: - Wait from referral to first consultation: 145 days - Wait from first consultation to surgery: 58 weeks - LOS 6 days - 31% mobilized day of • The degree of improvement among patients in the new continuum of care exceeded that of patients in the conventional approach as measured by the WOMAC and SF-36 • Patients in the new continuum of care had a 36% improvement in their average

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								WOMAC score, compared with a 31% improvement for patients in the conventional approach • The lower total cost to public health care together with improved patient outcomes indicate the new continuum is more cost-effective than the conventional approach to hip and knee replacement *Note: impact based on implementation alongside other approaches
Facilitated Access to Treatment (FAST) (Interview)	Regional (Not reported)	General surgery	To improve access and reduce wait times for elective surgeries	Yes	Yes	Yes	• Standardized referral form • Surgeon champion to provide guidance when team is uncertain how to triage a referral • Patient choice of first available surgeon or specific surgeon	*Interview:* • Program was expanded to shoulder and spine surgeries •Requests have been received to establish similar programs for foot and ankle, thoracic, obstetrics and gynecology, and ophthalmology • 95% of referrals go to first available surgeon • Fewer cancellations or "no shows" • Fewer incidences of family doctors sending referrals to multiple surgeons • Patients are getting in to see surgeons sooner, although they may still have to wait a while for the actual surgery • For the program to work, you need all surgeons to "buy in" before you begin. Few surgeons may be interested in participating at the start. • When the program was expanded to the University, the importance of having all surgeons engaged was emphasized, as referrals were coming from the same family physicians and PCNs for all of the surgeons • If the family physicians begin sending their referrals to central intake only, the surgeons not involved may begin losing out. Reluctance to join the program was primarily around fear of receiving less referrals and, consequently, less income • To improve buy-in, they demonstrated that surgeons still had the same number of surgical candidates on their lists

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								• Their number of referrals may be slightly smaller, but primarily because the inappropriate referrals (duplicates, patient doesn't want surgery, patient already had surgery, etc.) are removed • Patients have reported back that this was their best experience in getting in to see a surgeon, even though they still had to wait a long time to have surgery • Patients were more satisfied because they knew that someone was actually looking at their referral. The uncertainty over whether anyone has their referral is stressful for patients.
Alberta Thoracic Oncology Program(13)	Provincial (Not reported)	Oncology	To offer rapid, state of the art, multidisciplinary evaluation of patients with suspected malignancies	Yes	Yes	No	• Part of a standardized, integrated care pathway • CT required for referrals with suspected lung cancer • Direct referrals from radiologists are now possible • Referrals are reviewed and triaged by nurse practitioners • Access to all lung cancer diagnostic and staging modalities • First consultation is with the nurse practitioner or a respirologist • Collaboration with Thoracic Surgery and Lung Tumour Group oncologists to discuss therapeutic plans • Pre-operative assessment of pulmonary function	Not reported
Cardiac Ensuring Access and Speedy Evaluation (EASE) program(14, 15)	3-year pilot (2003) Operational program at Mazankowski Alberta heart Institute(2006)	Cardiothoracic	To streamline the efficiency of consultation by cardiologists	Yes	Yes	No	• Referrals reviewed by clinic secretary to ensure completeness • Referrals better suited to previous cardiologist or specialty clinic were forwarded on • Multidisciplinary team (cardiologists, nurse practitioners, doctoral-trained pharmacists, cardiac technician, and sonographer) - Triage performed by a nurse practitioner based on pre-consultation information, diagnostic testing available or ordered by the EASE team, and information from the referring physician	*Peer reviewed literature:* • In a single evaluation of the 3-year pilot data, mean wait time from receipt of referral to date seen in consultation was reduced from 71 ± 45 days in the pre-EASE group vs. 33 ± 19 days in the EASE group ($p<0.0001$) • Wait times for pre-EASE patients originating within the form Capital Health Region were longer than waits for patients referred from outside the region. This effect was attenuated with Cardiac EASE. Mean wait time adjusted for baseline confounders, age and geographical origin still showed a

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							- Initial consultation began with the NP/PharmD performing a detail history and physical, and collating all laboratory and non-invasive testing - Cardiologist conducted an assessment focused on aspects deemed pertinent, discusses diagnoses/treatment options, and implements a management strategy - NP or PharmD reinforced the care plan and coordinated follow-up testing and procedures - Non-invasive diagnostic testing by the cardiology technician and sonographer typically coordinated with the first consult • Prioritization criteria for triage: patients coded based on urgency from 0 to 3 - Patients in categories 0 (emergent) or 3 (not needing follow-up within 3 months) not considered for EASE - Patients in category 1 (urgent) scheduled within 1 week - Patients in category 2 (stable) seen within 4-6 weeks • Patients requiring > 2 visits transferred to a cardiologist's individual clinic • Telehealth was planned to be used patients residing far outside of Edmonton to review diagnostic testing and laboratory results	significant reduction in the EASE group ($p<0.0001$). • Mean wait from date of referral to the date first booked was also significantly shorter in the EASE group ($p<0.0001$). • Wait to a definitive diagnostic decision and treatment plan was significantly shorter for the EASE group compared to the pre-EASE group (51 ± 58 days vs. 120 ± 86 days, $p<0.0001$). • Volume increased by nearly 50% in 2005 and by 19% in 2006. Consequently, wait times increased from 24 ± 13 days in 2004 to 42 ± 20 days in 2006 ($p<0.05$). However, patients were still seen significantly sooner in each year of the pilot than in the pre-EASE period ($p<0.0001$). • 98% of the EASE group had follow-up scheduled with their family doctor compared to 85% of the pre-EASE group. • Rapidity of feedback to referring physician through a transcribed letter was not significantly different between the pre-EASE and EASE group (8 ± 22 days vs. 9 ± 14 days, $p=0.51$).
Central Access and Triage(16)	Provincial (Not reported)	Various (Gastroenterology, hematology and hematologic malignancies, cardiothoracic)	To improve service integration and patient access to primary care and specialist medical services	Yes	Yes	No	• Standardized referral form • Prioritization criteria: urgency (emergent, urgent, semi-urgent, and routine referral types) - Implementation of Western Canada wait list prioritization tools for rheumatology, nephrology, gastroenterology, and geriatric referrals was planned for 2009 • Confirmation of receipt of referral, acceptance, and appointment scheduling • Patient choice of first available surgeon or specific surgeon	*Grey literature:* • Preliminary evaluations have reported decreased wait times and timely access for patients requiring urgent care • Pooled referrals have eliminated duplicate referrals and wait times for physicians have equalized • Health care providers reported increase ease and efficiency of referrals • In the rheumatology CAT pilot (2006), there was a 15 to 37% reduction in wait times, depending on urgency • Between 2005 and 2008, mean wait time to consultation for urgent-level

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								referrals decreased from 29 ± 46 days to 17 ± 14 days ($p<0.05$) • Mean wait time to consultation for moderate-level referrals decreased from 110 ± 57 days to 63 ± 42 days ($p<0.00005$) • Mean wait time to consultation for routine-level referrals decreased from 155 ± 88 days to 108 ± 37 days • Wait list shopping by referring family doctors was documented to have ended • In the gastroenterology pilot, there was an 8% reduction in wait times, despite 153% increase in referrals
Canada- British Columbia								
Burnaby Hospital Central Intake and Optimization Clinic for Arthroplasty(17) (interview)	Hospital (Not reported)	Orthopedic	To provide better access to joint replacement surgery	Yes	Yes	Yes	• Standardized referral form • Multi-disciplinary team - Initial assessment performed by intake nurse • Patient choice of first available surgeon or specific surgeon • Preoperative education and support for surgical candidates • Cancellation list • SuperPath approach offered to eligible patients • Non-surgical patients and patients who do not want surgery within 6 months referred back to their family doctor with information about alternative treatment options • Data management system	*Grey literature:* • Similar models have been implemented at the Vancouver General Hospital, as well as in Vancouver Island and Prince George. There were plans to expand to other centres in late 2018 *Interview:* • Central intake and screening clinics do minimize wait 1 but, while non-operative patients are screened out, the patients who needs to see a surgeon waits twice • The majority of patients do not meet the criteria to be excluded from surgery
Interior Breast Rapid Access Investigation and Diagnosis (IB-RAPID)(18)	Regional pilot (2011)	Oncology	To address the issue of wait times for breast cancer care not meeting acceptable benchmarks	Yes	Yes	Yes	• A nurse navigator facilitates all relevant imaging tests and biopsies, obtains pathology reports and expedites surgical referrals • They nurse navigator also provides information and support to patients/families one-on-one and in group educational events involving other health care providers	*Peer reviewed literature:* • Wait times from 1st imaging to surgical intervention decreased with the introduction of IB-RAPID (59 vs 48 days, median) • The implementation of nurse navigation for patients with breast cancer appears to be effective at reducing the wait times for surgical treatment • Either a well-defined care process or an individual tasked with guiding patients through the health care system appears to

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								enable a faster transition to surgery and improve patient satisfaction
RebalanceMD New Joint Program (interview)	Regional (2013)	Orthopedic	To reduce wait time for surgery, provide a "one-stop" shop for musculoskeletal complaints, and provide rapid access and care for surgical and non-surgical patients	Yes	Yes	Yes	• Surgeries performed out of Royal Jubilee and Victoria General hospitals • Multi-disciplinary team (surgeons, non-operative surgeons, sports medicine physicians, physiatrists, physiotherapists, nurse/physio navigators and administrative staff) • Patient choice of first available surgeon or specific surgeon • Educational materials available online • Pre-operative and post-operative care (including physiotherapy) • Care plans for patients identified as non-surgical • Data management system - EMR built to interface with health authority electronic records	*Interview:* • Wait time for consultation decreased from 18 months when the clinic first opened in 2013 to 6-10 weeks • Wait time for hip/knee surgery is 14 weeks • 1400-1500 referrals/month for all conditions, not only surgical • 1000-2500 surgeries booked/year
University of British Columbia Hospital Centre for Surgical Innovation (CSI)(19)	Hospital (2006)	Orthopedic	To improve access to surgery	Yes	Yes	Yes	• Two centralized joint clinics to provide multidisciplinary assess of patients, refer to surgeon if necessary, and perform rehabilitation - Complex Joint Reconstruction Clinic at Vancouver General Hospital - Osteoarthritis Service Integration System • Multidisciplinary teams - OASIS is physiotherapy-based • If the patient's own surgeon is unavailable to operate, then referral proceeds directly to a participating surgeon, or the patient is assigned to a participating surgeon by the UBCH office	*Peer reviewed literature:** • In the 2006/07 and 2007/08 fiscal years, the CSI program achieved its headline target by performing 1609 and 1600 joint replacements, respectively, or about 16% of the total number of provincial cases •Total number of patients waiting > 26 weeks in BC decreased by 15% from 3878 at the end of 2005/06 to 3203 in 2006/07 and by a further 14% to 2768 in 2007/08 • Total number of patients on the waiting list decreased by 16% over the first year of the program • The result is a median waiting time of 3 months for hip replacements and 4 months for knee replacements • The 2 health authorities that are local to the program achieved their patient participation targets, whereas the 3 distant health authorities did not • Patient satisfaction with the service provided at the CSI remains high, with a mean satisfaction score recorded at 4.7 out of 5 on a Likert scale for 599 patients randomly surveyed after discharge

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								• Any reported concerns were mainly related to waiting time and travel rather than service quality • Targets were well met for an average OR time of 1 hour and 45 minutes, an average length of stay in post-anesthesia recovery of 2 hours and 4 minutes and an average postsurgical length of stay in hospital of 3.4 days • Changes have already taken place in Vancouver to accommodate ASA grade 3 patients within the program to more directly and effectively deal with the backlog of patients waiting > 26 weeks. • Increased staffing levels and medical coverage on the surgical observation unit have been instrumental in facilitating this change • The change has been successful and, at present, very few patients are ineligible for the CSI program, thus alleviating concerns of so-called "cherry-picking" *Findings are based on the entire CSI program
Hip and knee centres(20)	Regional (Not reported)	Orthopedic	Not reported	Yes	Yes	Not reported	• Pre-surgical optimization clinic • Patient choice of first available surgeon or specific surgeon • Increased access to post-operative support and rehabilitation	Interview: • These programs "have helped a bit with wait times" • Integrated programs allow some non-surgical patients to be deflected to osteoarthritis clinics Interview: • While these programs minimize Wait 1 by screening out non-surgical candidates, surgical patients essentially "need to wait twice" to see a surgeon • First available surgeon only helps to reduce wait times if there are significant discrepancies in wait times between surgeons
Trans-catheter aortic valve replacement (TAVR) program(21)	Hospital (Not reported)	Cardiothoracic	To address the growing number of referrals and complexities of	Yes	Not reported	Not reported	• Standardized referral form (electronic) • Transcatheter heart valve (THV) Nurse Coordinator position to support the program and patients, conduct a global functioning assessment, and provide	*Peer reviewed literature:* • 5-8 new referrals were received per week, with approximately 70% of referred patients deemed eligible for TAVR following careful assessment

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			TAVR candidates				clinical triage coordination, waitlist management, patient and family education and communication with clinicians • Interdisciplinary rounds assist in the selection of candidates • Clinical data management system facilitates standardized documentation and quality assurance	
Canada- Manitoba								
Winnipeg Central Intake Service for total joint replacement(22) (interview)	Regional (2012)	Orthopedic	To improve access to total joint replacement surgery	Yes	Yes	No	• Standardized referral form • Patient choice of first available surgeon or specific surgeon for both consultation and surgery • Standardized pre-consultation questionnaire about mobility, pain issues, and medical history • Letter to confirm referral receipt • Allocations completed based on surgeons' wait 1, wait 2, and patient capacity • Data management system - Patient Access Registry Tool to monitor and manage patients on wait list for consultation and surgery - Regional Joint Replacement Registry to monitor surgical performance and outcomes	*Peer reviewed literature:* • In a pre-post study, the variability in total wait time was reduced by 3.7 weeks for hip surgery and 4.3 weeks for knees • Knee replacements within benchmark increased by 5.9% *Grey literature:* • Reduced variability in waiting times across surgeons • Increased referral volumes to next-available surgeon • More patients having surgery within benchmarks *Interview:* • If referrals are going to the early adopters of central intake, late adopters will eventually get on board as their referrals drop off Interview: • General equalization of total waitlists • Fewer complaints to the Ministry as patients receive information from central intake staff • Provincial volume increased by 25% with the implementation of central intake *Interview:* • Central intake or wait list can have a positive impact by better matching supply and demand so that wait times are evened out and reduce overall • However, if demand continues to be higher than the capacity, central intake

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Example	Healthcare setting (year implemented)	Specialty area	Purpose	Centralized referral and triage	Pooled waiting list	Screening	Other components	Impact
								will reach a point where it can no longer reduce wait times, it can only ensure no one is waiting much longer than anyone else
Cataract central wait list (interview)	Provincial (Not reported)	Ophthalmology	Not reported	Yes	Yes	Not reported	• Patient choice of first available surgeon or specific surgeon	*Interview:* • Central intake or wait list can have a positive impact by better matching supply and demand so that wait times are evened out and reduce overall • However, if demand continues to be higher than the capacity, central intake will reach a point where it can no longer reduce wait times, it can only ensure no one is waiting much longer than anyone else
Central intake for endoscopy in the Winnipeg Regional Health Authority(23)	Regional (Not reported)	Endoscopy	To improve patient access to timely endoscopy, ensure patients are getting the right test for the right indication, and improve communication, record keeping and continuity with patients and referring physicians	Yes	Yes	Not reported	• Standardized referral form	Not reported
Spine assessment clinics (interview)	Provincial (Not reported)	Orthopedic/ neurosurgery	Not reported	Not reported	Not reported	Yes	• Multidisciplinary team - Physiotherapists assess patients and refer to surgeon if they are a surgical candidate	*Interview:* • Initiatives that redirect patients to more appropriate services have demonstrated impact, provided their use is consistent
Canada- Newfoundland								
Interdisciplinary Central Intake and Assessment Clinics(24, 25) (interview)	Provincial (2011)	Orthopedic	To reduce wait times for hip and knee replacement surgeries	Yes	Yes	Yes	• Standardized referral form • Multidisciplinary team - Triage and assessment performed by non-physician - Follow-up performed by physiotherapist • Patient choice of first available surgeon or specific surgeon	*Grey literature* • In 2-year pilot in the Eastern Health Region wait times for referral from a family doctor to initial orthopedic consult was reduced from a median of 325 days to 91 days for high-priority referrals and 179 days for routine referrals

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							• Self-management programs for patients identified as non-surgical • Pre-surgical optimization clinics • Preoperative assessments • Education for patients • Services for patients requiring medical assessment to determine their fitness for surgery • Patients deemed not ready for surgery are discharged back to family doctor but assured they can get in within 1 month for a consultation if their condition worsens • Only book patients 1-1.5 months out	• Having the clinic arrange for additional services reduces delays and duplicate referrals *Interview:* • To keep up with increased demand, it is necessary to scrutinize appropriateness in every part of the continuum
Other provincial central intake programs (interview)	Provincial (Not reported)	Various	Not reported	Yes	Yes	Not reported	• Standardized referral form • Patient choice of first available surgeon or specific surgeon for consultation and surgery	*Interview:* • Patients are accepting of seeing first available surgeon for consultation and surgery (i.e. the surgeon who performs your surgery might not be who you saw in consultation) • Working on expanding the model into other areas (e.g. general surgery) but funding is necessary for a number of new positions • Immediately eliminate duplicate referrals, but demand increases • To keep up with increased demand, it is necessary to scrutinize appropriateness in every part of the continuum
Canada- Nova Scotia								
Orthopedic Surgery Central Referral Clinics(26, 27)	Provincial (2017)	Orthopedic	To improve access to hip and knee care	Yes	Yes	Yes	• Standardized referral form • Multidisciplinary team (nurse, social worker, physiotherapist, occupational therapist, dietitian) - Triage and assessment performed by RN and physiotherapist • Patient choice of first available surgeon or specific surgeon • Care plans patients identified as non-surgical patients • "Education, advice, and support" before and after surgery • Pain management services • Wellness programs • Physiotherapy	*Grey literature:* • In one health region, referrals to surgeons that were awaiting assessment decreased from 1200-1250 (2010) to 235 (2014). • LOS for knee arthroplasty patients decreased from 4.7 days (2010) to 3.8 days (2012) • LOS for hip arthroplasty decreased from 4.9 days (2010) to 4.1 days (2012)

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							• Advice on making home safer and more accessible	
Joint hernia clinic(28)	Hospital (2006)	General surgery	To increase effective use of resources to reduce waiting times	Yes	Yes	No	• Standardized referrals form • Patient choice of first available surgeon or specific surgeon for both consultation and surgery • Data management system - Team includes a data manager	*Peer reviewed literature:* • In a single study, there was no difference in post-operative complication rates between patients who saw the same surgeon for consultation and surgery (group 1) and those who saw different surgeons (group 2) • Waiting time from family doctor referral to initial clinic consult decreased from 208 days in 2007 to 59 days in 2009 • 98.4% of group 1 respondents considered it important to have the same surgeon for assessment and surgery vs. 48.3% of group 2 respondents ($p<0.0001$) • 98.4% of group 1 respondents had confidence in their assessing surgeon vs. 86.2% of group 2 respondents ($p=0.034$) • 100% of group 1 respondents had confidence in their operating surgeon vs. 86.2% of group 2 respondents ($p=0.009$) • 2/3 of respondents had confidence in the competence of any surgeon and believed the service was better and faster in specialized centre • Majority of respondents believed the group model uses resources more effectively • 52.5% of respondents understood that they could request the assessing surgeon to perform their surgery (49.2% group 1 vs. 55.2% group 2, $p=0.66$) • On average, 2/3 respondents were comfortable having their surgery performed by a surgeon they meet the day of surgery (59.7% group 1 vs. 75.9% group 2, $p=0.16$)
Canada- Ontario								
Inter-Professional Spine Assessment and Education Clinics(29) (interview)	Provincial (Not reported)	Orthopedic/ neurosurgery	To help assess and manage Ontarians with low back and low back	Yes	Yes	Yes	• Standardized referral form (electronic in some LHINs) • Multidisciplinary team (nurse, social worker, physiotherapist, occupational therapist, and clerk)	*Interview:* • Pilot programs in Hamilton, Thunder Bay, and Ontario showed significant success in patient outcomes and financial benefits to the system

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Example	Healthcare setting (year implemented)	Specialty area	Purpose	Centralized referral and triage	Pooled waiting list	Screening	Other components	Impact
			related leg symptoms				- Triage and assessment performed by Advanced Practice Provider (i.e. advanced practice physiotherapist or advanced practice nurse) - Assessments are performed in clinics closet to where patient lives • Patient choice of first available surgeon or specific surgeon • Non-surgical patients receive self-management plans	• The Ministry is making this program a priority for all LHINs • Champlain LHIN is the first to have implemented the program LHIN-wide • family doctors have benefited from this program as many have difficulty managing patients with lower back pain
Central Intake and Assessment Centres for Orthopedic(30-32) (interview)	Provincial (Not reported)	Orthopedic	To streamline the intake process (providing patients with more timely assessments and consult); improve surgeon wait list management and referral practices; provide patients with choice of hospital, surgeon, or shortest wait time; provide non-surgical patients with conservative management strategies; and improve communication to referral sources	Yes	Yes	Yes	• Standardized referral form (electronic in some LHINs) • Multidisciplinary team - Triage and assessment performed by Advanced Practice Provider (i.e. advanced practice physiotherapist or advanced practice nurse) • Patient choice of first available surgeon or specific surgeon • Care plans for patients identified as non-surgical • Data management system	*Interview:* • Hip and knee central intake was a success story for the Champlain LHIN, despite some pushback • Funding was obtained for a 3-year pilot project to expand the central intake and triage components to foot/ankle, shoulder, knee conditions requiring arthroscopy, cervical, thoracic, and spine • The assessment phase is seen as one of the most valuable components *Interview:* • Central referral and triage saves surgeons time and standardizes criteria for surgery • Most patients choose first available surgeon • Central intake had a greater impact on wait times once it became mandatory (patients now need a central tracking number to have their case booked)
Joint Health and Disease Management Program(33)	Regional (2007)	Orthopedic	To actively manage patients requiring hip and knee replacement	Yes	Yes	Yes	• Standardized referral forms • Multidisciplinary team (physician, advanced practice nurse, and advanced practice physiotherapist) - Triage and assessment performed by an advanced practice physiotherapist	*Grey literature:* • In a report published by the LHIN*, it was stated that 90% of patients in the LHIN are waiting <115 days for hip or knee replacement surgery vs. the provincial target of 182 days

Table S1. Central intake

Example	Healthcare setting (year implemented)	Specialty area	Purpose	Centralized referral and triage	Pooled waiting list	Screening	Other components	Impact
			surgery across the entire continuum of care				- APPs provide education and recommend a treatment plan, including self-management programs for non-surgical candidates - Likely surgical candidates may receive a high-level assessment by an RN to flag medical issues to be addressed in advance of surgery - Follow-up assessments performed by APPs • Prioritization criteria for triage: urgency • Multiple assessment centres • Patient choice of first available surgeon or specific surgeon • Education through standardized resource materials • Patient choice of first available surgeon or surgeon of choice • Standardized guidelines for follow-up care • Data management system - Web-based electronic referral tracking system to support collection, processing and analysis of data and to enable reporting to the WTIS	•Wait from date of referral to first consultation with a surgeon is <100 days *Note: impact based on implementation alongside other approaches
Thoracic Triage Panel(34)	Hospital (2014)	Oncology	To reduce wait times and improve patient flow through lung cancer diagnosis and treatment	Yes	Yes	No	• Standardized referral form • Referrals initiated by radiologists, who forward any plain film or CT studies that may indicate cancer to the Panel - The Panel sends a referral form to the family doctor for completion and patient consent • Panel is comprised of thoracic specialists (radiology, respirology, medical and radiation oncology, thoracic surgery, and pathology) • Nurse navigator to coordinate patient care and act as contact person for patients and clinicians	*Peer reviewed literature:* • In a single study, median wait time from first abnormal imaging to treatment initiation was 80 days for patients referred to TTP vs. 118 for patients managed by traditional means • Median wait time from first abnormal imaging to diagnostic biopsy was 36 days for patients referred to TTP vs. 61.5 for patients managed by traditional means • Median wait time from biopsy to treatment initiation did not change significantly with TTP intervention.
Canada- Quebec								
Montreal's Service Request Distribution Centre(35)	Provincial (2016)	Various	To streamline the referral process between	Yes	Not reported	Not reported	• Standardized referral form (electronic) • Prioritization criteria: urgency of the referral is defined by clinical priority codes	Not reported

Table S1. Central intake

Example	Healthcare setting (year implemented)	Specialty area	Purpose	Centralized referral and triage	Pooled waiting list	Screening	Other components	Impact
			general practitioners and specialists				•A local medical coordinator can assist family doctors in filling out the referral form.	
Canada- Saskatchewan								
Spine Pathway Clinics(36-38)	Provincial (2010)	Orthopedic/ neurosurgery	To improve quality for lower back pain care by encouraging guidelines-concordant evidence-based primary care while reducing wait times for appropriate MRI and surgical referral	Yes	Yes	Yes	• Part of a standardized care pathway - Patients with "red flags" or those who do not improve with recommendations outlined in the pathway are referred to clinic • Multidisciplinary team - Triage and assessment performed by specially trained physiotherapist • Patients may be triaged for further mechanical therapy, imaging, and/or referral to a spine surgeon • Patient choice of first available surgeon or specific surgeon	*Peer reviewed literature* • In a retrospective analysis of 215 consecutive new patient referrals between June 1, 2011 and May 30, 2012, it was reported that SSP clinic referrals were significantly more likely to be candidates for surgery than referrals from outside an SSP clinic (59.1 vs. 37.6%, p=0.003)(38)
Hip & knee pathway clinics(39)	Provincial (Not reported)	Orthopedic	Not reported	Yes	Yes	Yes	• Part of a standardized care pathway • Multidisciplinary team - Triage and assessment of patients - Surgical bookings if patient is candidate - Education (sessions and take-home information) • Patients identified as non-surgical are provided with access to non-surgical care in the community	Not reported
Pooled referrals in Saskatchewan(40-42)	Provincial (Not reported)	Various	To provide patients with quicker access to specialists by maximizing the use of all specialists evenly	Yes	Yes	No	• Standardized referral form • Central intake service (Referral Management Service) established for specialists who do not share an office • Patient choice of first available surgeon or specific surgeon for both consultation and surgery in some groups • Patients can also exclude a specific surgeon • Confirmation of referral receipt within 10 business days • Allocations completed using algorithms developed by the specialist group	*Grey literature:* • Pooled referrals are a popular choice amongst patients. • A Regina gynecologist was quoted as saying that her colleagues were not hard to convince of the benefits of pooled referrals. They receive a steady stream of appropriate referrals and the system matches the flow of referrals to the capacity of the specialists.
New Zealand								

Table S1. Central intake

Example	Healthcare setting (year implemented)	Specialty area	Purpose	Centralized referral and triage	Pooled waiting list	Screening	Other components	Impact
New triage system in the Orthopedic Department, Canterbury District Health Board(43)	Hospital (2015)	Orthopedic	To Ministry-mandated time frames for first specialist consultation and completion of surgery	Yes	Yes	No	• Referral guidelines shared with all family doctors in the region and available online • Workshop before implementation to ensure family doctors understood new process • Prioritization criteria: clinical severity based on referral letter and standard radiograph (<6 months old) - Emphasis on pain and functional limitations •Direct referral to surgical wait list initially allowed for patients seen privately by an orthopedic surgeon and assessed as needing surgery (to ensure equity, privately seen patients later required to go through same process) • Triage performed by orthopedic surgeons • Referrals denied if information is insufficient, patient has a BMI>40 (referral to obesity clinic), patient is deemed low priority, or if there is no capacity (total surgical volumes per year are set by the Ministry of Health)	*Peer reviewed literature:* • A single evaluation of the program from August 1, 2015 to March 31 2016 was performed • Of 393 hip referrals, 47% accepted for specialist consultation after triage, 19% declined due to no capacity,16% declined as low priority, 10% direct to wait list, and 8% declined for insufficient information • Of 895 knee referrals, 37% accepted for specialist consultation after triage, 26% declined due to no capacity,19% declined as low priority, 13% direct to wait list, and 9% declined for insufficient information • In total, 43% of hip and 54% of knee problems were denied access to specialist consultation, most of whom were returned to their family doctor •Predictive accuracy of the triage process in assess patients who would be subsequently placed on the waiting list was >90%
Norway								
Elective surgery pathway at Forde Hospital(44)	Hospital (2008)	Various	To reduce cancellation rates for surgery	Yes	Yes	Not reported	• Patient choice of first available surgeon or specific surgeon, as well as date of surgery • Day surgery centre established at hospital • Centralized pre-admission • Capacity coordinator hired to manage program across departments • Data management system -Provides overview of referrals, waiting lists, and surgery schedules across all departments	*Peer reviewed literature** • In a single evaluation, mean cancellation rate was reduced from 8.5% to 4.9% (p<0.001) • Median number of operations performed per month increased 17% • Median number of scheduled operations per month increased from 373 to 400 (p=0.04) *Note: impact based on implementation alongside other approaches
United Kingdom								
Referral management centres(45)	Regional (Not reported)	Various	Not reported	Yes	Yes	No	• Triage may be administrative or clinical • May act as a 'choice' centre and support patients in selecting secondary care services	*Grey literature:* • The King's Fund report stated that limited evidence on impact could be found
Direct-booking hernia service(46)	Pilot (hospital)	General surgery	To reduce wait times for	Yes	Yes	No	• Part of study comparing a direct-booking service vs. traditional care	*Peer-reviewed literature:*

Table S1. Central intake

Example	Healthcare setting (year implemented)	Specialty area	Purpose	Centralized referral and triage	Pooled waiting list	Screening	Other components	Impact
			surgical consultations and hernia repair surgery				pathway (referral to outpatient clinic followed by surgical booking) • All patients were referred through central intake and added to a pooled waiting list for the first available surgeon	• Outcomes reported in the study compared the impact of the direct booking service to the traditional care pathway • They did not discuss the impact of centralized referral, pooled wait lists, or centralized triage and assessment.
Pooled waiting lists for cataract surgery in the UK(47)	Not reported	Ophthalmology	To reduce waiting times for surgical consultation and variation in waiting times between surgeons	Not reported	Yes	Not reported	Not reported	*Peer reviewed literature:* • 7.5% of ophthalmologists surveyed in a postal survey (n=479) use pooled wait lists, but 73% reported that patients were moved between specialists when a wait list became excessive • 30% were in favour of pooled lists and 67% were against • 92% of family doctors were happy to transfer their patients to an equally experienced surgeon if the operation would be done sooner • 82% of patients surveyed (n=85) would want their operation done sooner if performed by a surgeon of equal ability
United Kingdom – England								
Centralized assessment and triage services(45)	Regional (Not reported)	Various	To treat and access to majority of patients and reduce onward referrals to specialist secondary care services	Yes	Yes	Yes	• May also provide treatment	*Peer reviewed literature:* • A systematic review reported evidence that requiring a practice-based second-opinion can reduce unnecessary referrals *Grey literature:* • "Attaching a physiotherapist to a family doctor practice can increase the proportion of musculoskeletal referrals sent to the most appropriate destination"
Generic wait list for elective non-complex spinal surgery in Greater Manchester(48)	Regional (Not reported)	Orthopedics/ neurosurgery (spine)	To reduce waiting times for elective non-complex spinal surgery	Yes	Yes	No	• Centralization of neurosurgical services in Greater Manchester to single hospital (Hope Hospital) • MRI booking system integrated with outpatient review appointments	*Peer reviewed literature:* • In a single study, the number of patients waiting > 26 weeks from referral to first outpatient examination decreased to 0 within 4 months • Number of patients waiting >13 weeks declined greatly after implementation of the generic waiting list • Mean wait from MRI scan to outpatient review fell from 185 days to 31 days

Table S1. Central intake

Example	Healthcare setting (year implemented)	Specialty area	Purpose	Centralized referral and triage	Pooled waiting list	Screening	Other components	Impact
								• The % of patients waiting more than 9 months for surgery decreased from 37% to 0
Two week wait clinic(49)	Hospital (Not reported)	Oncology	To promptly identify patients with colorectal cancer and commence treatment in a timely manner	Yes	Not reported	Not reported	• Established in response to Department of Health recommending the 2 week wait rule (all cases of suspected cancer be reviewed by specialist services within 2 weeks of family doctor referral) • Standardized referral form - family doctors fax a tick box proforma containing the NICE guidelines	*Peer reviewed literature:* • 720 patients were seen in the clinic in 2008 • No waiting time results are reported • 356 (49.4%) of the urgent referral met the guideline high-risk criteria for referral • The pickup rate of colorectal cancer was 7.2% (52 patients) • 245 patients were identified to have colorectal cancer ascertained through all routes of referral • The pickup rate of colorectal cancer in patients with high-risk symptoms and signs meeting guidelines was 7.6% (27/356) • The pickup rate of colorectal cancer in patients with no symptoms and signs meeting guidelines was 6.9% (25/364). No different from patients who had signs meeting guidelines (p=0.71) • The clinic also identified 32 patients with other types of cancers
England multi-disciplinary diagnostic centre(50)	Hospital (2016)	Oncology	To deliver faster diagnoses	Yes	Not reported	Not reported	• Multidisciplinary team - Nurse specialist to triage patients, arranges for diagnostic services at the centre, and reviews the test results - Organize further investigations or arrange outpatient consultations for patients with suspected cancer • Patients who do not have cancer referred to appropriate specialist • Patients with suspected cancer reviewed by multidisciplinary team	Not reported
United Kingdom – Northern Ireland								
Integrated Clinical Assessment and Treatment Services(51)	Regional (Not reported)	Orthopedic	To provide specialist musculoskeletal assessment and triage for patients whose musculoskeleta	Yes	Yes	Yes	• Direct referral of patients whose issue has not been resolved with family doctor, physiotherapy, or podiatry care • Standardized referral form (electronic) • Multidisciplinary team (family doctor, specialist nurse, and allied health professionals, including physiotherapists)	Not reported

Table S1. Central intake

Example	Healthcare setting (year implemented)	Specialty area	Purpose	Centralized referral and triage	Pooled waiting list	Screening	Other components	Impact
			l complaints have not resolved with family doctor, physiotherapy, or podiatry care				- Team performs assessment, treatment, and diagnostic tests • Patients requiring specialist consultation are referred for a hospital outpatient appointment	
United Kingdom – Scotland								
Extended scope physiotherapist-led community screening services(52)	Regional (2009)	Orthopedic	To achieve the 18-week referral to treatment standard in orthopedic services	Yes	Yes	Yes	• Standardized referral form (electronic) • Triage and assessment are performed by Extended Scope Physiotherapists - Patients may be referred to a specialist, family doctor, or physiotherapist • Data management system	*Grey literature:* • In a report from the Scottish Government, it was noted that time taken to review and allocate referrals has decreased from 8-14 days (maximum 56 days) to 3-7 days (maximum 14 days) • "The introduction of this service has supported the achievement of reduced waiting times for specialist led orthopedic clinics" • In a report from NHS Scotland, it was noted that 77% of patients were successfully triaged away from specialist clinics • <20% of onward referrals to specialists • 13% of patients did not require treatment in acute care • New to return ratio for referrals to ESPs of 4:1 • In an evaluation from NHS Forth Valley, it was reported that ESPs were able to manage 72% of referrals, with only 18% requiring an orthopedic specialist outpatient appointment • In an evaluation from NHS Orkney, it was reported that mean waiting times from referral to consultation with orthopedic specialist decreased from 11 weeks in March 2008 to 4.5 weeks in March 2010 • In an evaluation from NHS Aintree, it was reported that waiting times for orthopedic specialists have reduced from 28-120 weeks to 16 weeks or less

Table S1. Central intake

Example	Healthcare setting (year implemented)	Specialty area	Purpose	Centralized referral and triage	Pooled waiting list	Screening	Other components	Impact
								• Only 17-18% of patients require specialist opinion • 88% agreement in diagnoses made by ESPs and specialists for patients to be referred to specialist • 88% of patients were happy to be seen by an ESP instead of an orthopedic specialist • There was skepticism from some specialists and family doctors about physiotherapists taking on an assessment role, but this has diminished with the positive results produced • Physiotherapists expressed some concern around liability but we reassured they were protected by the Trust (having a high-level champion in the Trust Chief Executive was important) • Continuing audit of outcome measures alongside ongoing evaluation and improvement of the service was identified as the key factor to this project's success
Referral Management Services in Scotland(53)	Regional (2006)	Various	Not reported	Yes	Not reported	Yes	• Multidisciplinary team - Examine referrals and decide most appropriate referral route for each patient including immediate treatment by the team (e.g. physio or minor surgery), referral to alternative non-specialist service, further diagnostic testing, referral to specialist, or return to family doctor with advice	*Grey literature:* • Typical results for fully implemented referral management services in specialties with strong potential for MDT intervention (such as dermatology or orthopaedics) include ~ 60% of patients triaged away from consultant clinics, high new to return ratios in excess of 2:1, and onward referral rates to consultants from the MDT of 10 – 20%

Table S2. Expanded roles for family physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description of role	Description of additional training	Impact
Direct access						
Australia- Western Australia(54)	State (1996)	General surgery	To increase access to diagnostic endoscopy in rural and remote Western Australia	• As part of an outreach rural surgical services program in Western Australia, family doctors were able to directly refer for endoscopy procedures without an initial gastrointestinal consult (open access endoscopy)	Not reported (Not reported)	*Peer reviewed literature:* • In one prospective study, 772 of the 4400 patients seen by the outreach program between 1996 and 2000 underwent upper endoscopy, colonoscopy, and flexible sigmoidoscopy • The referral rate for all endoscopy procedures was greater for general practitioners 583 (75%) compared to the visiting surgeons 189 (25%) • The overall compliance rate for approved indications using the American Society for Gastrointestinal Endoscopy guidelines for both groups was 92% (general practitioners 92%; visiting surgeons 91%) • 28 of the colonoscopies were outside the ASGE indications. There was no significant difference between the two groups on the basis of the guidelines • Patients are able to receive timely diagnostic services in their communities • Benefits include a reduction in transfers of rural patients to metropolitan and regional centres, no additional pressure on waiting lists, a reduction in government-assisted travel costs for rural and remote patients living in Western Australia and a personal financial saving to the individual
Ireland(55)	Hospital (Not reported)	General surgery	To reduce the number of visits to hospital for outpatient minor operative procedures	• family doctors directly referred patients to the hospital for treatment • Following treatment, patients were referred back to their family doctor for suture removal and histology results	Not reported	*Peer reviewed literature:* • In one pilot study, 48 (20%) of the 241 identified appropriate patients were treated through the clinic within 5 weeks • Current waitlist has been reduced from 13 months to 9 months • It is projected to reduce below best-practice guidelines of 6 months before the end of the project
Ireland(56)	Hospital (Not reported)	ENT (tonsillectomy)	To reduce lengthy waiting time from initial family doctor assessment to surgery and also the overall cost involved	• Patients referred by their family doctor were directly booked for surgery without prior assessment in the outpatient department • After referral, patients were sent a questionnaire to assess their suitability	Not reported	*Peer reviewed literature:* • In a single-blinded cohort study, 22 patients were booked through the traditional approach and 20 patients booked through direct booking • Mean± SD waiting time from referral to surgery for the traditional approach was 12.8±3.0 months (range: 8 - 18 months)

Table S2. Expanded roles for family physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description of role	Description of additional training	Impact
				• The returned questionnaire were reviewed by the otolaryngologist and patients fulfilled the criteria for tonsillectomy were booked for the procedure • Once booked, a leaflet regarding the procedure was sent to the patients • Patients that did not fulfil the criteria or those requiring further assessment were sent an outpatient appointment • Patients were assessed by the otolaryngologist on the day of admission • Tonsillectomy was chosen for The 'direct booking system' because it is based on the concept that the decision made to proceed with surgery is based on history and not the clinical appearance of the tonsils		• Mean± SD waiting time from referral to surgery for the direct booking system was 5.4±1.1 months (range: 4-7 months) • Difference was statistically significant ($p<0.001$) • Based on knowledge assessment, despite oral and written advice patients booked through either form (traditional and direct booking) were poorly informed regarding the procedure
New Zealand(57)	Regional (Not reported)	ENT	Not reported	• family doctors with Special Interests in otorhinolaryngology can were able to plan care for patients requiring common surgical interventions and directly refer them to the waiting list	Not reported	*Grey literature:* • In a document published by the health authority, it was reported that referrals and treatment by family doctors were appropriate, access for patients was improved, and waiting times had reduced • 99% of referrals to the minor surgery service are managed by family doctors • Average waiting time from referral to treatment for minor surgery was 12.3 days in 2010/11
New Zealand(57)	Regional (Not reported)	Various	Not reported	• family doctors with Special Interests in Counties Manukau were able to fast track patients requiring some surgical procedures direct to waiting lists obviating the need for hospital-based FSAs	• family doctors with Special Interests • No other information provided	*Grey literature:* • In a document published by the health authority, it was reported that median wait time for priority 3 patients (semi-urgent, to be seen within 8 weeks) was 37 days for the family doctors clinic and 77 days for the Manukau Surgical Centre
United Kingdom – England(58)	Hospital (Not reported)	Orthopedic (carpal tunnel syndrome)	Not reported	• Directly referred patients for carpal tunnel decompression, bypassing outpatient or preadmission clinics	• family doctors were given patient information sheets and questionnaires to be filled out for each referral	*Peer reviewed literature:* • In one pilot study of 51 patients were seen over 18 months, the mean time from referral to surgery was 6.9 months (range 1.5 to 15)

Table S2. Expanded roles for family physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description of role	Description of additional training	Impact
					• The questionnaire served two purposes: to remind the practitioner of the criteria required for referral and to allow the consultant to screen patients' suitability for direct access to surgery before their names were added to the waiting list	• The time from referral to surgery was reduced by 4 months (i.e. the time patients had to wait to be seen for preoperative surgical consultation) • 4% of patients had surgery cancelled • At follow-up, 41 patients (80%) said they would have their referral handled this way again, 9 (18%) and 1would not • Lack of preoperative information was the cause of dissatisfaction in some patients
United Kingdom – England(46, 59)	Hospital (Not reported)	General surgery (hernia)	To reduce wait times for hernia repair	• Uncomplicated hernia cases as described in the referral letter and likely ASA grade I or II risk for general anaesthetic were offered direct access to hernia surgery • Patients underwent surgery without a preoperative clinical appointment with surgeon • Patients were evaluated in the pre-operative assessment clinic and assessed by a nurse on the week before their operation	Not reported	*Peer reviewed literature:* • In one retrospective study, the median waiting time in the direct access group was 69 days • The total median time for patients who had a surgical appointment before surgery was 142 days • Patients had to wait a median of 83 days for the surgical appointment and 57 days for surgery • There were no mortality and major complications registered in the study •Direct access surgery appointments have allowed other patients to be seen in the out-patient department • In a second retrospective study, 7% of patients in the direct access group did not attend surgery • The mean waiting time from referral to surgery for patients in the direct access group was 70 days (range 10 to 177) • The total mean waiting time for patients who had a surgical appointment before surgery was 161 days • Patients had to wait a mean of 77 days (range 35 to 136) for the surgical appointment and 84 days (range 28 to 105) for surgery
family doctor-led surgery						
Canada- Alberta (interview)	Provincial (Not reported)	Various	Not reported	• family doctors have performed surgeries, primarily in rural hospitals	Not reported	Not reported

Table S2. Expanded roles for family physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description of role	Description of additional training	Impact
Ireland(60)	National pilot (in progress)	ENT	To provide a greater volume of care in communities, reduce the number of referrals and waitlist	• A pilot project is in progress in which family doctors with a special interest in ENT will provide a defined range of procedures without referral to otorhinolaryngologists • family doctors and ENT services will be formally linked, and appropriate learning and research opportunities will be explored and developed to enable family doctors obtain accreditation in ENT procedures agreed and accepted as suitable for primary care surgery	• A Training Process and Accreditation for family doctors in ENT Primary Care Surgery is under development	• Data is being collected and no results have been reported • The predicted outcomes are a reduction in outpatient referrals, a reduction in existing outpatient waitlist and reduction in the return to new patient ratio
New Zealand(57)	Regional (Not reported)	General surgery	Not reported	• Seven family doctorwSIs within the Otago region were trained to provide general surgery through contracts with Southern DHB	• family doctors with Special Interests (family doctorwSI) • No other information provided	*Grey literature:* • In a document published by the health authority, it was reported that referrals and treatment by family doctorwSIs were appropriate, access for patients was improved, and waiting times had reduced • 99% of referrals to the minor surgery service are managed by family doctorwSIs • Average waiting time from referral to treatment for minor surgery was 12.3 days in 2010/11
United Kingdom – Northern Ireland(61)	National (2018)	Urology	To improve access to treatment	• family doctors have performed vasectomies	Not reported	Not reported

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
Perform triage and assessments							
Australia-Queensland(62)	Hospital (2008)	Neurosurgery	Not reported	Physiotherapist	• Assessed and triaged patients referred to neurosurgery for spinal pain	Not reported	*Grey literature:* • Reduced outpatient waiting times • Reduced need for neurosurgical consults
Australia-Queensland(63)	State (2016)	ENT	To reduce waiting times, improve patient flow, and improve patient outcomes and satisfaction	Audiologists, speech pathologists and physiotherapists	• Served as first point of contact for category 2 and 3 referrals in ENT Specialist Outpatient Clinics • Triaged, assessed, managed, and discharge patients as appropriate	Not reported	*Grey literature:* • Reduced waiting times for specialist outpatient appointments • Increase in non-surgical management for patients with routine conditions • Escalation of referrals for patients with complex needs and release of ENT consultant time
Australia-Queensland(63)	State (2016)	Orthopedic	To reduce waiting times, improve patient flow, and improve patient outcomes and satisfaction	Physiotherapist	• Served as first point of contact for category 2 and 3 referrals in Orthopedic Specialist Outpatient Clinics • Triage, assess, manage with conservative interventions, and refer to other allied health services, primary care and medical specialists	Not reported	*Grey literature:* • Assist Hospital and Health Services to meet National Elective Surgery Targets (NEST) • Reduce waiting times for specialist outpatient appointments
Australia-Queensland(62)	State (Not reported)	Orthopedic	Not reported	Physiotherapist	• Triaged neurosurgery outpatients to determine need for surgical or conservative intervention.	Not reported	*Grey literature:* • Initial appointment wait reduced from 12 months to 4 months • 20% of patients seen by physiotherapist fast-tracked to surgeon, with imaging to facilitate consultation • Most patients seen by physiotherapist managed conservatively and discharged without having to see a surgeon • Freed up surgeons' consultation time.
Australia-Queensland(64)	Hospital (Not reported)	Orthopedic	Not reported	Physiotherapist	• Identified patients awaiting orthopedic/surgical opinion, who may benefit from non-surgical management of their condition • Part of the Orthopedic Physiotherapy Screening Clinic and Multidisciplinary Service	Not reported	*Grey literature:* • The program helps reduce wait times for patients who do require surgery

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
Australia-Queensland(65)	Regional (2014)	Orthopedic	To reduce the number of patients waiting longer than the clinically recommended time for a specialist outpatient appointment	Physiotherapists	• Screened patients in orthopedic and neurosurgical physiotherapy clinics	Not reported	*Grey literature*:* • The number of long-wait patients waiting for outpatient specialist appointments was reduced from 8,090 in July 2014 to 1,026 in June 2015 • An overall reduction of 87% (7,064 patients), while at the same time seeing 4% or approximately 12,000 more patients than the previous year • Across all combined categories the percentage of long waits reduced from 56% in July 2014 to 10% in June 2015 • The individual category performance breakdown is Category 1 46% to 0%, Category 2 67% to 15%, and Category 3 from 45% to 6%. *Note: these results report on all specialties
Australia-Queensland(65)	Regional (2014)	ENT	To reduce the number of patients waiting longer than the clinically recommended time for a specialist outpatient appointment	Audiologist	• Screened patients in audiology clinics	Not reported	*Grey literature*:* • The number of long-wait patients waiting for outpatient specialist appointments was reduced from 8,090 in July 2014 to 1,026 in June 2015 • An overall reduction of 87% (7,064 patients), while at the same time seeing 4% or approximately 12,000 more patients than the previous year • Across all combined categories the percentage of long waits reduced from 56% in July 2014 to 10% in June 2015 • The individual category performance breakdown is Category 1 46% to 0%, Category 2 67% to 15%, and Category 3 from 45% to 6%.

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
							*Note: these results report on all specialties
Australia-Queensland(62)	State (Not reported)	Neurology	Not reported	Physiotherapists	• Conducted screening assessment for patients with back and neck pain on the neurosurgical wait list • Conservative management arranged as appropriate • Patients requiring consultant review were referred to the neurosurgery clinic	Not reported	*Grey literature:* • Reduced demand on neurosurgery outpatient clinics • Effective use of neurosurgical consultants' time
Australia-Queensland(62)	State (Not reported)	Orthopedic	Not reported	Podiatrist	• In a podiatrist-led clinic, assessed patients (of low priority for foot surgery) to determine benefits of conservative management versus surgery	Not reported	*Grey literature:* • Reduced waitlist for Orthopedic • Quicker access to appropriate care. Improved outcomes through timely conservative management
Australia-Queensland(62)	State (Not reported)	Ophthalmology	Not reported	Orthoptists	• Assessed and managed patients with chronic eye conditions, including diabetic retinopathy, cataracts and glaucoma.	• Credentialed using a competency training package	*Grey literature:* • More timely access to care and increased staff capacity • Allowed for development of a service for patients with retinal disorders • Freed up ophthalmologists to take on more complex cases
Australia-Queensland(66)	State (2014)	Various (ENT, neurology, gynecology, orthopedic, urology)	Not reported	Allied health practitioners	• Audited semi-urgent and non-urgent referrals to identify patients suitable for management in an allied health clinic • Assessed and managed patients	Not reported	*Peer-reviewed literature:* • 5824 new patients received care in the allied health primary contact clinics between March 2014 and June 2016 • The largest contribution to this throughput was from physiotherapy-led musculoskeletal clinics, which collectively provided 3000 new patient appointments (51.5% of the total) across the health service • Reduction in the number of Category 2 and 3 patients waiting on relevant specialist out-patient wait lists across all four facilities, from 20,446 patients in September 2014 to 12,306 patients in June 2016
Australia-Tasmania(67)	State (Not reported)	Orthopedic	To provide a more cost efficient pathway	Physiotherapist	• Ran the Comprehensive Osteo-Arthritis Pathway (COACP) to	Not reported	*Grey literature:*

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
			for patients through the health system		identify patients whose clinical symptoms do not require review by an orthopedic surgeon		• Pathway is overloaded and with the recent reduction in allied health professional (AHP) staffing resources it will be even less effective
Australia- Tasmania(67)	State (2009)	Orthopedics/ neurosurgery (spine)	To triage and assess people with spinal pain within a rheumatology service	Physiotherapist	• Triaged and assessed patients in a rheumatology service with spinal pain • Physiotherapists worked under medical supervision	• "Advance scope of musculoskeletal practice" • No other details provided	*Grey literature:* • Waiting time for patients was reduced from >2 years to 6 months, and 94% patients were assessed as not requiring or not suitable for surgical intervention (i.e. they were waiting in the wrong clinical pathway) • Costly investigation and imaging was reduced by 90% • There was high patient satisfaction (93%) with the service provided • Due to a reduction in AHP resourcing, the service is becoming more inefficient and the waiting list is more unmanageable
Australia- South Australia(68)	Hospital (2003)	Ophthalmology	To improve access to care	Nurse practitioner	• Assessed patients for visually disabling cataracts and provides specialist postoperative care for cataract surgery patients • Part of a nurse-led cataract clinic • The clinic expedited direct transfer to the surgeon of patients who would benefit from cataract surgery • Patients recommended for cataract surgery were given a priority appointment to see the ophthalmologist, patients not requiring surgery were referred back to their family doctor and/or optometrist, patients found to have ocular comorbidity were referred to the appropriate subspecialist ophthalmologist	• Ophthalmic NPs have received authorisation from the state nursing board and their place of employment to work in autonomous practice role • Protocols were formulated in conjunction with senior ophthalmologists around preoperative assessment, post-operative assessment, and quality assurance mechanisms	*Peer-reviewed literature:* • Prospective observational study of 185 public patients • Waiting times for clinic appointments were reduced from a median of 115 days (range, 23-268 days) in the first 3 months of the nurse-led clinic to a median of 21 days (range, 9-43 days) in the last 3 months of the nurse-led clinic • Elective surgical waiting times among nurse-led clinic patients fell from a median of 44 days (range, 5-148 days) in the first 3 months to a median of 29 days (range, 14-154 days) in the last 3 months • A quarter of all patients attending the nurse-led cataract clinic were discharged from the clinic usually because of lack of visual disability

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
Australia- South Australia(69)	Hospital (2018)	Orthopedic	To reduce wait times for non-urgent outpatient orthopedic patients by offering alternative treatments to avoid surgery	Senior podiatrist or physiotherapist	• Explored alternative treatment options for patients identified as unlikely to need surgery on the wait list for a surgical consultation	Not reported	*Grey literature:* • In the first 3 months of this initiative, 466 patients were diverted from the non-urgent orthopedic waiting list into the allied health clinic • Of >400 people who attended an appointment, 72% were found not to require surgery and were taken off the wait list, instead referred for a course of allied health treatment • About 11% of patients attending the clinics were referred for further consultation with an orthopedic surgeon, and 1% were transferred to the list for surgical treatment
Australia- Victoria(70)	Hospital (Not reported)	Orthopedic	To coordinate optimal communication between referring family doctors, allied health services, waiting list managers, and surgeons	Physiotherapist	• Coordinates the Osteoarthritis Hip and Knee Service, which manages patients on waiting lists for specialist clinics and elective surgery	Not reported	*Grey literature:* • Better use of limited specialist orthopedic services, including deferral of people who do not need surgery to conservative management • Early comprehensive assessment resulting in fast-tracking surgical assessment as appropriate and/or early referral for conservative management • Active management of the elective surgery waiting list, including prioritisation to match patient need • Improved patient satisfaction
Canada- Alberta (interview)	Regional (Not reported)	Orthopedic	Not reported	Nurses	• Performed screening assessments on patients attending central hip and knee clinics	Not reported	Not reported
Canada- British Columbia(71)	Hospital (Not reported)	Orthopedic	Not reported	Nurses, occupational therapists, physiotherapists	• Assessed patients' appropriateness for surgery to prevent those not suited from surgery filling waitlists and allowing surgeons to focus on the most urgent patients • Part of the Osteoarthritis Service Integration System	Not reported	Not reported

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
Canada- British Columbia(72)	Hospital	Orthopedics/ neurosurgery (spine)	Not reported	Advance Practice Physiotherapist	• Conducted a comprehensive clinical assessment to determine whether a consultation with a spine surgeon is required • Part of the Rapid Access Spine Triage Program • The initial visit was not an appointment for physiotherapy treatment, but rather a detailed interview, physical examination, review of available diagnostic imaging and an identification of any issues that may require further discussion with a surgeon • Referring physicians received a timely, detailed report outlining the clinical impression and recommended treatments • Patients requiring a surgical consultation were booked on an expedited basis with the appropriate, next available, spine surgeon	• "Spine-specific advanced training work"	*Grey literature:* • Successfully piloted in 2017, the program decreases patient wait time for assessment and treatment of non-emergent spinal complaints. • Previously, there was a 2-year waiting period. Only 10 out of 100 patients warranted surgery, but all needed expertise on what kind of management would help them. Patients now access the clinic within 14 days. • This program is the first of its kind in B.C.," says spine surgeon Dr. John Street. "Similar programs in other provinces only assess low back pain, while ours assesses all spine conditions from head to toe. The APPs provide in-person, comprehensive, evidence-based assessments early on in the evolution of a patient's symptoms, when non-operative care can be most effective. We've also eliminated unnecessary imaging with significant cost savings." Dr. Marcel Dvorak agrees, adding: • "Patients appear to be very satisfied with the APPs' professionalism, knowledge and timely advice."
Canada- British Columbia(73)	Provincial	Orthopedic	To achieve a target 26 week wait from patient and surgeon decision to treat to completion of surgery for 90% of people	Advanced practice rehabilitation professionals	• Performed triage • No other details reported	Not reported	Not reported
Canada- Ontario(74, 75)	Hospital (Not reported)	Orthopedics/ neurosurgery (spine)	To improve accessibility, consultation and timely care for patients waiting to be seen by a specialist	Nurse practitioner	• Assessed patients to determine which are appropriate surgical candidates and refer them accordingly • Non-surgical patients were directed back to referral source for further management	• Advanced education and development of clinical expertise in subspecialty areas	*Grey literature:* • Self-report satisfaction questionnaire (177 patients seen between January to December 2008) • Of the patients examined by an NP, only 10% were candidates for surgery

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
							• The diagnosis by the NP was the same as that of the surgeon in 100% of cases • Patients who attended the clinic had significantly shorter wait times (average of 12 weeks vs. 10-52 weeks) before the initial examination by a spine surgeon
Canada-Ontario(76, 77)	Hospital (2003)	Orthopedic	To reduce hip and knee replacement wait times, improve patients access to care, and save surgeons' time so they can perform more surgeries	Advanced practice physiotherapist	• Assessed (pre- and post-operatively), triaged, and managed orthopedic patients ensuring only patients who need surgery are seen by the surgeon • Prescribed conservative management and monitoring in an ongoing basis • Completed wait list validation, contacting all patients on the wait list for over a year without seeing a surgeon	Not reported	*Peer-reviewed literature:* • In a pilot observational study, there was 100% agreement between orthopedic surgeons and APPs on patients deemed non-surgical • APPs are more cautious and tend to rate subjects as higher surgical priority, while patients rated themselves the same as surgeons did in terms of priority • APPs made more recommendations for conservative treatments; however, if the surgeons recommended surgery, they made no other recommendations • APPs still recommend conservative management while patient wait for surgery, which can be important in improving surgical outcomes • In a year-long evaluation of role, patients were highly satisfied seeing either provider • Wait from referral to consultation decreased from an average of 140 to 40 days • Wait from consultation to surgery decreased from a 3 month minimum for most urgent cases to a 6 month maximum for all surgeries, including the least urgent • Surgeon's wait list reduced from 200 people awaiting surgery to 59

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
							• Surgeon was able to spend 16 additional days in surgery as a result of reduced time in clinic; however, this also required additional surgical resources
Canada-Quebec(78)	Rural public hospital (2008)	Orthopedic	To promote services of high quality, while increasing the access to healthcare professionals involved in the orthopaedic continuum of care	Nurse	• Determined the priority code for referrals based on information provided by the attending physician or following the decision of the interdisciplinary committee • Part of a interdisciplinary musculoskeletal clinic • In committee meetings, the patient's case is discussed and a decision about the prioritization, the type of healthcare professional to whom to refer the patient, and/or the treatment plan, is taken according to the interactive discussion and the analysis of each member of the interdisciplinary committee (i.e., pivot nurse, physiotherapist and/or ergotherapist, orthopaedic doctor, family doctor, nutritionist and/or psychologist) • If the information given by the attending physician is inadequate or incomplete, the pivot nurse will return the request form to obtain needed data. Once the priority code is established, the secretary of the interdisciplinary musculoskeletal clinic, along with the pivot nurse, sets an appointment either with the pivot nurse for an initial assessment or with one of the healthcare professionals of the interdisciplinary musculoskeletal clinic to establish a diagnosis and start treatment. • Some patients are assessed by the pivot nurse before being	• Bachelor's degree in nursing	*Peer-reviewed literature:* • Cross-sectional comparative study, 202 patients in case control clinic and 89 in case study clinic • There was a significant reduction in the waiting-list duration in the case study clinic from 36.21 weeks to 8.17 weeks • These positive results are, of course, related to the reorganization of the orthopaedic clinic to the extent that only 57% of the patients were directly referred to an orthopaedic doctor during the time of this survey, when compared with 100% earlier.

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
					referred to the clinic's healthcare professionals		
Canada-Saskatchewan(36-38)	Provincial	Orthopedics/ neurosurgery (spine)	To streamline patient assessments, provide quicker access to diagnostic tests or surgical referrals, and help manage and treat patients who do not necessarily need surgery	Physiotherapist	• Reassessed the classification diagnosis, treatments, and patient education of patients whose symptoms have not improved through family doctor management (as outlined in the Saskatchewan Spine Pathway) • Triage patients to receive further mechanical therapy, imaging, and/or referral to a spine surgeon	• "Trained" but details not provided	*Peer-reviewed literature:* • Of 215 referrals reviewed in a medical record review, 66 were made by the SSP clinic and 149 were conventional referrals • SSP clinic referrals were significantly more likely to be candidates for surgery (group A (SSP) = 59.1%, Group B = 37.6%; p=0.003).
New Zealand(57)	Not reported	Orthopedic	Not reported	Advance practice physiotherapists	• Assessed and treated patients with conditions which may require surgery or for which surgery is not an option	Not reported	*Grey literature:* • Reduced waiting times for patients from referral to consultation and from consultation to surgery • Decreases the number of patients seen by orthopedic surgeons and effectively prioritizes those who are seen by such surgeons • An APP can effectively manage post-operative arthroplasty care, freeing up orthopedic surgeons to see new patients and increase their availability for operating times
New Zealand(57)	Regional (2005)	Urology	Not reported	Nurse practitioner	• Completed first specialist assessments, follow-ups and ongoing management of patient needs in urology clinics	Not reported	*Grey literature:* •NP role has been shown to have a positive impact on elective delivery in urology (e.g., nurse-led cystoscopy clinics), cardiac care and ophthalmology • Effective use of the NP role reduces waiting time from referral to consultation for patients who meet referral criteria • The number of patients waiting >6 months for a first specialist appointment in the urology service was reduced 87% with the introduction of the urology NP role.

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
New Zealand(57)	Regional (2004)	Orthopedic	Not reported	Physiotherapist	• Conducted first assessments for the central intake process	Not reported	Not reported
United Kingdom – England(79)	Regional (2002)	Cardiothoracic	Not reported	Nurse	• The Thoracic Liaison Officer (a nurse) triaged referrals and, in collaboration with secretarial and administrative staff and surgeons, offered outpatient appointments or operation dates • Requested plain chest X-rays to check if patients needed to have chest drains removed after surgery • In collaboration with referrers, surgeons and oncologists the TLO also made direct referrals to other professionals (e.g. a patient referred for diagnostic surgery and a resulting diagnosis of small cell lung cancer will be referred straight onto an oncologist and clinical nurse specialist for lung cancer within the Network)	• A nurse (Thoracic Liaison Officer) who is experienced in oncology	*Peer-reviewed literature:* • Pilot observational study • Mean waiting time from decision to treat to treatment was reduced from 38 days to 13 days • It was further reduced to 8 days
United Kingdom – England (80, 81)	Hospital (2012)	Oncology	To improve patient care and meet the two-week cancer referral target	Nurse specialist	• Patients with suspected cancer were referred to undergo investigation (diagnostic tests) as their first contact with secondary care, omitting the initial outpatient appointment • Pre-assessment with patients were conducted over the phone by a nurse	Not reported	*Peer-reviewed literature:* • The median wait time from referral to endoscopy reduced from 26 days (IQR 17 - 43 days) to 14 days (IQR 11-24 days) ($p<0.001$)
United Kingdom – England(50)	Hospital (2016)	Oncology	Not reported	Nurse specialist	• Triaged referrals received at a multi-disciplinary centre for suspected gastrointestinal cancer • Arranged diagnostic services when required • Reviewed test results and send patients who do not have cancer to appropriate specialist • Organized further investigations or arrange outpatient consultation for patients with suspected cancer	Not reported	Not reported

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
					(after multidisciplinary team has discussed their case)		
United Kingdom – England(82)	Hospital (2001)	Cardiothoracic	To facilitate early diagnosis of cardiac disease	Cardiology Nurse Consultant	• Ran a rapid access chest pain clinic • Patients had an ECG on arrival and were assessed by the nurse to determine if further investigation is required • The nurse requested tests, booked outpatient appointments, and arranged admissions for angiography as required • Medical staff were available for discussion if necessary • A report form was faxed back to the family doctor outlining a management plan	•The authors indicate there is a lack of defined training for nurses in this role • For nurses to be considered specialists, they must have extensive experience in the specialty and should also be educated to the masters degree level	*Peer-reviewed literature* • Observational study of 454 patients seen in the clinic • Majority of patients are offered an appointment within 1 week of referral • 232 patients (52%) were referred back to their family doctor and 89 (20%) were referred to the outpatient department •75 patients had coronary artery disease: 33 underwent percutaneous coronary intervention, 19 underwent CABG, and 23 were treated medically •172/173 patients who responded to a satisfaction a satisfaction survey indicated they were either very satisfied or satisfied with the service received
United Kingdom – Scotland(52)	Regional (Not reported)	Orthopedic	To achieve the 18 weeks referral to treatment standard	Extended Scope Physiotherapist	• Reviewed and triaged referrals, allocating them to the most appropriate service	Not reported	*Peer-reviewed literature:* • Cross-sectional study of 170 patients referred by ESPs to an Orthopedic department between 2000 and 2001 • Statistical analysis showed no relationship between the appropriateness of ESP referral for consultant management and the anatomical site of the lesion. • 95 (56%) patients were referred specifically for surgery. Out of them, 75 (79%) patients were considered to have operable lesions. 66 (69%) patients underwent surgery and 29(30%) patients were managed non-surgically. • 75 (44%) patients were referred for investigation/further opinion. Out of them, 52 (69%) patients

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
							were managed non-surgically and 23 (31%) patients underwent surgery.
United Kingdom – Scotland(53, 83)	Regional, Aryshire and Arran (Not reported)	Orthopedic	To achieve the 18 weeks referral to treatment standard	Extended Scope Physiotherapist	• Reviewed and triaged referrals, allocating them to the most appropriate service	Not reported	*Grey literature:* • Time taken to vet referrals and appoint patients has dropped from mean of 8 -14 days and a maximum of 56 days, to an mean of 3 – 7 days and a maximum of 14 days
United Kingdom – Scotland(53, 83)	Regional, Renfrewshire (Not reported)	Orthopedic	To achieve the 18 weeks referral to treatment standard	Extended Scope Physiotherapist	• Reviewed and triaged referrals, allocating them to the most appropriate service	Not reported	*Grey literature:* • In NHS Renfrewshire over 6 months (Jan-June 2005) 77% of patients successfully triaged away from consultant clinics • New to return ratio for the ESPs of nearly 4:1 • Onward referral rate to consultants of less than 20% • 13% of patients did not require treatment in acute care
United Kingdom – Scotland(53, 83)	Regional, Dumfries and Galloway (Not reported)	Orthopedic	To achieve the 18 weeks referral to treatment standard	Extended Scope Physiotherapist	• Reviewed and triaged referrals, allocating them to the most appropriate service	Not reported	Not reported
United Kingdom – Scotland(53, 83)	Regional, Orkney (Not reported)	Orthopedic	To achieve the 18 weeks referral to treatment standard	Extended Scope Physiotherapist	• Reviewed and triaged referrals, allocating them to the most appropriate service	Not reported	*Grey literature:* • Mean waiting times from referral to orthopaedic consultant reduced from 11 weeks in March 2008 to 4.5 weeks in March 2010.
United Kingdom – Scotland(53, 83)	Regional, Forth Valley (Not reported)	Orthopedic	To achieve the 18 weeks referral to treatment standard	Extended Scope Physiotherapist	• Reviewed and triaged referrals, allocating them to the most appropriate service	Not reported	*Grey literature:* • In a sample of 213 referrals, ESPs were able to manage (or further refer within primary care) 72% of referrals, with only 18% requiring orthopaedic consultant outpatient appointment.
United Kingdom – Scotland(53, 83)	Regional, Aintree (Not reported)	Orthopedic	To achieve the 18 weeks referral to treatment standard	Extended Scope Physiotherapist	• Reviewed and triaged referrals, allocating them to the most appropriate service	Not reported	*Grey literature:* • Waiting times before approach in the Orthopaedic department were between 28 and 120 weeks.

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
							• Waiting times for orthopaedic consultants have reduced to 16 weeks or less • Patients assessed by ESPs are seen in 4-6 weeks of referral. • The new service has shown that only 17%-18% of patients require a consultant opinion. • Audit demonstrated an 88% agreement in diagnoses made by ESPs and consultants for patients referred to a consultant. • An average of 1400 patients a year are seen by ESPs. • Surveys have also shown high levels of patient satisfaction with 88% happy to be seen by an ESP instead of an orthopaedic consultant. • There was scepticism from some consultants and family doctors about physiotherapists taking on this assessment role but that has diminished as positive results have been produced. family doctors and patients were able to opt out of the project if they wanted. • There was concern among physiotherapists about liability but they were reassured that they were protected by the Trust. Having a high level champion in the Trust Chief Executive was important. • Outcome measures also needed to be agreed and tested for reliability.
United States(84)	Hospital (2014)	Oncology	To increase the quality of care while reducing costs	Advance Practice Clinicians (APC; an Advance Practice Nurse)	• An independent APC clinic was established within an existing breast cancer clinic • The team was comprised of two advance practice nurses, 2 surgeons, an MBA trained administrator, a surgical resident and a research nurse	Not reported	*Peer-reviewed literature:* • Study comparing data from before the Advanced Practice nurses were hired (Oct 2012 – Jan 2013) to the 11 months after (Feb 2013 – Dec 2013)

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
					• The APCs conducted independent initial patient evaluations and follow-up, ordered and acted on diagnostic studies, and independently performed minor procedures (e.g. Port-A-Cath removals, breast injections for sentinel node procedures, and breast cyst aspirations)		• Total number of new patient visits did not change from October 2012 to October 2013. • Patients seen per month ranged from 10 to 44 for the surgeon and from 3 to 16 for the APC • Before the APC clinic was established, the widest range of time to get an appointment with the surgeon was 1 to 53 days (median 11) • In the 3 months after the APC clinic was established, this range narrowed to 0 to 16 days (median 6 • The median time to be seen statistically significantly decreased from 16 days in 2012 to 9 days in 2013 • The mean monthly patient satisfaction score (based on Press Ganey scores) for the surgeon was 95.8, while the mean score for the APC was 96 • No delays or failures in diagnosis of breast cancer were noted secondary to the implementation of the APC Clinic
United States(85)	Hospital (2003)	Oncology	To optimally use breast health specialists from surgery and internal medicine to simplify and expedite access	Advanced practice nurse	• As part of a new breast health program (BHP) and triage system, an agreed-on, centralized triage system was implemented to allocate patients among 4 surgeons and 5 nonsurgical breast specialists • All physician participants provided computer access for patient scheduling • Referral decisions were made by the advanced practice nurse with backup from the medical director as needed	Not reported	*Peer-reviewed literature:* • Observational study of program between 2003 and 2006 • BHP-referred patients had significantly shorter times to surgical appointment (10 days) than non-BHP referrals (45 days) • Median times for recent appointments for all surgical and medical referrals were 1 and 3 weeks, respectively • These results were obtained in a patient population at high risk for delayed care as evidenced by high no-show rates for nonsurgical breast visits • Median time to surgical evaluation of 7 days for BHP

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
							cancer patients in the most recent time period
Perform procedures							
Canada-Ontario(86)	Hospital (2011)	Oncology	To improve quality of care	Sonographers	• Performed thyroid biopsies independently, under the supervision of a radiologist • Radiologist assistance for difficult cases only	• Training included didactic instruction (i.e. lectures on neck anatomy, thyroid ultrasonography, features of malignant nodules, informed consent, and various biopsy guidelines), observation, hands-on training (beginning with thyroid phantoms AKA models), and one-on-one training in a biopsy centre.	*Peer-reviewed literature:* • In a retrospective study, wait from referral to for biopsy to completion of biopsy decreased from an average of 80.7 days to 28.3 after implementation of the program • No major procedural complications occurred • Patients, sonographers, and radiologists did not report any issues
United Kingdom – England(87)	Pilot (1999)	Orthopedic	To reduce waiting times for patients with carpal tunnel syndrome	Nurse	• Managed entire care pathway for patients with carpal tunnel syndrome, from first clinic appointment through to surgery and discharge • Nurse and surgeon reviewed referral letters to determine if referral was appropriate • Nurse performed the surgery as a day-case procedure under local anesthetic without a tourniquet • Anesthetists were available for advice at all times	Not reported	*Peer-reviewed literature:* • Observational study • Average wait times for first appointment went from 40 to 2 weeks after the program • Before the program, average wait time from first appointment to follow-up discharge was 105 weeks • After pilot study, the wait time was reduced to 6 weeks • Overall complication rate was 2.5% • 1.3% of patients reported no improvement in their symptoms • A surgeon opinion was required at least once in each clinic during the first year, but this reduced in frequency as the nurse's experience developed • Authors reported considerable criticism from patients and surgical groups on the approach
United Kingdom – England(88)	Regional (2003)	Oncology	To reduce wait times for biopsy and improve care delivery	Nurse	• Performed biopsies on patients with suspected skin cancer • The role included obtaining consent, administering local	• Training package developed in accordance with The Scope of Professional	*Peer-reviewed literature:* • Observational study • Wait times from referral to biopsy were reduced from 8

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
					anaesthetic, surgical removal of a section of skin, and insertion of sutures • A one-stop service is now available	Practice Guidelines (UKCC, 1992)	weeks to 0 weeks (due to the one-stop service) • Doctors were able to focus on more complex types of surgery and wait times from referral to more complex dermatology surgery were reduced from 8 weeks to 2 weeks • In a patient questionnaire administered in a month period in 2003, patients were happy to have their biopsy performed by a nurse • Given a choice, they would rather have the biopsy performed on the day of their visit by a nurse than return at a later date to have it performed by a doctor
United Kingdom – Scotland(89)	Regional	Gynecology	Not reported	Specialist nurse hysteroscopist	• Diagnosed and referred patients for specialist treatment • Carried out minor procedures such as biopsies and polypectomies, which would otherwise require a separate appointment with a specialist	Not reported	*Grey literature:* • It is expected that 10% of the nearly 200,000 patients see in gynecology can be diverted to nurse clinics by the 3rd year of this program (date not given)
United Kingdom – Scotland(88)	Hospital (Not reported)	Oncology	To reduce wait times for biopsy and improve care delivery	Nurse	•Performed biopsies on patients with suspected skin cancer • The role included obtaining consent, administering local anaesthetic, surgical removal of a section of skin, and insertion of sutures • A one-stop service is now available	• Training package developed in accordance with The Scope of Professional Practice Guidelines (UKCC, 1992)	Not reported
Provide direct-access							
United Kingdom-England(90)	Hospital (2008)	Orthopedic	To reduce waiting times and decrease number of outpatient appointments for consultations	Extended scope physiotherapists	• Directly listed patients onto surgical wait list of orthopedic surgeons based on a defined set of inclusion and exclusion criteria • Generated referral letters, which are reviewed by a fellowship-grade surgeon prior to listing for surgery (patient not assessed by surgeon's team in	Not reported	*Peer-reviewed literature:* • Retrospective data review between Jan 2 2008 – December 31 2009 • 40 patients were referred by family doctors with a mean waiting time from referral to surgery of 24.7 weeks • 130 patients were referred by physiotherapist, with a mean

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
					person until pre-operative assessment clinic) • Referred patients who did not meet eligibility criteria to an orthopedic outpatient appointment		waiting time from referral to surgery of 22.1 weeks • 92/130 physiotherapist referrals proceeded directly to surgery, with a mean waiting time from referral to surgery of 21.4 weeks • 38/130 patients deviated from direct listing due to medical issues, administrative error, or some other reason, with a mean waiting time from referral to surgery of 24.2 weeks
United Kingdom-Northern Ireland(51)	Regional (Not reported)	Orthopedic	To eliminate the need for physiotherapists and podiatrists to refer patients back to the family doctor in order to gain access to the orthopedic ICATS (Integrated Clinical Assessment and Treatment Services)	Physiotherapist	• Directly transferred patients to ICATS	Not reported	Not reported
United Kingdom-Scotland(53)	Not reported	Ophthalmology	Not reported	Optometrists	• Diagnosed, prepared and referred cataract patients directly onto the surgical list	Not reported	Not reported
Conduct follow-ups							
Australia-Queensland(66)	Regional (2014)	Orthopedic	Not reported	Advanced practice physiotherapist	• Advanced practice physiotherapy program established within Post Arthroplasty Review (PAR) services • Program is led by "highly trained" advanced practice physiotherapists who assist in the post-surgical review of hip or knee replacement patients	Not reported	*Peer-reviewed literature:* • Observational study • Capacity of orthopedic surgeons to see new and complex patients was increased by 551 hours and an additional 3,053 orthopedic appointments were made available • Cost per patient was reduced by 41%, while maintaining safe and high-quality care, with no adverse events related to the physiotherapists' role reported • 97% of patients reported satisfaction with the model
Australia-Queensland(62)	State (Not reported)	Orthopedics/ neurosurgery	Not reported	Experienced musculoskeletal physiotherapists	• Experienced musculoskeletal physiotherapists conducted the routine 6-week postoperative review of patients following	Not reported	*Grey literature:* • Decreased waiting times for post-operative review appointments

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
					uncomplicated neurosurgical procedures such as laminectomy and discectomy instead of the orthopedic surgeon		• Decreased waiting time on the day of appointment • Increased patient satisfaction and experience • Increased capacity for neurosurgeons to see new patients • Increased education and access to rehabilitation/advice for patients.
Australia-Queensland(62)	State (Not reported)	Orthopedic	Not reported	Physiotherapist	• Physiotherapist carried out post-surgical outpatient reviews following hip and knee replacement, as an alternative to orthopedic review • Evaluated recovery with respect to desired outcomes and facilitated appropriate referral for rehabilitation.	Not reported	*Grey literature:* • Improved outpatient access and flow • Reduced demand on orthopedic consultant workforce
Australia-Victoria(91)	Hospital (2009)	Orthopedic	Not reported	Senior musculoskeletal physiotherapist	• Senior musculoskeletal physiotherapist completed post-surgical reviews of joint replacement patients in place of an orthopedic surgeon	Not reported	*Peer-reviewed literature:* • Retrospective case-controlled audit, new referrals receive management in a more timely fashion, reducing time delay for orthopedic consultation
Canada- Alberta (interview)	Province (Not reported)	Orthopedic	To free up the surgeon's time	Nurse and physiotherapist	• Nurse and physiotherapists followed up with patients so the surgeon does not need to see them at every appointment	Not reported	*Interview:* • Having other members of the team perform follow-ups has freed-up the surgeons time to perform new consultations and surgeries
United Kingdom – England(92)	Regional (Not reported)	Various	To improve productivity in elective care	Nurses, physiotherapists, optometrist	• Nurses, physiotherapists, and optometrists performed follow-up on elective surgery patients	• "Appropriately trained"	Not reported
United Kingdom – Scotland(53, 83)	Regional (2010)	Orthopedic	To achieve the 18 weeks referral to treatment standard	Extended Scope Physiotherapist	• Extended Scope Physiotherapist performed all post-operative shoulder surgery follow-up	Not reported	Not reported
United Kingdom – Scotland(93)	Not reported	Various	Not reported	Nurse	• Nurse completed follow-up with patients post-elective surgery	Not reported	Not reported
United Kingdom – Scotland(89)	National (Not reported)	Ophthalmology	Not reported	Optometrists	• Optometrist completed post-cataract return appointments in community settings • Small proportion of complex cases still require review by hospital eye services	Not reported	Not reported

Table S3. Expanded roles for non-physicians

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of provider	Description of role	Description of additional training	Impact
United Kingdom – Wales(94)	National (Not reported)	Ophthalmology	Not reported	Optometrist	• Optometrist performed follow-up on post-operative cataract surgery patients • Only patients who have no ocular comorbidity requiring clinical review	Not reported	Not reported
United States(95)	Hospital (2016)	Cardiovascular	To increase efficiency and schedule 50% of patients within 7 days of referral	Nurse practitioners	• As part of a 6-month pilot project, the NPs role was redefined • NP schedules were implemented for new patients and for follow-up, postoperative and unscheduled add-on visits • NPs also review the schedules 3 months ahead for physician unavailability	Not reported	*Peer-reviewed literature:* • Observational study • Within 4 months, change in practice of roles and scheduling demonstrated positive results in improving access and patient satisfaction • The clinic achieved the goal of 53% by April 2014, which increased to 62% in the following months *Results are based on the entire project
United States(96)	Hospital (2013)	Oncology	To improve access	Associate providers (nurse practitioner and physician assistant)	• Two APs, a PA and NP, were each assigned to work exclusively with 1 of the 2 head and neck surgeons in the Section of Otolaryngology in the weekly Dartmouth-Hitchcock HNT • The surgeon and AP worked in a partially independent practice model10—that is, working together in clinic but seeing patients independently • Patients could be ‘‘flexed’’ between providers depending on their needs • APs were assigned to see postoperative patients as well as those who had completed treatment and required routine follow-up for cancer surveillance	• Both APs were experienced in the evaluation and management of patients with common otolaryngologic conditions	*Peer-reviewed literature:* • Observational study comparing data from 2 years prior to (Jan 2011 – Dec 2012) and 2 years subsequent (Jan 2013 – Dec 2014) • Number of new patients seen by the 2 head and neck surgeons increased by 36%, from 44±4 to 60±5 patients per month (P=0.001) • There was a reduction in number of days to a third available appointment to see the head and neck surgeon by 0.51%, from 56 ±4 days to 27±2 for new patients (P=0.001) • For follow-up appointments, the reduction was 19%, from 43±3 days to 35±2 (P=0.001) • Overbooked hours dropped by 42%, from 14.7±3.1 hours to 8.6 ±1.7 (P = 0.002) • Surgeon productivity remained stable (109 ±11% vs 113 ±6%, P = 0.56) despite the reduction in overbooked hours

Table S4. Fast track programs

Jurisdiction	Healthcare Setting (year implemented)	Specialty area	Purpose	Description	Impact
Canada- Alberta (interview)	Provincial (Not reported)	Oncology	To help all lung cancer patients get to the point of diagnosis and treatment faster	• Alberta Thoracic Oncology Program is a program that runs out of the Foothills and Royal Alexandra Hospital (i.e. where the province's thoracic surgical program are located) • They received funding, capital equipment, and extra OR time • A triage program and program to improve access to diagnostic procedures were established • Relationships were formed with pathology and radiology to establish additional initiatives to speed up access • Patients are referred automatically by radiologists when a spot is detected on a CT scan • Waiting time targets are measured an put on a dashboard (accessible using an AHS computer)	*Interview:* • Automatic referral has ensured that no patients fall through the cracks and the wait for consultation has dropped by 14-15 days • However, they receive a number of CT scan with lumps that do not necessarily need to be seen by an ATOP surgeon
Canada- Alberta (interview)	Provincial (Not reported)	Oncology	To help patients access services in a timely manner and minimize delays in receiving care	• The Comprehensive Breast Care Program provides the following services via telephone: - Care coordination by nurse navigators who are specialized in breast health and cancer - Coordination of diagnostic tests and other appointments, such as ultrasounds and biopsies for patients with a palpable mass on clinical examination - Patient education to assist with decisions about treatment options - Information regarding which health providers or facilities can provide services in a timely manner - Access to medical breast experts as required for complex cases - Support from clinical social workers for cancer patients	Not reported
Denmark(97)	Hospital (2007) National	Oncology	To decrease waiting times between diagnosis and treatment for patients with head and neck cancer	• A "pack solution" fast track program was implemented for patients with suspected head and neck cancer, which included pre-booked slots for outpatient evaluation (clinical examination), imaging, and diagnostic surgical procedures for each cancer type • Once a family doctor suspected a patient with potential symptoms, the family doctor contacted a specialist directly	*Peer reviewed literature:* • It was reported that the time from referral to first consultation was reduced by 8 days to 1 day from 2006 to 2012 • The time from referral to diagnosis was decreased from 24 to 10 day • The success of this program depended on flexible hours: all patients who were referred the same or the next day were able to be seen

Table S4. Fast track programs

Jurisdiction	Healthcare Setting (year implemented)	Specialty area	Purpose	Description	Impact
				• The specialist had to provide the patient with an appointment date (same or the next day) • If the specialist determined that there is head and neck cancer, then a hospital referral was made immediately • If the specialist determined that treatment is not needed immediately, the patient was followed according to guidelines	and specialists also saw patients during the evening hours • The program was seen as feasible and thus was implemented widely across Denmark
United Kingdom-England(98)	National (2010)	Oncology	To address the long wait times and improve cancer survival rates	• The NHS implemented rapid diagnostic and treatment pathways with the following targets: - Maximum 14-day wait between urgent family doctor referral and outpatient appointment (called Two-Week Wait (TWW)) - Maximum 31-day wait between decision to treat and initiation of treatment - Maximum 62-day wait from urgent family doctor referral to treatment initiation • NICE provided TWW triage pathway • Penalties were enforced if the targets were not followed.	*Peer reviewed literature:* • As of 2015, it was reported that there was 93% achievement for the 14-day wait, 96% for the 31-day wait, and 85% for the 62-day wait • Although there were penalties for not achieving targets, it continued to happen and caused for criticism of the program especially for colorectal cancer where there was a very low number of referrals • Although, clinicians viewed the TWW program as needed, they expressed criticisms about the established targets was directed toward the strict targets and that one-size-fits-all targets were not considered appropriate for all cancers It was highlighted the problems applying the TWW referral criteria for colorectal cancer to individual patients because there were not always signs about the cancer. TWW was seen as a good program needed to fast track patients from a diagnosis to treatment. However, there were challenges related with the implementation of the program and meeting the outlined targets. Key challenge was limited capacity in secondary care Coordination of care is needed to make this fast track program more plausible.
United Kingdom-England(99)	National (2000)	Oncology	Not reported	• A ‘fourteen day rule’ fast-track referral program was established that requires all patients with suspected cancer to be seen by a specialist within 14 days of urgent referral by their family doctor • Patients that were referred in this program by the family doctor, were given the next available clinic slot	*Peer reviewed literature:* • The program allowed for the time interval from referral to diagnosis to be reduced ($P < 0.01$) due to the decrease of the wait time for the first appointment • The program did not impact the wait time between first appointment and diagnosis ($P < 0.05$) • Wait times for patients that were referred as a routine improved

Table S4. Fast track programs

Jurisdiction	Healthcare Setting (year implemented)	Specialty area	Purpose	Description	Impact
					• The program allowed for the decrease of wait times for the first appointment to see a specialist • Patient education is needed for early detection
United Kingdom-England(100)	National (1999)	Oncology	To reduce wait times for diagnosis and treatment of urgent breast problems	• A fast-access breast clinic was implemented with a '2-week wait' • Patients with suspected malignancy were referred to this program • Fast track referral system enables family doctors to refer patients with a suspected new breast cancer, so that specialist breast surgeon sees them within 2 weeks (urgent referrals) • Referrals are indicated for patients over 30 years of age or those with a suspected new breast malignancy	*Peer reviewed literature:* • In 71% of patients , the 2-week policy was inappropriate (non-malignant lesion) • Waiting time to book a consultation with family doctor was 2.2 days (range: 1-28 days) • In 85% of patients, the referral letter by the family doctor was done within 2 days. • Mean waiting time from receiving referral to surgeon appointment was 6.6 days (range: 5-17 days) • The program led to the increased referral for 'urgent' cases • This led to the increase of wait times for 'routine' patients to increase • Although there is no evidence that a fast tracked program impacted breast cancer outcomes, it did reduce anxiety levels associated with breast cancer diagnosis

Table S5. Patient choice

Jurisdiction	Healthcare setting (year implemented)	Purpose	Specialty area	Choice type	Description	Impact
Australia – Queensland(101)	State (2016)	Not reported	Various	Consultation date	• As part of Queensland Outpatient Strategy, patients were given the ability to book their appointments online to give them more choice and flexibility	Not reported
Canada- Alberta(9, 11, 102, 103)	Provincial (Not reported)	To reduce lengthy waiting times for consultation and surgery and to improve care for patients	Orthopedic	Surgeon	• A provincial hip & knee care pathway was implemented which provides patients receiving hip & knee replacements in Alberta have the choice of first available surgeon or a specific surgeon • Alberta's eReferral system shows the current wait time for the surgeon selected as well as the wait time for the next available surgeon(102) • This information gives referring physicians and their patients the ability to make an informed choice based on accurate wait times(102)	*Grey literature:* • Patient choice of next available surgeon has resulted in reduced waiting times for patients(103) • "The Hip and Knee Replacement Program has reduced the time between the decision to have surgery and the surgery date to 19.2 weeks, down 12 per cent or almost three weeks from when the program launched in 2010." (103)
Canada- Alberta(16)	Provincial (Not reported)	To improve service integration and patient access to primary care and specialist medical services	Various (Endocrinology, General internal medicine, Rheumatology, Hematology, Respiratory)	Surgeon	• Central Access and Triage programs have implemented the choice of first available surgeon or a specific surgeon	*Grey literature:* • Preliminary evaluations have reported decreased wait times and timely access for patients requiring urgent care • Pooled referrals have eliminated duplicate referrals and wait times for physicians have equalized • Health care providers reported increase ease and efficiency of referrals • In the rheumatology CAT pilot (2006), there was a 15 to 37% reduction in wait times, depending on urgency • Between 2005 and 2008, mean wait time to consultation for urgent-level referrals decreased from 29 ± 46 days to 17 ± 14 days ($p<0.05$) • Mean wait time to consultation for moderate-level referrals decreased from 110 ± 57 days to 63 ± 42 days ($p<0.00005$) • Mean wait time to consultation for routine-level referrals decreased from 155 ± 88 days to 108 ± 37 days • Wait list shopping by referring family doctors was documented to have ended

Table S5. Patient choice

Jurisdiction	Healthcare setting (year implemented)	Purpose	Specialty area	Choice type	Description	Impact
						• In the gastroenterology pilot, there was an 8% reduction in wait times, despite 153% increase in referrals *Note: impact based on implementation alongside other approaches
Canada- British Columbia(104)	Regional (Not reported)	To allow patients to identify surgeons with the shortest wait times	Various	Surgeon	• The Soonest Surgery Tool was implemented to provide a list of up to 5 surgeons most likely able to perform surgery sooner than others in Fraser Health • The tool uses statistics from the Ministry of Health's wait times website and results are changed regularly based on the number of patients referred to each surgeon and the amount of time available in ORs • Family doctors access the Fraser Health physicians website to refer a patient to a surgeon most likely able to perform the surgery sooner • If a patient already has a referral and would like a second opinion or be referred to a surgeon who can perform the surgery sooner, s/he can go back to their family doctor and ask to be referred to a second surgeon or one that is on the list	Not reported
Canada- British Columbia(105)	Regional (2016)	To allow patients to see surgeons faster	Various	Surgeon	• Island Health implemented the First Available Surgeon Triage (FAST) system to allow patients the choice of seeing the first available surgeon	*Grey literature:* • In 1 year, FAST has reduced the wait time for consultation with a surgeon from 24 to 8 weeks
Canada- British Columbia(20)	Regional (2013)	To provide better access and reduce wait times for joint replacement surgery	Orthopedic	Surgeon	• Hip & knee centres throughout the province (i.e. centres with centralized referral and assessment) have implemented the choice of first available surgeon or a specific surgeon (e.g. Burnaby Hospital Central Intake and Optimization Clinic, Rebalance MD, etc.)	Not reported
Canada- Manitoba(22) (interview)	Regional (2012)	To improve access to total joint replacement surgery	Orthopedic	Surgeon	• Winnipeg Central Intake Service for total joint replacement implemented the choice of first available surgeon or a specific surgeon	Not reported

Table S5. Patient choice

Jurisdiction	Healthcare setting (year implemented)	Purpose	Specialty area	Choice type	Description	Impact
					• Patients classified as "delay by choice" if they do not choose the first available surgeon	
Canada- Newfoundland(24, 25)	Provincial (2011)	To reduce wait times for hip and knee replacement surgeries	Orthopedic	Surgeon	• Interdisciplinary Central Intake and Assessment Clinics implemented patient choice of first available surgeon or a specific surgeon	Grey literature • In 2-year pilot in the Eastern Health Region wait times for referral from a family doctor to initial orthopedic consult was reduced from a median of 325 days to 91 days for high-priority referrals and 179 days for routine referrals • Having the clinic arrange for additional services reduces delays and duplicate referrals *Note: impact based on implementation alongside other approaches
Canada- Nova Scotia(26, 27)	Provincial (2017)	To improve access to hip and knee care	Orthopedic	Surgeon	• Orthopedic Surgery Central Referral Clinics implemented patient choice of first available surgeon or a specific surgeon	Grey literature: • In one health region, referrals to surgeons that were awaiting assessment decreased from 1200-1250 (2010) to 235 (2014). • LOS for knee arthroplasty patients decreased from 4.7 days (2010) to 3.8 days (2012) • LOS for hip arthroplasty decreased from 4.9 days (2010) to 4.1 days (2012) *Note: impact based on implementation alongside other approaches
Canada- Nova Scotia(28)	Regional (2006)	To increase effective use of resources to reduce waiting times	General surgery (Hernia)	Surgeon	• The joint hernia clinic implemented patient choice of first available surgeon or a specific surgeon for both consultation and surgery	*Peer reviewed literature:* • There was no difference in post-operative complication rates between patients who saw the same surgeon for consultation and surgery (group 1) and those who saw different surgeons (group 2) • Waiting time from family doctor referral to initial clinic consult decreased from 208 days in 2007 to 59 days in 2009 • 98.4% of group 1 respondents considered it important to have the same surgeon for assessment and surgery vs. 48.3% of group 2 respondents ($p<0.0001$) • 98.4% of group 1 respondents had confidence in their assessing surgeon vs. 86.2% of group 2 respondents ($p=0.034$) • 100% of group 1 respondents had confidence in their operating surgeon vs. 86.2% of group 2 respondents ($p=0.009$)

Table S5. Patient choice

Jurisdiction	Healthcare setting (year implemented)	Purpose	Specialty area	Choice type	Description	Impact
						• 2/3 of respondents had confidence in the competence of any surgeon and believed the service was better and faster in specialized centre • Majority of respondents believed the group model uses resources more effectively • 52.5% of respondents understood that they could request the assessing surgeon to perform their surgery (49.2% group 1 vs. 55.2% group 2, p=0.66) • On average, 2/3 respondents were comfortable having their surgery performed by a surgeon they meet the day of surgery (59.7% group 1 vs. 75.9% group 2, p=0.16)
Canada- Ontario (interview)	Provincial (Not reported)	To help assess and manage Ontarians with low back and low back related leg symptoms	Orthopedics/ neurosurgery (spine)	Surgeon	• Inter-professional Spine Assessment and Education Clinics implemented patient choice of first available surgeon or a specific surgeon	*Interview*: • Pilot programs in Hamilton, Thunder Bay, and Ontario showed significant success in patient outcomes and financial benefits to the system • The Ministry is making this program a priority for all LHINs • Champlain LHIN is the first to have implemented the program LHIN-wide • family doctors have benefited from this program as many have difficulty managing patients with lower back pain *Note: impact based on implementation alongside other approaches
Canada- Ontario(30-32) (interview)	Provincial (Not reported)	To streamline the intake process (providing patients with more timely assessments and consult); improve surgeon wait list management and referral practices; provide patients with choice of hospital, surgeon, or shortest wait time; provide non-surgical patients with conservative management strategies; and improve communication to referral sources	Orthopedic	Surgeon	• Central Intake and Assessment Centres implemented patient choice of first available surgeon or a specific surgeon	*Interview:* • Hip and knee central intake was a success story for the Champlain LHIN, despite some pushback • Funding was obtained for a 3-year pilot project to expand the central intake and triage components to foot/ankle, shoulder, knee conditions requiring arthroscopy, cervical, thoracic, and spine • The assessment phase is seen as one of the most valuable components *Interview:* • Central referral and triage saves surgeons time and standardizes criteria for surgery • Most patients choose first available surgeon • Central intake had a greater impact on wait times once it became mandatory (patients now need a central tracking number to have their case booked)

Table S5. Patient choice

Jurisdiction	Healthcare setting (year implemented)	Purpose	Specialty area	Choice type	Description	Impact
						*Note: impact based on implementation alongside other approaches
Canada- Ontario(33)	Regional (2007)	To actively manage patients requiring hip and knee replacement surgery across the entire continuum of care	Orthopedic	Surgeon	• Joint Health and Disease Management Program implemented patient choice of first available surgeon or a specific surgeon	*Grey literature:* • In a report published by the LHIN*, it was stated that 90% of patients in the LHIN are waiting <115 days for hip or knee replacement surgery vs. the provincial target of 182 days •Wait from date of referral to first consultation with a surgeon is <100 days *Note: impact based on implementation alongside other approaches
Canada- Saskatchewan(40)	Provincial (Not reported)	To provide patients with quicker access to specialists by maximizing the use of all specialists evenly	Various: • Cardiothoracic • OBGYN • Orthopedic • General surgery • Gastroenterology • Hematology • Urology • Neurosurgery	Surgeon	• Pooled referrals have implemented patient choice of first available surgeon or a specific surgeon	*Grey literature:* • Pooled referrals are a popular choice amongst patients. • A Regina gynecologist was quoted as saying that her colleagues were not hard to convince of the benefits of pooled referrals. They receive a steady stream of appropriate referrals and the system matches the flow of referrals to the capacity of the specialists.
Canada- Saskatchewan(36-38)	Provincial (2010)	To improve quality for lower back pain care by encouraging guidelines-concordant evidence-based primary care while reducing wait times for appropriate MRI and surgical referral	Orthopedics/ neurosurgery (spine)	Surgeon	• Spine Pathway Clinics have implemented patient choice of first available surgeon or a specific surgeon	*Peer reviewed literature:* • In a retrospective analysis of 215 consecutive new patient referrals between June 1, 2011 and May 30, 2012, it was reported that SSP clinic referrals were significantly more likely to be candidates for surgery than referrals from outside an SSP clinic (59.1 vs. 37.6%, p=0.003) *Note: impact based on implementation alongside other approaches
New Zealand(57)	Regional (Not reported)	To reduce waiting times for first specialist appointments, 'did not attend' rates, and work for administrative staff to reschedule appointments	Various	Consultation date	• A Patient Focused Booking system ('U Book') was established in Hutt Valley District Health Board, which sends patients a letter inviting them to call the outpatient clinic to arrange a convenient time to be seen • The DHB indicated that it would also have an online booking system for patients up and running in 2012	*Grey literature:* • 'Did not attend' rates reduced from 13-15% to 7-8% over a 3-month period, and have been maintained at this level • Cancellations have reduced • 'Rework' for administration staff is significantly lower • According to a survey, patient satisfaction is very high, waiting times in 2 specialties have reduced
United Kingdom – England(106-108)	National (pilot 2005, full 2006)	To increase patient choice and receive treatment faster	Various	Hospital	• Patients requiring planned hospital care were able to book appointments from their choice of four to five	*Peer reviewed literature:* • One study was based on administrative discharge data from the UK Department of Health

Table S5. Patient choice

Jurisdiction	Healthcare setting (year implemented)	Purpose	Specialty area	Choice type	Description	Impact
					providers (chosen by their primary care trusts) at the point of referral from their family doctor, paid for by the NHS • family doctors were required to ensure that patients were made aware of, and offered, choice	(data from every hospital in the England NHS from 2003 to 2008; analysis included 13,500 elective CABG discharges). Mean waiting times from referral to treatment decreased when choice was available, but other policies such was enforcement of waiting time targets were also in place. The average probability of being informed about choice was about 50%, showing that not all physicians did offer choice as mandated by the reform. The study also reported that patients were more responsive to clinical quality than wait times when choosing a hospital. • In a literature review of studies from the discipline of economics • Patients who are older, female, have lower educational qualifications, or who look after children are less likely to indicate that they wish to take up choice. Patients are willing to trade-off waiting time against reputation of the hospital, with some indication that this trade-off is affected by the income of the patient • It also appears that lower waiting times for those in the scheme were not at the expense of patients who were not in the scheme. Waiting times for all patients fell as sending hospitals responded to loss of patients (and funding) by improved performance on waiting times and receiving hospitals did not increase waiting times for other patients at the hospital
United Kingdom – England(109)	Not reported	Not reported	Various	Consultation date	• A pilot study of electronic booking of out-patient appointments allowed patients to be booked into the next available urgent or routine appointment as appropriate, have the choice of date for their appointments • A clinical appointment with a specialist was done on the same day as the referral through an electronic system	*Peer-reviewed literature:** • The appointment booking was achieved on the same day as the referral was made, whereas it took an average of 7 days for paper referral • There was no significant difference in the time from referral to being seen in clinic between the electronic and paper (i.e. traditional referral) group (8 days vs 10 days) • Non-attendance rate for the electronic group was 8.5% whereas for the paper group was 22.5% • Patients in the electronic group were less likely to change their appointment than those in the paper group

Table S5. Patient choice

Jurisdiction	Healthcare setting (year implemented)	Purpose	Specialty area	Choice type	Description	Impact
						*Note: impact based on implementation alongside other approaches
United Kingdom – Scotland(53, 83, 110)	National (2003)	Not reported	Various	Consultation date	• Patient-focused booking process was implemented, where patients are sent a letter detailing the timeframe their appointment will be within and they contact the service to book an actual appointment slot • Patient Focused Booking refers to a set of processes and procedures to manage the waiting list; a set of principles around patient booking (such that no appointment is made without the direct involvement of the patient); and a set of practices such as dedicated resources to provide a single and central point of contact for patients within the hospital • Patient focused booking also uses clinical priority and time on the waiting list to calculate when a patient will be seen (patients placed on waiting lists are sorted first by clinical priority and then by waiting time)	*Grey literature:* • Data from one health authority (NHS Dumfries and Galloway) was modeled to compare actual waiting times to possible waiting time through patient focused booking and found that maximum wait times were reduced from 44 weeks to 21 weeks • Patients are more likely to attend as they have had some choice in the timing of the slot. Those that do not respond to the initial letter can be followed up and some will turn out not to require the appointment anymore • Ensure the appointment letter provides a prompt for patients to let you know if the appointment is no longer required. Consider reminder options such as telephone and SMS • When introducing Patient Focused Booking it is essential to have staff leave policies in place, which require six weeks notice for any leave which will affect an outpatient clinic • The combination of booking patients only four weeks in advance of their appointment and the application of the staff leave policy leads to fewer hospital cancellations (The few cancellations at short notice (e.g. due to sickness) can be rescheduled into an empty clinic in five weeks time)

Table S6. Process improvement methodology

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
Lean					
Canada- Alberta (111-115)	Provincial (2013)	Various	To reduce wait times through quality improvement initiatives	• A LEAN project was initiated to address increased wait time at three centres, to assess patient and paper workflow from receipt of referral to consult. Standardizing the referral process across all zones and testing of new e-referral technology is being rolled out across the remaining tumour groups; to be completed by the end of 2013	Not reported
United Kingdom-England(116)	Hospital (2007)	ENT	To increase efficiency in order to comply with the Department of Health's maximum wait time target of 18 weeks for cochlear implantation	Lean The 5 steps of Lean were followed and improvement opportunities were identified • A single experienced clerical staff member appointed to oversee the patient pathway • Management workload devolved to management and clinicians encouraged to concentrate of patient care • Production of a pre-patient pack containing critical information about the procedure and technology and an invitation to book a number of key appointments • Appointments to be booked in blocks • Patients found unsuitable for implantation identified early and brought to the multidisciplinary committee (MDT) for agreement to discharge • MDT meetings held to manage patient decisions • Expansion of working hours	*Peer-reviewed studies:* • 141 long waiting patients included • 43 patients were lost to follow up/died/withdrew from assessment • 10 patients had been assessed or were awaiting implant • Remaining 88 were assessed; 42 were deemed unsuitable for implantation and 46 were offered the implant (3 declined) • Of the 46, 11 went on to a trial of the implant • Of the remaining 35 who went on to implantation, 31 (89%) met the 18 week target. 3 of the remaining 4 were unless at time of scheduled implantation, and the last patient needed another intervention prior to implantation
United States (117)	Hospital (2013) *pilot*	General surgery	To reduce current delay and wait times in VA institutions	Lean The Value Stream Analysis (in 2013) identified several "Just Do Its" (JDIs) and conducted raid process improvement workshops (RPIWs), and projects for simple, medium and complex solutions. Improvements learned in JDIs were implemented immediately, and more complex reforms from RPIWs and projects were rolled out in stepwise fashion. Committees continued to meet to review ongoing metrics.	*Peer-reviewed studies:* • Mean (SD) of wait time for general surgery statistically significantly decreased from 33.4 (8.3) days in 2012 to 26.0 (9.5) days in 2013. This appeared to coincide with the rollout of several RPIWs. In 2014, these numbers fell further to 12.0 (2.1) days. • Total operative volume increased from 931 patients in 2012 to 1090 in 2013 and 1072 in 2014, with no changes in surgeons or patient mix, despite the closure of one OR in early 2014. • Clinic volume fluctuated from 3131 visits in 2012 to 3241 in 2013, and to 3084 visits in 2014, but this was offset by increased use of telehealth approaches, including e-consultations, where medical record review is used to answer a specific question without necessitating a clinic visit, and clinical video teleconferencing (CVT). E-consultations rose from 50 in 2012 to 64 in 2013 to 129 in 2014. Clinical video teleconferencing visits, which were not available in 2012, rose from 155 visits in 2013 to 304 in 2014.

Table S6. Process improvement methodology

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
					Thus, combined clinic, CVT, and e-consultation encounters increased from3131 in 2012 to 3460 in 2013 and 3517 in 2014. • Despite the increased number of patients seen, no shows decreased from 366 in 2012 and 346 in 2013 to 227 in 2014 (*P* = .02)
United States(118)	Five hospitals/health systems (Not reported)	Various	To reduce wait times	Improving flow: • Kaiser Permanente addressed elective surgery wait times by examining the entire care pathway and instituting process changes, e.g., longer use of ORs, Saturday procedures, and simple process changes. This improved efficiency and OR utilization rose to 85% • Using Lean principles, and reviewing workflow and improvements to OTR processes, scheduled operations in Seattle Childrens' Hospital start on time with a 99% success rate. Balancing supply and demand: • Lean approaches have been used in Seattle Childrens' Hospital to improve scheduling and wait time challenges. A centralized scheduling centre coupled with a standardized process to manage schedules and fill vacancies has yielded a more efficient and streamlined process. Evening clinics have been instituted based on trending data for hourly, weekly and seasonal variations. • At the Mayo Clinic, flexibility of provider supply has been increased. Full schedules are set as the expectation for specialty physicians. Rather than allowing schedule gaps, specialists are scheduled to see general patients. • In Denver Health, appointment utilization was maximized using same-day appointments. • Kaiser Permanente evaluated historical data to staff appropriately with fluctuations in time.	Not reported
Others					
Canada- Alberta (111-115)	Provincial (Not reported)	Various	To reduce wait times through quality improvement initiatives	• AIM (Access, Improvement, Measure) quality improvement involved finding efficiencies in all parts of the processes in the Alberta Hip & Knee Clinic (Calgary) and the Edmonton Musculoskeletal Clinic.	*Grey literature:* In a one-year period, the wait time between referral to the clinic and initial consult has been reduced from five months to less than three months. • In a one-year period, the wait time between referral to the Calgary clinic and initial consult has been reduced from five months to less than three months. Patients at Edmonton's hip and knee clinic have seen their wait times cut by 80. In a one-year period, the wait time between referral to the surgeon-owned clinic and initial consult has been reduced from 10 months to <2 months.

Table S6. Process improvement methodology

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
Canada- Alberta(111-115)	Provincial (Not reported)	Orthopedics	To reduce wait times through quality improvement initiatives	• The Bone & Joint SCN in partnership with the ABJHI is leading the development of an applied research program that will serve to inform the development of centralized referrals as a triaging strategy for musculoskeletal in Alberta; central intake methodologies to improve "next available surgeon" options to new referrals. Review central intake methodologies to improve "next available surgeon" options to new referrals.	*Grey literature:* • The wait time for 90% of the people who require a hip replacement is down to 36.3 weeks this year, compared to 39.8 weeks in 2011-12. The wait time for knee replacement surgery is at the lowest point in the past two years, with an annual wait time of 40.9 weeks compared to 48.0 weeks in 2011-12. The number of hip and knee replacements has increased by nearly 19% compared to two years ago. More joint replacement surgeries (11,330) have been performed this year.
Canada- Alberta (111-115)	Provincial (Not reported)	Oncology	To reduce wait times through quality improvement initiatives	• Expansion of a pilot to increase the number of new lung surgery referrals into the clinics through the implementation and communication of standard referral criteria to primary care providers and select radiologists.	*Grey literature:* • 184 additional lung surgeries completed by 31 March 2013

Table S7. Remote consultations

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
Canada- Alberta (interview)	Surgeon-specific	Not reported	Not reported	• Telehealth has been implemented in some pockets across the province for consultations	Not reported
Canada- Manitoba(119, 120)	Hospital	Pediatric	To allow patients to receive care in remote locations via videoconferencing	• As a part of a study, a pediatric surgeon began integrating telehealth into his routine practice for initial consults and follow-ups using MBTelehealth • Staff screened patient referral letters and follow-up visits for suitability • The service was optional • Appointments were coordinated by the pediatric surgeon's support staff and MBTelehealth schedule coordinator • A trained telehealth coordinator facilitated the telehealth examination for each community, assisted in the telehealth examination, and was trained in the use of the network and equipment • Coordinators were trained nurses with other functions in their local health center, laboratory technologists, and a retired dentist	*Peer reviewed literature:* • A retrospective study was performed comparing patients from outside Winnipeg who used telehealth, patients outside Winnipeg who came for appointments in-person, and patients in Winnipeg who came for appointments in-person: Group 1-all non-Winnipeg telehealth patients Group 2- non-Winnipeg in-person patients Group 3- convenience sample of Winnipeg in-person patients • There was no statistically significant differences in the number of appointments kept between the three groups of patients • Patients in Winnipeg had a statistically significantly shorter interval from referral to first consult compared to non-Winnipeg in-person patients and non-Winnipeg telehealth patients • There was no statistically significant different in the wait for follow-up or to completion of procedure between the three groups (note: the start point for these intervals was not specified) • Waits for telehealth services improved over time as it became integrated into routine practice. Regardless, time to appointment was faster for Winnipeg patients (urban (i.e. Winnipeg) patients have more ready access to specialist care because 95% of province's specialists reside in Winnipeg) • The author reviewed intraoperative and postoperative complications and determined that none were intuitively related to the mechanism by which the patient was seen before the procedure. Telehealth did not result in a delay or misdiagnosis of postoperative complications. However, a statistically significant difference was found in the total number of complications reported in non-Winnipeg telehealth patients (8/59 or 15.1%) and the non-Winnipeg in-person patients (3/114 or 2.9%) ($p<0.007$).

Table S7. Remote consultations

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
Canada- Newfoundland (interview)	Provincial (Not reported)	Orthopedic	Not reported	• Telehealth services have been implemented for consultations with patients in remote communities	*Interview:* • Physical examinations are difficult to do over telehealth
Canada- Ontario(121)	Provincial	Various	Not reported	• Ontario Telehealth Network has been used by specialists to conduct consultations • Ontario's Telehealth Network's eVisit was created to allow patients to see their healthcare provider through a secure video feed from their health centre, home (via computer), or on-the-go (via tablet) • Before having an eVisit, the physician must determine if it is appropriate for the patient • If the patient is approved for eVisit, the patient receives an email with instructions for connecting to the service or an appointment is set-up if they are attending the eVisit from a healthcare centre	*Grey literature:* • In 2010, the OTN delivered more than 90,000 patient visits so patients could get care as close to home as possible • In the past year (reported Nov 2010), more than 31,000 telemedicine clinical consultations took place in Northern Ontario • Nearly 3,000 health care professionals in more than 1,000 sites use OTN to deliver care to patients • Since 2006, Telemedicine has save approximately 134 million km in patient travel
Canada- Saskatchewan(122)	Provincial (Not reported)	Various (oncology, surgery, rehabilitation services, group patient education, etc.)	Not reported	• Telehealth Saskatchewan was established to link patients to healthcare teams through secure videoconferencing technologies	*Grey literature:* • The benefits of Telehealth include reduced travel and associated expenses for patients, less time spent on travel and waiting periods, and increased patient access to specialty care throughout the province • Across all services, over 6,000,000 km of patient travel have been avoided • In 2017, over 17,000 patients have undergone a clinical consult • Today, over 200 specialists use Telehealth to deliver clinical services • 4,500 patients received group patient education services using Telehealth, such as hip/knee surgery education, cardiac class, diabetes class and pulmonary rehabilitation
United States(123)	State (1999)	ENT	Not reported	• A 16-year retrospective study (1992-2007) examined the use of store-and-forward telemedicine at the Norton Sound Regional Hospital in Nome, Alaska • Store-and-forward telemedicine is an asynchronous communication that allows the sender to take the necessary time to collect data from the patient and then send the case, which the consulting physician can later read and respond to when time is available • Store-and-forward telemedicine (electronic consultation) has advantages compared with videoconferencing telemedicine, including	*Peer-reviewed literature:* • Waiting times decreased from an average of 4.2 months before telemedicine to 2.9 months in the first 3 years with telemedicine, and then to 2.1 months in the next 3 years with telemedicine • Before telemedicine, 47% of new patient referrals waited 5 months or more to see an ENT specialist in person, but this decreased to 3% of all new patient referrals once telemedicine had been running for 6 years • More than 70% of all consultations prevent patients from having to travel to see

Table S7. Remote consultations

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
				that there is no need to synchronize the referring and consulting providers' time, no need to schedule a session using a videoconferencing network and bridge, low bandwidth requirements, minimal technical support needs, documentation of multimedia data for future reference, the potential for electronic data integration into electronic health records, and tracking of cases for time studies and administrative purposes	specialists, resulting in statewide savings estimated at $3 million to $4 million annually in avoided patient travel costs (airfares) • Specific to the ENT Department, 73% of all consultations prevent patient travel, and this has generally been consistent since the program was first adopted in 2002 • A smaller, but significant, portion of telehealth cases (9% for ENT, 8% for all telehealth cases) cause patient travel, which is to be expected because disease states and various health issues are identified through telehealth, possibly at a much earlier and more easily treated stage in the disease state
United States(124)	Hospital	Dermatology	Not reported	• Bronx Veterans Affairs Medical Center (VAMC) implemented teledermatology to perform preoperative consultations for Mohs micrographic	*Peer reviewed literature:* • Both teledermatology and face-to-face preoperative consults resulted in an equivalent percentage of treated lesions • Teledermatology had a significantly decreased consult failure rates • Teledermatology decreased the time-to-treatment by two weeks, increased the percentage of lesions treated within 60 days, and resulted in average travel savings of 162.7 minutes, 144.5 miles, and $60.0 per person

Table S8. Specialist advice request

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
Canada- Alberta(125)	Regional (2014)	Various (Gastroenterology, neurology, nephrology, pediatrics, podiatric surgery, sports medicine, urology, vascular surgery)	To help improve communication and collaboration between primary and specialty care	• Specialist LINK, a telephone advice line, was implemented to allow family doctors to contact specialist for advice about a patient in real time	*Grey literature:* • The Specialist LINK tele-advice line and clinical care pathways improved access and have resulted in shorter wait times for specialists, a reduction in unnecessary specialty visits and large cost-savings • The tele-advice line alone is estimated to have saved the health care system almost $1 million in its first four years of operation • It is estimated the service will save the system $1 million per year by 2024
Canada- Alberta(126)	Provincial (2014)	Various (Nephrology, urology, endocrinology, pulmonary medicine, adult gastroenterology, obstetrics/gynecology, spinal neurosurgery, general internal medicine)	Not reported (Not reported)	• An advice request system was implemented through Netcare eReferral (eReferral Advice) • Responses are received within 5 calendar days	Not reported
Canada- British Columbia(127, 128)	Provincial (2008)	Various (Endocrinology, General, Pediatrics Geriatrics, Nephrology, Neurology, Obstetrics and Gynecology, Ophthalmology, Orthopedic, Otolaryngology/ENT, Geriatric Radiology, Respirology)	To enhance patient care	• Rapid Access to Consultative Expertise (RACE) line was implemented to allow family doctors to receive advice from specialists, avoiding the need for face-to-face specialist consultations or emergency department referrals • The system was design to provide easy accessibility while allowing for sustainability through an organized rotation • Compensation for physicians was established via fee for service billing • While any FP could call any specialist, prior to RACE, it was on a "catch me if you can" basis and there was no guarantee that a specialist could be contacted or would call back in a timely manner • RACE was designed to provide: - An opportunity to speak directly with specialists - Timely guidance and advice - Assistance with plan of care - Learning opportunity - Enhanced ability to manage the patient in the family doctor's office - Calls returned within 2 hours - CME credit through "Linking Learning to Practice"	Not reported
Canada- British Columbia(129)	Pilot (Not reported)	Various (Cardiothoracic, ENT, General,	To enhance patient care	• eCASE (electronic Consultative Access to Specialist Expertise) was established as a complementary eConsultation service to RACE, in	*Grey literature:* • eCASE helps reduce specialty waitlists improving specialists capacity to see necessary

Table S8. Specialist advice request

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
		Hand and Upper Limb, Interventional Radiology, Ophthalmology, Neurology, Pediatrics, Pediatric Rheumatology, Respirology, Rheumatology, Thrombosis, Transgender Care, Medical Imaging, Otology)		which family doctors can ask a specialist non-urgent questions through a text-based system, attaching any clinical documents necessary (e.g. test results, patient history, images, etc.) • eCase was created to provide: - Assistance with plan of care - Learning opportunities - Enhanced ability to manage the patient within the family doctors office - Questions answered within 1 week and commonly within a few days - An opportunity to speak directly with specialist - Timely guidance and advice	cases in person; allows specialists to address questions at their convenience (within 7 days); provides a way for family physicians to be updated; specialists are remunerated • eCASE also simplifies the patient journey, improves patient outcomes, reduces systemic costs, strengthens the connection between primary and specialty care
Canada- Manitoba(130)	Provincial (Not reported)	Not reported	Not reported	• MyMBT Messaging was established to facilitate care coordination between health-care providers by offering secure text messaging and image sharing from the user's computer or mobile device • eConsult (Store and Forward) has enabled health-care providers to ask questions and/or send digital images of some non-urgent health-related conditions to a specialist without the patient having to travel	Not reported
Canada- New Brunswick(131, 132)	Pilot (2018)	Various (chronic pain management, dermatology, geriatric medicine, obstetrics/gynecology, orthopedics, neurology and psychiatry)	To reduce wait times for specialist appointments	• The BASE eConsult system (see below) was implemented in a 'proof of concept' trial in New Brunswick in 2018 (eHealth NB)	*Grey literature:* • In the 'proof of concept' in NB, over 75% of family doctors originally engaged submitted an eConsult during May-Oct 2018 - Dermatology services had the highest volumes in French and English - Specialist response times were great - Feedback from family doctors was 'overwhelmingly positive' - In 67% of cases, referral was contemplated and avoided as a result of the eConsult service
Canada- Newfoundland(133) (interview)	Provincial (2016)	Various (addictions medicine, cardiothoracic, cardiac surgery, chronic pain, clinical pharmacy, dermatology, endocrinology & metabolism, gastroenterology, geriatrics, hematology, hepatology, HIV, infectious disease, internal medicine, medication		• The NL BASE™ eConsult developmental project commenced Fall 2016 • The system was based off of the Champlain BASE™ eConsult program • Over 15 months, close to 1,000 eConsults have been generated • 200 family doctors enrolled in NL BASE™ • There were plans to engage, at a minimum, another 120 PCPs to participate in NL BASE™ •The recruitment focus was on PCPs practicing in rural and remote areas of the province, as it is believed NL BASE™ will have the greatest impact on practitioners and patients in these areas	*Interview:* • They are just finishing the pilot phase of the project

Table S8. Specialist advice request

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
		therapy services clinic, nephrology, neurology, obstetrics/ gynecology, opioid dependency, orthopedics, palliative care, pediatrics, psychiatry, public health & preventative medicine, respirology, sports medicine, surgery, urology and wound care)		• eConsult has been embedded in the electronic health record	
Canada- Newfoundland(134)	Regional (2011)	Diagnostic imaging	Not reported	• The Provincial Picture Archiving and Communications System (PACS) was created to allow physicians and regional nursing staff in Labrador-Grenfell Health facilities to view radiology reports and their associated images online, reducing the need to print hard-copy X-rays and send them by mail or courier to consultant radiologists outside the region • PACS has also allowed for regional consultation with a specialist for remote sites • The Charles S. Curtis Memorial Hospital installed a Digital Mammography Unit in 2011 (all imaging is stored in PACS)	*Grey literature:* • This system "dramatically reduced" wait times for diagnostic reports • Need for patients to have to travel to see the specialists themselves has decreased • 2011-2012 Annual Report reported that wait times for mammography services immediately improved with the introduction of the Digital Mammography Unit at the Memorial Hospital as the time to complete a mammogram decreased significantly, allowing more clients to be tested each day
Canada- Ontario(135, 136)	Regional (2010)	Various	To reduce wait times for specialist appointments	• Champlain LHIN established the Champlain BASE eConsult System, a secure web application where primary care physicians (PCPs) and nurse practitioners can initiate an eConsult about patients through an online portal • family doctors provide patient demographics (age and gender are mandatory) and a question for the specialist • Supplementary files can be attached, including imaging or laboratory results, or multimedia (e.g. pictures or videos) • eConsults are assigned to a specialist based on their availability or by rotation • Specialists can ask for additional information or clarification, provide recommendations, or suggest a face-to-face consultation • Specialists are asked to reply within a week and are remunerated quarterly at a rate of $200/hour prorated to their self-report time spent responding to eConsults	*Peer reviewed literature:* • In one specialty (otolaryngology-head and neck surgery (OTO-HNS)), 109 eConsults were received between April '11 and Jan '15 - The vast majority of family doctors were satisfied with the eConsult service - family doctors considered the service valuable to patients 88% of the time and valuable for themselves 92% of the time. <3% of responses were classified as 'not very useful' - Median response time of 1.89 days vs. a wait time of 7.8 weeks for traditional face-to-face consultation - An unnecessary referral was prevented in 48.7% of cases where the family doctors had initially planned a formal consultation - It took the otolaryngologists less than 10 minutes to respond in over 75% of the eConsults and no eConsult took longer than 20 minutes

Table S8. Specialist advice request

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
				• After receiving a response, family doctors can either close the encounter or reply for further clarification	• In a single costing study, it was found that the multispecialty Champlain BASE eConsult service generated cost savings from the societal perspective (net societal savings of $38 729 over a 1 year period)
Canada- Quebec(133)	Provincial (Not reported)	Not reported	To reduce wait times for specialist consultations	• eConsult Québec platform was established to enable rapid communication between family doctors, family doctors, nurse practitioners, and medical specialists • Specialists respond within 3 days	*Grey literature:* • Information obtained through eConsult can be integrated into patient care in 66% of cases, or even confirm a course of action already being considered by the PCP in 33% of cases • "The results of our impact analysis are promising and are generating enthusiasm with our key partners, notably within the Ministry of Health and Social Services," adds Dr. Maxine Dumas Pilon, eConsult Québec steering committee president.
Canada- Saskatchewan(133)	Provincial (Not reported)	Not reported	To support primary care physicians to work to their full scope of practice, reduce wait time to see specialists and reduce the number of inappropriate referrals sent to specialists	• LINK, a provincial physician-to-physician telephone consultation service, was established to give family physicians quick access to specialists for consult on acute and complex but non-urgent conditions	Not reported
New Zealand(57)	Regional (Not reported)	Not reported	Not reported	• An electronic service was established to provide specialist advice according to clinical history and findings as reported by the referring practitioner	*Grey literature:* • Approach shown to reduce wait times
United Kingdom – England(137)	National (2018)	Not reported	Not reported	• An 'advice and guidance' option was implemented within the NHS e-Referral Service (e-RS) to avoid the need to default to an outpatient referral • The advice and guidance feature was designed to allow clinicians to have multi-way conversations about patients using the e-RS feature • 80% of requests receive a response within 2 working days	Not reported
United Kingdom – Scotland(138)	Pilot (Not reported)	Oncology	To enable true skin malignancies to be diagnosed earlier and subsequently treated sooner, as well as reduce the pressure of outpatient clinics	• In a pilot study, family doctors used an electronic referral service to send digital images to the plastic surgery department for suspected skin malignancy • An onsite-training package was established for family doctors on the use of the camera and the attachment of images to the referral letter electronically	*Peer reviewed literature:* • Results from 300 patients included in the study who underwent the electronic referral system • Mean wait time from referral to diagnosis reduced from 10.9 days (traditional referral system) to 2 days (electronic system)

Table S8. Specialist advice request

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
				• The specialist on call screened (triaged) and vetted all referrals received enabling all patients to be assessed within one day • All images were accompanied by a full letter including history, relevant past medical history and current medication	• Mean wait time from diagnosis to treatment was similar between the traditional and electronic system • Mean wait time from referral to treatment reduced from 59 days (traditional) to 28 days (electronic) for urgent cases • Mean wait time from referral to treatment reduced from 126 days (traditional) to 52 days (electronic) for 'soon' cases • Mean wait time from referral to treatment reduced from 303 days (traditional) to 65 days (electronic) for routine cases • Mean overall correct diagnosis was 83.2% • Total of 90.2% of malignant lesion and 76.6% of benign lesions were correctly identified • A questionnaire was sent to 34 family doctors and 25 of them responded. 88% felt that the feedback from surgeons has been educationally valuable and has enhanced the patient journey (84%) • A questionnaire was sent to 31 patients and 21 of them responded. None of the patients were unhappy about the overall treatment

Table S9. Standardized referral forms

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
Canada- Alberta(111, 126, 139-141)	Provincial (Not reported)	Various	To streamline the referral process	• The province-wide eReferral system was developed with the assistance of ABJHI and AHS's Bone and Joint Health Strategic Clinical Network (BJH SCN) • eReferral simplifies the referral process by standardizing the information required to be submitted with the referral • The system informs the referring physicians of the waiting time to see the specialist before they transmit the referral • It also makes referral status updates available in real time, any time. • With eReferral, AHS has introduced to Alberta's physicians standardized referral forms and standardized wait times rules, terminologies and metrics • The definitions of key events during the wait, the start and end times of these events, and the practices used to measure data are the same across the province. • eReferral eliminates errors by standardizing the information required on the electronic form • Missing referral information causes hours of extra work and adds as much as six weeks to the wait to see a specialist • Lost referrals will be a problem of the past as the transmission and exchange of paper are eliminated • The eReferral system has been integrated with Alberta Netcare, a secure and confidential health record database where all patient health information is integrated, stored and made available to authorized health care providers • Only physicians who have adopted Alberta Netcare can use eReferral • AHS is encouraging physicians to give up paper-based referrals and adopt eReferral and Netcare	*Grey literature:* • Standardization reduces the wide variability in what is being measured and how it is being measured when tracking wait times for hip and knee replacements
Canada- Alberta (interview)	Provincial (Not reported)	Various	Not reported	• Standardized referral forms have been implemented for all sites using ACATS (~93% of sites)	Not reported
Canada- Alberta (interview)	Provincial (Not reported)	Oncology	To avoid patients falling through the cracks	• Alberta Thoracic Oncology Program established a protocol in which all CT scans in which a spot is detected result in automatic referral to their program • An arrangement was made with radiologists so that they include a note in their voice dictations to refer to ATOP and an immediate fax is sent to the program	*Interview:* • Patients no longer fall through the cracks and the time to be seen in consultation dropped by 14-15 days • However, they now have a number of CT scans with lumps that don't necessarily need to be seen by ATOP surgeons • They may get repeat referrals or contact patients who have had a benign lump for years that does not bother them
Canada- Manitoba (interview)	Provincial (Not reported)	Orthopedic	Not reported	• Central intake process for hip and knee replacements implemented a streamlined, single-page referral form, which must include an x-ray	*Interview:* • The electronic referral system was not able to build a critical mass of specialists and referring clinicians quickly enough, so despite

Table S9. Standardized referral forms

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
				• Process also ensures family doctors receive acknowledgement of referral as well as a notification when consult is booked and a report back on outcomes and next steps	initial very positive results, its value was not fully realized and it was retired
Canada- Newfoundland(142)	Regional (Not reported)	Various, endoscopy, and diagnostic imaging	Not reported	• Standardized booking processes were implemented in the Labrador-Grenfell health authority through the development of regionally standardized request forms for surgical, endoscopy, and diagnostic imaging procedures. • No other details were reported.	Not reported
Canada- Ontario (interview)	Regional (Not reported)	Not reported	Not reported	• Some LHINs have implemented e-Referral (e.g. in Southern Ontario) • The Ministry hasn't decided to take a lead on establishing a preferred vendor • A lack of standardized referral is one of the reasons why MRIs/CTs are such an issue in Ontario as the data provided in requisition forms often isn't enough to indicate if a scan is actually required	Not reported
Canada- Saskatchewan(36-38)	Not reported	Orthopedics/ neurosurgery (spine)	To improve compliance to the Saskatchewan Spine Pathway	• The Saskatchewan Spine Pathway (SSP) implemented several strategies to improve compliance, including structured referral forms	*Peer reviewed literature:** • In a retrospective analysis of 215 consecutive new patient referrals between June 1, 2011 and May 30, 2012, it was reported that SSP clinic referrals were significantly more likely to be candidates for surgery than referrals from outside an SSP clinic (59.1 vs. 37.6%, p=0.003) *Note: impact based on implementation alongside other approaches
Australia- New South Wales(143)	Regional (2014)	Ophthalmology	To improve quality, safety and health care experience for Ophthalmology patients	• A new model of care was developed collaboratively between Health Executives, Ophthalmology clinicians, nurse specialists and orthoptists in New South Wales to improve clinical engagement and more seamless partnerships with internal and external providers • Innovative local solutions were developed which included strong clinician leadership and engagement, a revised model of care, introduction of a standardized referral/triage service and concurrent surgical sessions for Registrars	*Grey literature:** • As of June 2014, 6 months after the project commenced, all patients clinic waitlist was cleared and new clinic wait times were reduced to < 365 days, over 150% reduction to pre-project wait times • The project also increased access to ophthalmic surgery, thus improving efficiencies and meeting key performance indicators and service measures *Note: impact based on implementation alongside other approaches
Australia- Queensland(144)	Hospital (2008)	Various	To reduce wait lists to access specialist clinics in the public system	• The Townsville Hospital, the family doctor Liaison Officer, family doctors and hospital staff including specialists, collaborated to develop a process to review patients waiting longer than two years • The template was developed to collect a minimum data set for each of the specialities. The minimum data set was used to	*Peer-reviewed literature:* • At the end of 2009 the wait time for orthopedics, ENT, neurosurgery, and urology was 2 years, and the wait time for general surgery was down to 1 year

Table S9. Standardized referral forms

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
				update clinical information for the long wait process and to ensure all appropriate investigations had been performed • The purpose of the template was to improve the adequacy of the information contained in the referral and to enhance appropriate triaging. • A letter sent to long wait patients (patients who were on the wait list for longer than 2 years) offered two options 1) take no action if the appointment was no longer required or 2) visit their family doctor to update their referral on a clinic specific template if they felt the referral was still required • Local family doctors were advised of the trial and provided education on the new template and minimum data required for specialist referrals	• By the end of 2010 wait time is expected to be 1 year for general surgery, 18 months for orthopedics and ENT, neurosurgery and urology, and 2 years for ophthalmology and vascular surgery • All stakeholders benefit: family doctors have access to consultant opinion for their patients; specialists have improved referral data enabling clinical management decisions at the first consultation; and patients who need procedures receive them • It was noted that this process would have been much easier to achieve if referral communication was electronic rather than paper based. An additional advantage of an electronic system would be the accuracy of referral data to accurately evaluate the process
Australia – Queensland (145)	State (2018)	Various	To streamline the referral process to specialist outpatient services	• Smart Referrals was implemented in Queensland to streamline referrals from family doctors to specialist • An integrated online directory was embedded in the system with a listing of specialist public outpatient services, where and how they are offered, referring requirements and expected clinic wait time • family doctors access their practice management software, create an electronic referral and submit it to the health service • Smart Referrals auto populates referral information and flagging anything that needs to be attached, • Smart Referrals allows family doctors to track and follow up a referral, ensuring referrals are not lost or duplicated • The referral is securely submitted to the right place, where it is electronically processed and triaged according to its clinical urgency • Smart Referrals also allows hospital and health service staff to create and submit referrals to any public specialist across Queensland • Referral Lodgement and Tracking provides technical capability to facilitate digital lodgement and tracking referrals across the state • Smart Referrals Workflow provides digital capability to facilitate the seamless receipt, registration and triage of specialist outpatient referrals • Smart Referrals are expected to improve: - Safety and quality of care—enhanced quality of referral information, informs clinical handover, triage and treatment of patients. - Workflow efficiency—faster, streamlined referral management supports better patient outcomes. ◦ Patient	Not reported

Table S9. Standardized referral forms

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
				experience—enhanced quality of referral information reduces wait times. - family doctor experience—quicker and easier for family doctors to refer. - Clinician experience—enhanced decision support information improves patient care. - Financial benefits—reduction in referral rework and avoidable appointments.	
Australia – Queensland(101)	State (2016)	Various	To develop consistent referral practices and standards across the state	• As part of Queensland Health's larger strategy to provide additional specialist outpatient appointments, eReferrals were implemented to ensure referrals are sent to the right place the first time • By 2020, family doctors will also have access to an online statewide directory of public hospital services to better inform and direct their referrals • The Government invested $361.2 million over 4 years to provide more specialist outpatient appointments for Queenslanders and to fix known problems in key parts of the patient journey by 2020	*Grey literature:* • By 2017, more patients will be seen within clinically recommended times and current long waits will be reduced
Australia – South Australia(4)	Pilot (2006) Hospital (2008)	Orthopedic	To optimize conservative management but ensure that joint replacement surgery is undertaken in an appropriate and timely manner	• The Orthopaedic Unit of the Repatriation General Hospital (RGH) in Adelaide, South Australia implemented a quality care management system for patients with arthritis of the hip and knee • As part of the system, a standardized referral template was developed • There was a focus on the development and implementation of an evidence-based referral and triage system sought to ensure timely response to new patients appropriate to the severity of their disease • This element featured a standardized Referral Template with a minimum dataset and supporting Referral Guidelines for family doctors	*Peer-reviewed literature:* • Over 4 years the model has: reduced waiting times for initial outpatient assessment from 10 to 3 months and surgery from 18 to 8 months, increased throughput of arthroplasty surgery from 396 procedures in 2005–6 to 548 procedures in 2009–10, increased attendance at patient preoperative education sessions from 31 to 81%, decreased length of stay from 6.3 to 5.3 days for hips and 5.8 to 5.3 days for knees, reduced the use of inpatient rehabilitation from 44 to 8% from June 2008
Australia- South Australia(146)	State (2010)	Various	To deliver efficient and sustainable health care services for the well-being of all patients, as well reduce waiting times for consultation and treatment	• The Specialist Outpatient Services Policy Directive was implemented in Australia to reduce inappropriate referrals by standardizing the referral process and giving clinicians a better understanding of who should be referred • Information about best clinical protocols was also provided	Not reported
Australia – South Australia(6)	State (2010)	Various	To reduce waiting times for consultation and treatment	• In 2010-11, The South Australian Government announced that outpatient services in public hospitals would be reformed • As part of these reforms, a standardized state-wide referral form was developed	*Grey literature:** • Through the delivery of the outpatient reform program SA Health has set a savings target of $5m during the 2013-14 period

Table S9. Standardized referral forms

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
				• South Australian Health allocated approximately $220m to outpatient services	*Note: impact based on implementation alongside other approaches
New Zealand(147)	Regional (2008)	Orthopedic	To help patients to recover faster and therefore get home sooner after surgery	• A group of surgeons, family doctors, allied health staff and nurses, with input from patients, develop standardized electronic referral forms for family doctors were introduced in New Zealand for patients requiring elective hip/knee surgeries • The form includes mandatory fields and open fields where family doctors can provide extra information on the specific patient requirements • This ensures that the hospital has all of the information to make a decision about whether the patient needs to be assessed for surgery • This approach was used in conjunction with other approaches such as pre-rehabilitation and education	*Grey literature:** The target to increase the volume of elective surgery by at least 4000 discharges/year has been met at the national level since Oct. 2009. *Note: impact based on implementation alongside other approaches
New Zealand(43)	Regional (2015)	Orthopedic	To standardize referral quality	• As part of a new triage process for elective hip and knee referrals, a protocol was developed informing general practitioners (family doctors) and specialists of the information required to facilitate an accurate assessment • This protocol was communicated to all family doctors in Canterbury by hard copy and was posted on the family doctor website • Patients were triaged based on the information in the referral letter and their radiology, according to clinical severity Switzerland • Failure to comply with the protocol in terms of the requested clinical information and radiological views resulted in a return of the referral letter with an invitation to re-submit when the requested document was provided	*Peer-reviewed literature:* • 43% of hip and 54% of knee problems were denied access for a first specialist appointment; most were returned to their family doctor • The triage process was influenced by the surgical capacity of the department and its ability to remain compliant with a maximal 4-month waiting time requirement as determined by the Ministry of Health • Remaining compliant and avoiding financial penalties is one of the driving forces limiting the number of first specialist assessments • This reduction in waiting times for a FSA and subsequent surgery has led to patients with a surgically treatable problem not being assessed and offered a surgical option • The triage process lacked objective scoring. The process was refined over the course of the study; standard of family doctor letters improved • The triage surgeons were able to accurately assess and prioritize the need for surgery
Switzerland (148)	Hospital (2010)	Various	To identify the expectations of the city doctors; strengthen the link with city medicine, downstream, upstream and during	• In 2013, the Hospitaux Universitaires de Geneve (HUG) set up an electronic appointment system enabling city doctors to refer their patients to the various HUG departments	Not reported

Table S9. Standardized referral forms

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
			hospitalization; and improve the economics of consultations		
United Kingdom – England(149)	Hospital (Not reported)	Oncology	To reduce wait times	• A two-week maximum time was set where all cases of suspected cancer had to be reviewed by specialist services within 2 weeks of a family doctor referral • The 2-week maximum was introduced along with the use of specific Head and Neck referral proformas for family doctors within the catchment area • There was an introduction of the Health and Neck referral proforma for family doctors within the hospital catchment area	*Peer-reviewed literature:* • Following introduction of the specific head and neck family doctor referral proforma and the Calman-Hine 2-week rule, a considerable improvement in the intervals encountered by patients with head and neck tumours treated •The overall range of mean waiting times was reduced after the implementation of the two approaches • The categories of improvement were delay in patient presentation to their family doctor; family doctor management; family doctor referral to specialist clinics; specialist clinics to biopsy, FNAC, MRI, CT, chest X-ray, endoscopy, histology result, primary radiotherapy, and surgery
United Kingdom – England(150)	Pilot (Not reported)	Oncology	To achieve the correct referral urgency, to achieve referral 'straight to test' where appropriate and to achieve referral to the correct specialist (e.g. colorectal surgeon or gastroenterologist)	• An electronic referral protocol was conceived with the purpose of handling the whole of the lower gastrointestinal referral process from primary to secondary care • The protocol was available under an electronic referral system • The family doctor, with the patient, fills in the protocol and the destination and referral urgency are given in the final screen page • The family doctor has the option to refer according to the protocol or to override	*Peer-reviewed literature:* • Based on 100 patients with colorectal cancer, the electronic referral protocol increased their identification to the TWW* pathway from 43% (based on the traditional referral pathway) to 85% • Based on 100 TWW referrals to the colorectal unit, the electronic referral protocol identified all patients with colorectal cancer to undergo the TWW pathway, upgraded 25 patients into the TWW category, and excluded 27 patients with benign conditions from the TWW category • Based on 100 patients who were referred as routine patients (non-urgent), the electronic referral protocol identified 3 of 4 colorectal cancers and assigned them to the TWW category, upgraded 21 patients into the TWW category, and correctly categorized 69% as routine patients • No wait times for patients using the electronic referral protocol were reported *TWW refers to the 2-week wait referral (a type of urgent referral indicated for patients with suspicion of cancer) - separate extraction form

Table S9. Standardized referral forms

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
					** The electronic referral protocol was evaluated not only in terms of its ability to deal with colorectal cancer, but also its ability to address the broad spectrum of other benign conditions such as colitis, irritable bowel, haemorrhoids and fissures.
United Kingdom – England(137)	National (2018)	Various	Not reported	• NHS e-Referrals system was implemented in all family doctor practices and hospitals • A new specialist 'advice and guidance' option was developed, avoiding the need to default to an outpatient referral • It also embedded decision prompts on local providers with the shortest waiting times, to help with demand/capacity 'smoothing'	Not reported
United Kingdom – England(151)	Hospital (2010-2011)	Oncology	To streamline diagnosis for patients with head a neck cancer	• As part of a study, the referral process for an oncology service in a single hospital was streamlined through the appointment of a designated coordinator and the introduction of a newly devised proforma • All referrals using the proforma were sent to the coordinator who had access to the head and neck surgical operating schedules • Based on the information at the proforma, a consultant then decided if patients should be scheduled for biopsy, or an appointment to attend the head and neck clinic • Patients scheduled for biopsy were seen on the day of the operation for the informed consent process	*Peer-reviewed literature:* • Median waiting time from referral to biopsy decreased from 74 to 22.5 days • Mean waiting time from referral to biopsy decreased from 98 to 18 days • The proforma was only used in 29% of cases
United Kingdom – Scotland(138)	Hospital (Not reported)	Oncology	To enable true skin malignancies to be diagnosed earlier and subsequently treated sooner, as well as reduce the pressure of outpatient clinics	• A referral system was established for patients with suspected skin cancers as well as non-malignant symptomatic skin lesions using high quality digital images transferred via a secure electronic referral system (ERS) • family doctors send digital images of skin lesions and suspected skin cancers to the plastic surgery department • The specialist on call screened (triaged) and vetted all referrals received enabling all patients to be assessed within one day • All images were accompanied by a full letter including history, relevant past medical history and current medication	*Peer-reviewed literature:** • Results from 300 patients included in the study who underwent the electronic referral system • Mean wait time from referral to diagnosis reduced from 10.9 days (traditional referral system) to 2 days (electronic system) • Mean wait time from diagnosis to treatment was similar between the traditional and electronic system • Mean wait time from referral to treatment reduced from 59 days (traditional) to 28 days (electronic) for urgent cases • Mean wait time from referral to treatment reduced from 126 days (traditional) to 52 days (electronic) for 'soon' cases • Mean wait time from referral to treatment reduced from 303 days (traditional) to 65 days (electronic) for routine cases • Mean overall correct diagnosis was 83.2%

Table S9. Standardized referral forms

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
					• Total of 90.2% of malignant lesion and 76.6% of benign lesions were correctly identified *Note: impact based on implementation alongside other approaches
United Kingdom – Scotland(83)	Regional (2010)	Orthopedics	To achieve the 18 weeks referral to treatment standard in orthopedics	• NHS Ayrshire and Arran created referral templates for staff to use instead of letters as a means of making consultant to consultant referrals • It was anticipated that these forms would be instantly received and flow smoothly into the receiving department's electronic referral management process	*Grey literature:* • Time taken to vet referrals and appoint patients has dropped from mean of 8 -14 days and a maximum of 56 days, to an mean of 3 – 7 days and a maximum of 14 days
United Kingdom – Scotland(152)	Regional (Not reported)	Various	To create a robust waiting list management system. This was addressed through electronic referrals	• There are now electronic referrals being received from NHS Lanarkshire, NHS Lothian, NHS Greater Glasgow and Clyde, NHS Ayrshire and Arran, NHS Dumfries and Galloway and NHS Forth Valley • Reconfiguration of electronic referral process has enabled a single point of access, a single waiting list and efficient electronic triage for a core team of AHPs including physiotherapists, occupational therapists, podiatrists and orthoptists	Not reported
United Kingdom – Scotland(93)	National (Not reported)	Various	Not reported	• Structured referral sheets were implemented as part of the Planned Care Improvement Programme, which prompt family doctors to conduct any necessary pre referral tests or treatments and educational support by specialists in creation of local referral guidelines	Not reported

Table S10. Targeted funding

Jurisdiction	Healthcare setting (year implemented)	Description	Impact
Human resource- Increased staff			
Australia - Tasmania(153)	State (2008)	• Tasmanian Government's $8.4 million Improving Time to Treatment: Elective Surgery Improvement Plan includes almost $285,000 to introduce dedicated elective surgery managers in hospitals • The North West Regional Hospital employed an additional general surgeon • The Mersey Community Hospital employed an additional ophthalmologist	*Grey literature:* • There was a 50% increase in eye surgery at the Mersey Community Hospital through the addition of an ophthalmologist
Australia- Victoria(154)	Regional (2008)	• A full-time urologist was appointed resulting in the region to significantly increase OR utilization at the main treatment site, which also enabled the network to commence a urology service from the smaller satellite hospital • The appointment of the full-time urologist could be considered the greatest resource that was implemented in this initiative as it provided the best ability for the health service to provide treatment to a larger number of patients	*Peer-reviewed literature:* • The number of patients assessed as 'ready for care' reduced from 579 to 190 (a 67% reduction) and the number of patients classified as 'overdue for surgery' went from 390 to 85 (a 78% reduction) • The average waiting time for semi-urgent and non-urgent (Category 2 and 3) patients went from 248 days to 180 days in the 10-month period • Because a large number of these patients fall within the DHS defined semi-urgent category and their waiting times still exceeded the recommended 90 days, although a 28% reduction in waiting time is a positive outcome, it still falls below the benchmark required
Canada- Alberta(155)	Regional (2011)	• A new orthopedic surgeon has started in the North Zone in July and additional staff have been hired in the Zone to meet target levels	*Grey literature:* • The wait time for knee replacement surgery in Q2 2011/12 was 49.9 weeks which is worse than the prior quarter and the Year to Date (YTD) wait time was 49.2 which is longer than the Alberta target for 2011/12 of 35 weeks • The wait time for hip replacement surgery in Q2 2011/12 was 39.7 weeks; slightly better than Q1, but the Year to Date (YTD) wait time was 41.4 weeks, which is longer than the Alberta target for 2010/11 of 27 weeks
United Kingdom – England(156)	National (Not reported)	• In England, a Government plan for coronary heart disease was announced in 1999; £50 million was earmarked for extra staff	*Peer-reviewed literature:* • Britain had fewer physicians per capita than Denmark in 1980; numbers increased by only 23% in the subsequent 15 years
United Kingdom – Scotland(157)	National (2018)	• The Waiting Times Improvement Plan sets out a range of actions that will deliver major change in access to care - its actions are short term – with clear deliverables at different points over the 30-month timeframe • The Scottish Government will invest a total of £535 million on resource and an additional £120 million on capital over the next three years to make a sustainable and significant step-change on waiting times • The Plan will initiate investment of £4 million in domestic and international recruitment • The Plan will also improve career pathways for key specialties (e.g. advanced nurse practitioners and general nurses) and enhance workforce capacity in urology, dermatology and general surgery	Not reported
United Kingdom – Scotland(158)	Hospital (Not reported)	• Extra clinical staff were recruited through the cancer programme • An additional breast surgeon was hired to reduce waiting times	*Grey literature:* • Waits for first clinic appointments were reduced to 10 days
Scheduling- expand outpatient services			

Table S10. Targeted funding

Jurisdiction	Healthcare setting (year implemented)	Description	Impact
Australia- Queensland(101)	State (2017)	• The Government invested $361.2 million over 4 years to provide more specialist outpatient appointments for Queenslanders and to fix known problems in key parts of the patient journey by 2020 • Specifically, there would be more surgical appointments so surgical procedures are provided within the clinically recommended time with appropriate follow up by specialists	*Grey literature:* • By 2017, more patients will be seen within clinically recommended times and current long waits will be reduced
Australia- South Australia(146)	State (2012)	• In 2010-11, the South Australian Government announced that outpatient services in public hospitals would be reformed in order to reduce waiting times for consultation and treatment • During 2012-13, SA Health allocated approximately $220m to outpatient services	Not reported
Israel (interview)	National (2017)	• Extra money has been paid to specialists to see patients after hours in the community • Program also consisted of funding other activities	*Interview:* • Program is effective at reducing wait lists

Table S11. Shared appointments for specialist consultations

Jurisdiction	Healthcare setting (year)	Specialty area	Purpose	Description	Impact
United States(159)	Hospital (Not reported)	General surgery	To improve patients' access to their physicians and improve physician productivity	• As part of a study, a hospital in Florida implemented shared medical appointments (SMAs) after bariatric surgery • There are two main models of SMAs (or group visits): physical examination SMAs and follow-up visits (which do not include a physical examination) • Multiple patients meet simultaneously with their healthcare provider(s), and the visits must provide an appropriate standard of medical care • Patients also have access to counseling with additional members of a healthcare team, including a behaviorist, nutritionist, or health educator, and benefit from the experiences and advice of other patients • The patients and the medical team are obligated to confidentiality • Patient encounters are billed as individual visits and are coded according to the level of care; the patients are not billed for the total time of the SMA visit, because the patient only has the individual attention of the physician for several minutes	*Peer reviewed literature:* • Of the patients who initially participated in a SMA, 91% scheduled a subsequent SMA and 96% indicated they would recommend SMAs to others • On a scale of 1-5 (1, poor and 5, excellent) patients graded their overall experience with SMAs as 4.5 • There was a statistically significant decrease in the average waiting period for an appointment for new patients • There was also a statistically significant decrease in the average waiting period for former patients • To ensure physician productivity and better access to follow-up visits, the number of patients seen in the SMA should be larger than the number of patients seen during the same period through individual appointments (e.g. 15 patients within a 90 minute session)
United States(160)	Clinic	Orthopedic	To increase access to care without increasing cost	• As part of a study, SMAs were implemented at a clinic providing nonsurgical and surgical care options for atraumatic and traumatic disorders of the hand in a teaching environment at an urban hospital in New Jersey • SMAs were implemented for patients with hand pain • Group visit staffing was the same as for the traditional visit: hand surgeon, nurse practitioner, orthopedic technician, medical student, and medical assistant • Each clinical session consisted of four 1-hour, consecutive group visits scheduled once a month on a Monday morning (traditional office visit clinic was scheduled on the other 3 Mondays in the month) • Up to 10 people could be scheduled for each 1-hour group visit and patients signed a confidentiality agreement at check-in • The group visits began with a 10-minute educational session and group discussion led by the hand surgeon • Time is allowed for questions and experiential sharing is encouraged	*Peer reviewed literature:* • SMAs are capable of increasing patient access to care and effectively handling increased patient volume with room for cost-effective growth in the future, all while maintaining quality of care • Access (time to appointment) was improved in the group visit model • The authors anticipate group visits dedicated specifically to carpal tunnel syndrome or hand arthritis; this will allow each group to be more focused and will streamline education and mutual support among the patients

Table S11. Shared appointments for specialist consultations

Jurisdiction	Healthcare setting (year)	Specialty area	Purpose	Description	Impact
				• A medical assistant entered the chief complaint using an electronic standardized questionnaire into the EMR along with basic vital signs for each patient either prior to, during, or after the group presentation • After the group educational session, patients transition to a large, open clinical room with 6 separate workstations (workstations in the open clinical room allowed for greater efficiency as providers can easily transition to other tasks from one workstation to another during time that may have been spent waiting for other team members in the more linear, traditional clinic) • Small procedures were performed on the table (suture removal, dressing changes, injections) • Patients could see the clinicians in a private exam room if they wish or require • In the group visit, major tasks are performed simultaneously by advance practice providers (nurse practitioners, physician assistants) in conjunction with supervision of the attending physician	

Table S12. Standardized treatment pathway

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
Canada-Alberta(11, 103, 139)	Pilot (2005) Provincial (2010)	Orthopedic	To reduce lengthy waiting times for consultation and surgery and to improve care for patients	• In 2003-04, the Alberta Orthopedic Society (AOS) undertook an initial comprehensive analysis and redesign of the continuum of care for hip and knee replacement in an effort to reduce lengthy waiting times for consultation and surgery and to improve care for patients • The work comprised all components of the continuum: referral, patient assessment by a specialist including a treatment plan for non-surgical patients, patient optimization, surgery, inpatient care, sub-acute care, recovery at home and ongoing monitoring • All services, other than family doctor and in-hospital, are provided in or through a hip and knee clinic - Care is fully integrated, provided by a multidisciplinary team and coordinated by a case manager in the clinic - Surgeons, nurses, and physiotherapists are involved in the care of the patient from consultation through to surgery and back into the community • Patients have the choice of first available surgeon or a specific surgeon • The addition of specific criteria was intended to reduce non-evidence based medical screening that is costly and consumes public health care resources • The new continuum applied evidence-based criteria to patient referral for home care following surgery • Evidence-based criteria were also applied when considering patient transfer to sub-acute care following surgery in the new continuum	*Peer reviewed literature:* • In the pilot study, patients who followed the new care path had significantly greater improvement in general health, less pain after surgery, and greater ability to perform normal daily activities than those who received conventional care • Waiting times from referral to first consultation and consultation to surgery decreased dramatically • LOS decreased by 1.3 days • The number of patients mobilized the day of surgery increased significantly (31 to 85%) • The degree of improvement among patients in the new continuum of care exceeded that of patients in the conventional approach as measured by the WOMAC and SF-36 • Patients in the new continuum of care had a 36% improvement in their average WOMAC score, compared with a 31% improvement for patients in the conventional approach • The lower total cost to public health care together with improved patient outcomes indicate the new continuum is more cost-effective than the conventional approach to hip and knee replacement • Results of the pilot suggested that the new continuum can achieve a standard for consultation waiting time of 17 working days or less on average by eliminating the backlog of patients and providing sufficient central intake resources • Alberta can achieve significantly higher standards in wait times in the two major components of access – consultation and surgery – through improved processes and better allocation of health care resources • Reduced LOS could be due to adherence to the new continuum's target length of stay, to improved patient optimization prior to surgery, or to a combination of these two factors *Grey literature:* • The Hip and Knee Replacement Program has reduced the time between the decision to have surgery and the surgery date to 19.2 weeks, down 12% or almost 3 weeks from when the program launched in 2010 • The average hospital stay for hip and knee patients has been reduced from 4.9 days for hip replacements and 4.6 days for knee replacements, to 4.1 days for both

Table S12. Standardized treatment pathway

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
					• Almost all patients returned to normal function for their age, indicating no ill effects from the shorter hospital stay • The patient satisfaction rate has increased from 86% to 98%. Rate of hospital readmission following surgery, already low at 4.3%, has improved even further to 4.1% • Reductions in length of hospital stay have freed up about 33,000 days of hospital bed space since 2010, enabling AHS to perform more than 1,600 additional hip and knee surgeries with the same bed capacity
Canada-Ontario(161)	Regional (2013)	Cardiothoracic	Not reported	• The Hamilton Niagara Haldimand Brant LHIN implemented the Integrated Cardiac Program, which operates across multiple sites and is led by a single medical director • Includes standardized referral and patient care processes that provide evidence-based care • Sites share policies, procedures and protocols, including common clinical policies, procedures, admission and discharge criteria • They also share common quality of care monitoring, reporting and identification with a commitment to joint monitoring of quality performance indicators	Not reported
Canada-Saskatchewan(36-38)	Provincial (2010)	Orthopedics/ neurosurgery (spine)	To improve quality for lower back pain care by encouraging guidelines-concordant evidence-based primary care while reducing wait times for appropriate MRI and surgical referral	• The Saskatchewan Spine Pathway, a standardized assessment and treatment process, was implemented for patients with low back pain •The Pathway is intended to support treatment of patients by family doctors in their communities • However, patients with "red flags" or those who do not improve with recommendations outlined in the pathway are referred to Spine Pathway Clinics •These clinics are multi-disciplinary and have centralized referral, triage and assessment, and pooled waiting lists	*Peer reviewed literature:* • In a retrospective analysis of 215 consecutive new patient referrals between June 1, 2011 and May 30, 2012, it was reported that SSP clinic referrals were significantly more likely to be candidates for surgery than referrals from outside an SSP clinic (59.1 vs. 37.6%, p=0.003)
Canada-Saskatchewan(39)	Provincial (Not reported)	Orthopedic	Not reported	• The Saskatchewan hip and knee pathway was implemented for patients with hip and knee osteoarthritis who may need joint replacement surgery • All patients are referred to a multi-disciplinary clinic where they are assessed and care options are discussed • The clinics offer a standard patient assessment process; provide consultations with an experienced health care team dedicated to improving patients' quality of life and health; confirm patients' need for surgery and provide surgical consults and surgical bookings (if patient is a surgical candidate); provide	Not reported

Table S12. Standardized treatment pathway

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
				faster referral to specialists and surgeons; provide patient education, educational sessions, and take-home information to prepare patients for surgery; follow up with patients after surgery to speed recover; and offer access to community partners, other health professionals, and ongoing follow-up and support • When surgery is not the preferred option, the clinics also help patients access non-surgical care in the community • Clinics are located in multiple cities across the province (Saskatoon, Regina, Prince Albert, and Moose Jaw)	
New Zealand (interview)	National (Not reported)	Orthopedic	Not reported	• District Health Boards have integrated clinical pathways, which include nonsurgical management prior to referral • If a referral is made, the patient is assessed by a specialist and if they do not meet the threshold, primary care resumes management • If a patient is not accepted for surgery, they are returned to the family doctor with a plan of care	Not reported
Norway(44)	Hospital (2008)	Various	To reduce cancellation rates for surgery	•An elective surgery pathway has been established for patients receiving elective surgery at Forde Hospital day surgery centre •The pathway includes centralized referral and pre-admission, patient choice of first available surgeon, patient choice of date of surgery, and a capacity coordinator to manage the program across all departments • A data management system is in place provide an overview of referrals, waiting lists, and surgery schedules across all departments	*Peer-reviewed literature:* • Mean cancellation rate was reduced from 8.5% to 4.9% ($p<0.001$) • Median number of operations performed per month increased 17% • Median number of scheduled operations per month increased from 373 to 400 ($p=0.04$)
United Kingdom-England(45)	Not reported	Various	Not reported	• One approach of referral management is passive use of referral protocols and electronic decision-support tools that describe care pathways	*Grey literature* • Systematic reviews have shown that referral guidelines can be effective in changing referral behaviours if combined with feedback from peers and/or specialists"

Table S13. Wait time targets

Case examples	Wait time targets	Wait time target policy	Other information	Impact of policies	Consequences/ implications
Policy: Legally binding wait time targets or guarantees enforced through positive and negative incentives					
United Kingdom- England (2000-2008) (107, 162-174)	Cancer: 2000: 2 weeks from family doctor referral to specialist assessment Non-cancer: 2000: 18 months for inpatient treatment 2002: 26 months from referral to specialist 15 months for inpatient treatment 2003: 21 months from referral to specialist 12 months for inpatient treatment 2005: 3 months from referral to specialist 6 months for inpatient treatment 2008: 18 weeks from referral to start of treatment The "star rating" system was introduced as a measure of institutional performance, and includes wait time considerations.	Implementation level: National • A wait time guarantee was given to all patients • The guarantee covered procedures funded by the public system • Initially, two separate guarantees were given to patients: one from referral to first specialist consultation, and another that covered inpatient waiting time. • Penalties were applied to hospitals with poor performance. − Jobs of senior executives were under threat if performance was poor. • Rewards were also given to hospitals that performed well in the form of greater autonomy. • Wait time data were published at the hospital level.	• A major increase in funding was provided during this time • Department of Health funded London Patient Choice Project (LPCP), in which patients at risk of breaching inpatient waiting time targets were offered the choice of an alternative hospital with a shorter wait. • Department of Health also set up overseas commissioning, which allowed hospitals to send their patients abroad to receive surgery so that Trusts could reach targets and avoid breaches.	Trends based on census data showed that during sanctions, fewer people waited more than 6 months for treatment. The median waiting time after patients were added to the waiting list was also shorter. A comparison of wait times before and after 2001 between England (which adopted an aggressive wait time targets policy coupled with strong sanctions for poor performing hospitals) and Scotland (which did not adopt the same policy) concluded that the proportion of patients waiting longer than 6 months for treatment fell by 6 to 9% points more in England than in Scotland and admissions for elective care increased. The order in which patients were treated did not appear to change, nor did the proportion of urgent cases fall. Further, there was no change in the severity of patients admitted for treatment or the quality of care patients received (based on the outcome measures assessed). However, there was evidence of waiting list manipulation, since the number of 'suspensions' (patients deemed not medically ready for treatment or could not attend first appointment date) and 'removals' (patients who died or were treated elsewhere) from the waitlist increased. Wait times were compared for breast cancer treatment before (1997-1999) and after (1999-2000) implementation of targets. The mean wait time from family doctor to specialist fell from 13.6 days to 12.3 days ($p<0.001$). However, the mean wait times from specialist to treatment (not covered under the guarantee at this time) increased from 21.4 days to 24.1 days ($p<0.001$). The mean wait time from family doctor to treatment increased from 35 days to 36.4 days ($p=0.01$). A duration analysis of wait time data from 2001/2002 and 2002/2003 for general surgery, orthopedics and ophthalmology	Overall findings are based on analysis of the outcome before and after implementation of wait time target policies. However, many other approaches were in place along with the wait time target policy. Thus, it is not possible to conclude that the observable impact was only attributable to the wait time target policy.

Table S13. Wait time targets

Case examples	Wait time targets	Wait time target policy	Other information	Impact of policies	Consequences/ implications
				found that variations in probabilities of admission coincided with changes to targets. Wait times were compared in England, Wales and Northern Ireland between 2001 and 2003. While they improved in England, they deteriorated in Northern Ireland and Wales, where the wait time target policies were not implemented. A before-after comparison of waiting time distributions for elective orthopedic surgeries in English hospitals found that the introduction of the wait time target changed admission patterns and led to an overall reduction in long waits. Admissions increased for all wait time categories except the shortest one. The mean waiting time from decision to treat to joint replacement fell from 157 days to 88 days ($p<0.001$) between 2006 and 2009. There was no evidence of socioeconomic disparities as the mean waiting time was 121 for the 20% less deprived and 119 days for the other groups. However, the mean "work-up waiting time" increased from 429 days to 487 days ($p=0.07$). Work up waiting time was defined as time from first referral to orthopedics clinic in the 3 years prior to surgery to inclusion in the waiting list. The policy faced criticism among healthcare professionals, e.g., mis-prioritization, undermined professional autonomy and "professionalism" Based on the results of a study exploring the effect of the LPCP on ophthalmology waiting times using 'difference in difference methods', the Project reduced both waiting times and variation in waiting times across London hospitals. A study comparing patients who travelled abroad for total knee replacement surgery through the overseas commissioning policy	

Table S13. Wait time targets

Case examples	Wait time targets	Wait time target policy	Other information	Impact of policies	Consequences/ implications
				with those who were treated locally found that while functional outcomes were comparable, the overseas group were more dissatisfied with their overall experience Low and high performing trusts based on the star rating system were compared to explore the impact of such a system. Through semi-structured interviews with senior executives and document analyses, it was found that while the system drove some beneficial change, it also led to "tunnel vision, a distortion of clinical priorities, bullying and intimidation, erosion of public trust, and reduced staff morale".	
Policy: Legally binding wait time targets or guarantees and mandatory offer of alternative provider enforced through negative or positive incentives					
United Kingdom- England (2011-current) (162, 166, 175, 176)	2011: Cancer: 2 weeks from family doctor referral to specialist 31 days from diagnosis to surgery 62 days from family doctor referral to first treatment Non-cancer: 18 weeks from referral to start of treatment	Implementation level: National • A wait time guarantee was given to all patients • The guarantee covers the whole patient journey from referral to initial treatment. • By law, patients are given options of other providers (public or private) if guarantee cannot be fulfilled. • NHS also sets operational standards in which at least 90-95% of patients have to start treatment within 18 weeks of referral. • Providers are monitored on a monthly basis and breach of the operational standard will result in up to 5% reduction in revenue		Interviews with family doctors, oncologists and surgeons about wait time targets for colorectal cancer were conducted. Overall, they were positive about the targets. However, the following concerns were raised: wait time targets took a 'one-size fits all' approach; providers faced considerable pressure; and waiting time targets over-rode patient and provider choice.	Overall findings are based on analysis of outcomes before and after implementation of wait time target policies. However, many other approaches were in place along with the wait time target policy. Thus, it is not possible to conclude that the observable impact was only attributable to the wait time target policy.
Sweden (2010) (162, 177-179)	Patients to have instant contact with the health care system (0 days) Patients to be seen by family doctor within 7 days and by a specialist within 90 days*	Implementation level: National • A wait time guarantee was given to all patients		A comparison of wait times for bariatric surgery in Sweden and Norway showed that the median waiting time from referral letter received to bariatric surgery was 253 days in Sweden and 461 days in Norway (where	-

Table S13. Wait time targets

Case examples	Wait time targets	Wait time target policy	Other information	Impact of policies	Consequences/ implications
	Patients to wait no more than 90 days after being diagnosed to get treatment No rationale for the wait time targets were found. * The Stockholm County Council had established more aggressive targets where patients were guaranteed consultation with a specialist within 30 days	• The guarantee covers patients from first contact with the health care system to surgery • By law, patient can choose another provider (public or private) if the guarantee was not fulfilled. Expenses would be covered by their home province • An economic incentive was introduced in 2009 (Queue Billion programme). Money was given to counties that reached the wait time targets set out in agreements.		guarantees were enforced for a targeted population and only if a patient files a complaint). However, the numbers of operations in private hospitals in 2016 were 2,240 in Sweden and 114 in Norway. 55% of operations in the private sector were paid by the Swedish Government, whereas 0% of operations in the private sector were paid by the Norwegian Government.	
Policy: Legally binding wait time targets or guarantees and mandatory offer of alternative provider					
United Kingdom- Scotland (2011-current) (158, 162, 180-183)	Cancer: 31 days from decision to treat to first treatment 62 days from referral to treatment Coronary heart disease: 16 weeks from referral to cardiac intervention. Other elective care: 12 weeks from specialist decision to treat to treatment 18 weeks from referral to treatment 6 weeks for eight diagnostic tests	Implementation level: National • A wait time guarantee was given to all patients • The guarantee covers the whole patient journey from referral to initial treatment. • By law, if the guarantee is not fulfilled, the Board must provide a written explanation to the patient. • Patients can be given the option of treatment elsewhere (private or public). • There are also operational standards in which, for example, 90% of patients have to start treatment within 18 weeks of referral. • Performance of regions is reported in the press, but currently it is unclear	Not reported	Not reported	Not reported

Table S13. Wait time targets

Case examples	Wait time targets	Wait time target policy	Other information	Impact of policies	Consequences/ implications
		what sanctions are in place if operational standards are not met.			
Policy: Non-legally binding wait time targets or guarantees and offer of alternative provider					
Denmark (1993) (162, 184)	1993: 12 weeks from family doctor or specialist referral to beginning of treatment	Implementation level: National • Patients were given the option of treatment at any public hospital • Expenses would be covered by the public system. • Patients were not reimbursed for travel expenses. (288;332)	"Extra funds allocated"	There was no effect on waiting times	A new policy was in place in 2002
Denmark (2000-2011) (162, 184)	2000: Maximum wait time for life-threatening conditions established 2002: 8 weeks from family doctor referral to beginning of treatment 2007: 4 weeks from family doctor referral to beginning of treatment 2011: Non-cancer: 4 weeks from family doctor referral to diagnosis Non-cancer and non-life threatening conditions: 4 to 8 weeks (depending on urgency) from diagnosis to beginning of treatment Cancer: 2 weeks from referral to specialist 2 weeks from diagnosis to surgery 4 weeks from referral to follow-up treatments Ischemic diseases: Unstable angina pectoris: 3 weeks from specialist to coronary arteriography and revascularisation Angina pectoris after MI: 5 weeks from specialist to revascularisation and coronary angiography	Implementation level: National 2002: • A wait time guarantee was given to all patients • The guarantee covered patients from referral to treatment • Patients were given the option of treatment from another provider (public or private) if the guarantee was not fulfilled. Expenses would be covered by the public system. • Patients were not reimbursed for travel expenses.	In 2002, an additional 1.5 billion DKK were pledged to surgical activity to increase it by 14-18%	One report concluded that waiting times declined after 2002, although other approaches were already in place during this time **(162)** and the number of patients using private hospitals increased from 2.0% in 2006 to 4.2% in 2008.	Not reported
United Kingdom- Scotland (2003-2007) (107, 158, 162, 181-183, 185-188)	2003: 9 months from referral to first specialist assessment 9 months from specialist decision to treat to treatment 2005:	Implementation level: National • A wait time guarantee was given to all patients without an Availability Status Code (ASC, assigned to patients who	Not reported	Overall, there was a reduction of waiting times after the implementation of the policy. But the decrease in waits for some patients was at the expense of other patients who would have waited less if the policy was not in place. Further, data was potentially manipulated (gaming) as the number of the	The ASC code was abolished in 2007. Overall findings are based on analysis of outcomes before

Table S13. Wait time targets

Case examples	Wait time targets	Wait time target policy	Other information	Impact of policies	Consequences/ implications
	6 months from referral to first specialist assessment 6 months from specialist decision to treat to treatment 2007: 18 weeks from referral to first specialist assessment 18 weeks from specialist decision to treat to treatment	were not available or suitable for treatment). • Two separate guarantees were given to patients: one from referral to first specialist consultation, and another that covered inpatient waiting time. • NHS boards were monitored on a monthly basis. Individual "breaches" had to be reported to the Executive and were rigorously investigated. • Patients at risk of breaching the target could be diverted to a national waiting centre dedicated to elective surgeries.		allocation of ASC code to patients increased during this period The mean waiting time from specialist to initial treatment decreased from 84.1 days to 74.9 days from 2003/04 to 2005/06. The median waiting time increased from 44 days to 49 days. However, at the 90th percentile, the waiting time decreased by 59 days. Further analysis showed that patients in the low priority group experienced an 11% (16 days) reduction in mean waiting time relative to the high priority group, whose waiting times did not change over time. Mean waiting time from specialist to treatment reduced from 79.4 days to 63.0 days from 2002 to 2007. Further analysis showed that waiting times decreased for patients with longer times at the expense of those who previously waited less. In the orthopedic surgery department of one Health Board, the 95 percentile wait decreased from 36 weeks in 2004 to 17 weeks in 2007. Wait time reductions after 2001 were compared between England and Scotland (where, at that time, waiting time targets were not strongly monitored). The proportion of patients waiting longer than 6 months for treatment fell by 6% to 9% more in England than Scotland. The study also reported that the percentage of patients waiting more than 6 months for care was 14% in those with the ASC code and 28% for those patients in Scotland without the ASC code	and after implementation of wait time target policies. However, many other approaches were in place along with the wait time target policy. Thus, it is not possible to conclude that the observable impact was only attributable to the wait time target policy.
Sweden (1997) (162)	1997: Patients to have instant contact with primary care (0 days) Patients to be seen by family doctor within 7 days and consulting a specialist within 90 days	• A wait time guarantee was given to all patients • The guarantee covered from physician's decision to treat to surgery • Patient could choose another provider (public	Not reported	No information found	Not reported

Table S13. Wait time targets

Case examples	Wait time targets	Wait time target policy	Other information	Impact of policies	Consequences/ implications
		or private) if the guarantee was not fulfilled. Expenses would be covered by their home province.			
Sweden (2005) (162, 177-179, 189, 190)	2005: Patients to have instant contact with the health care system (0 days) Patients to be seen by family doctor within 7 days and consulting a specialist within 90 days* Patients to wait no more than 90 days after being diagnosed to get treatment No rationale for the wait time targets were found. *The Stockholm County Council had established more aggressive targets where patients were guaranteed consultation with a specialist within 30 days	Implementation level: National • A wait time guarantee was given to all patients (but it was not a legal right) • An agreement was signed between the Federal Government and the county councils (although no legislation was implemented) • The guarantee covered patients from first contact with the health care system to surgery • Patient could choose another provider (public or private) if the guarantee was not fulfilled. Expenses would be covered by their home province.	Additional funding was provided extra funding to support the wait time target policy. The amounts were SEK 700 million in 2005, an additional SEK 500 million in 2006, and SEK 750 million in 2007. This was equivalent to 0.3% of the health care budget in 2005.	Data from the National Cataract registry showed that mean waiting times for cataract surgery decreased from 2005 (5 months) to 2008 (2.3 months). The number of patients crossing borders to have operations in another province went from 5% (2005) to 3% (2008). The mean waiting time for people who moved was 2.0 months, whereas the time for those who did not move was 3.4 months ($p<0.001$). Overall, waiting times decreased from 2005 to 2007. However, in 2008, 30% of all patients on the waiting lists had been waiting more than 90 days for an appointment with specialist. Also, there was a wide variation in wait times among regions. The general conclusion was that "the guarantee had a limited impact on waiting times, suggesting that implementation of the reform had not been completely successful".	Changes in the policy were introduced in 2010. Reasons were that policy had limited effect on wait times and many authorities did not inform patients and providers about the guarantee.
Policy: Non-legally binding wait time targets or guarantees					
Canada- Alberta (Five year action plan 2010-2015)(191)	30 days from referral to specialist Cancer: 4 weeks from referral to treatment CABG: 1 to 16 weeks from referral to treatment Other surgical procedures: 14 weeks from referral to treatment	Implementation level: Provincial A five year action plan set targets to specific surgical procedures	The targets were set under a 5-year Health Action Plan (2010-2015)	Not reported	Not reported

Table S14. Non-financial provider incentives

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Type of incentive	Description	Impact
Canada-Alberta(192, 193)	Provincial (2010) Hospital (2009)	Orthopedics	To improve patient outcomes and health system efficiency	Non-financial	• The Joint Optimization Incentive Team (JOINT) created a performance score card with key performance indicators in the 6 dimensions of quality: average LOS in hospital; time out for a final checklist in the OR before incision; percentage of patients mobilized on the day of surgery; time to surgery (referral date to date of surgery); patient satisfaction; date of discharge from hospital vs predicted date of discharge • Performance levels were set from 1-10 with the upper end identified as "ideal" • The Alberta Hip & Knee standardized, integrated care pathway was implemented in the hospital at the same time • Across the province, data have been collected from hip/knee replacement surgeons and analyzed by the ABJHI • Each surgeon gets a report twice yearly on results in 17 key indicators	*Peer-reviewed literature:** • In the first six months of the implementation of the scorecard, LOS declined to 4.4 days from 5.5 days, an improvement of 20%; compliance • Time-out to complete a pre-incision checklist increased to 96.1% from 60% • Patients mobilized on day of surgery increased to 76% from 47%; waiting time for surgery was 450 days, a reduction of 446 days or 50% *Note: impact based on implementation alongside other approaches

Table S15. Ongoing monitoring, analysis, and reporting of wait time and other outcomes data

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
Australia- South Australia(146)	State (2010)	Various	To develop a sustainable, safe, efficient and effective outpatient service for the South Australian community	• As part of the Outpatient Service Improvement Program, the South Australia Health implemented reforms to include all outpatient clinics in reporting systems, allowing measurement of key performance indicators at the clinical level and subsequent better management of clinics	Not reported
Canada- Alberta(141)	Provincial (2013)	Various	To identify where delays occur and support quality improvement, equity and transparency	• Hospitals (urban and rural) and diagnostic clinics collect data from physicians and other health-care providers and submit it to the Ministry of Health • Alberta Health Services (AHS) has established standardized processes for the collection and use of consistent and accurate wait time data to identify where delays occur • The health authority uses wait time data is used to support quality improvement, equity and transparency • AHS ensures that wait time information across the continuum of care is measured using standardized classifications, definitions and timestamp rules; is managed using established performance benchmarks based on diagnosis and/or clinical urgency and leading practice for process improvement; is reportable in a manner that is accessible to the public and health professionals and is in compliance with the HIA and other relevant privacy legislation and meets compliance, monitoring and auditing requirements	Not reported
Canada- Alberta(193)	Provincial (2010)	Orthopedic	To measure hospital performance in relation to benchmarks	• In the orthopedic wards of hospitals, teams have been using report cards to measure how they are doing in relation to benchmarks • They set targets for wait time, length of stay in hospital, pain reduction, getting patients on their feet after surgery, and many other indicators • Across the province, data are being collected from hip/knee replacement surgeons and analyzed by the ABJHI • Each surgeon gets a report twice yearly on results in 17 key indicators • Wait time data has become sophisticated enough that Alberta can distinguish the additional wait caused by patient postponement of surgery • At the same time, other approaches were implemented including central referral, patient choice of first available surgeon, etc.	*Grey literature:** • Ensuring patients make the necessary support arrangements has seen hospital LOS drop below the 4-day benchmark • Since 2004, Alberta has increased the number of hip and knee surgeries by 73% with only a 5% increase in the use of hospital beds • The program to reduce hospital stay saved 33,000 bed-days from 2010-2013 – a value of $33 million *Note: impact based on implementation alongside other approaches
Canada- Alberta(194)	Regional (2015)	Oncology	To improve system navigation and patient access to scheduled services	• Path to Care works with programs and services to improve system navigation and patient access to scheduled services	*Grey literature:* • With the tool in place, the program could determine if access targets for each referral type were being met

Table S15. Ongoing monitoring, analysis, and reporting of wait time and other outcomes data

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
				• The "Manual Tracker" is one of many tools Path to Care has developed to standardize wait time measurement so programs and services who do not have IT to support their referral and scheduling activities can measure wait times, generate wait lists, identify delays and find opportunities for improvement	• The referring physician receives confirmation of the receipt of referral the same day the referral is received by the program. • The program is able to track the time from first appointment to surgery, the number of referrals per surgeon, and if a patient's appointment is rescheduled, can track why (i.e. patient cancelled, patient rescheduled, no show, system rescheduled) • It was a major milestone to have accurate wait time data for the different steps in the process, be able to make improvements and have better communication with physicians and patients
Canada-Manitoba(195) (interview)	Provincial (2003-04)	Orthopedic	Not reported	• Provincial registry for hip and knee replacement patients built "on the back" of the Canadian Joint Replacement Registry • Regional health authorities are required to report wait time data for publicly funded services from physicians and operating room or scheduling systems • Data collected may be entered into the registry by office/clinic staff or information may be forwarded to a central office for entry • All pre-operative functional and disease severity scores are monitored for each surgeon by the provincial Standards and Quality Committee • They have other mechanisms for tracking cataract and CABG surgeries	*Interview:* • Services differ in how they measure wait 1 and 2 and various start times are used for the start of wait 2 (e.g. date consent is signed, date decision is made to proceed with surgery, date booking form is received at the hospital) • This inconsistency has some effect on calculated wait times • There was good buy-in as people wanted to improve outcomes and quality •There has been no change in preoperative disease severity scores since they started the registry (they are not operating on patients with more or less severe disease)
Canada-Newfoundland (interview)	Provincial (Not reported)	Various	Not reported	• Regional health authorities must report wait times for hip and knee replacements, cataract surgery, CABG, and hip fracture • They also collect the time to triage or referral and time to respond to family doctor	*Not reported*
Canada-Newfoundland(142)	Hospital (2008-09)	Various Endoscopy	Not reported	• An electronic surgical waitlist database was developed for elective surgery and endoscopy referrals and has been implemented at one site (Charles S. Curtis Memorial Hospital) • The system allows monitoring of wait times and service demand compared to actual service delivery • No other details were reported	Not reported
Canada- Ontario(196, 197) (interview)	Provincial (2004)	Various	To measure, report and manage wait times	• The Wait Time Information System is built on point-of-care data entry. It captures data electronically in one system, while also integrating with current OR booking system	*Interview:* • Recommendations tend to be well received because the program works with the experts, administrations, LHINs, etc.

Table S15. Ongoing monitoring, analysis, and reporting of wait time and other outcomes data

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
				• The WTIS was established to assist with the management of wait times at the LHIN, hospital, and surgeon level • It provides near real-time wait times data for surgery (waits1 and 2), diagnostic imaging, and alternate level of care (ALC) • Hospitals have wait time coordinators who are responsible for collecting data and training clerks in physicians' offices on data entry and look for issues that need to be addressed at the hospital level(105) • DARTS are used to report periods of unavailability due to patient reasons and remove them from the measured wait time (DART refers to periods of time between decision to treatment and the procedure date when the patient is unavailable for procedure(105) • The WTIS is managed by Cancer Care Ontario, who reviews the wait time information, analyzes patterns/trends, and provides recommendations to the Ministry, LHINs, and hospitals	• The process is very collaborative so recommendations make sense to everyone
Canada- Ontario (interview)	Regional (Not reported)	Orthopedic	Not reported	• The Champlain Regional Orthopedic Network measures "wait 1a" (wait from family doctor referral to central intake), "wait 1b" (wait from assessment to first consultation with surgeon), and "wait 2" (wait from decision to treat to surgery) • Using this information, the Network provides advice to the LHIN regarding distribution of services, where services should be offered, volume allocation, funding, etc.	Not reported
New Zealand (interview)	National (Not reported)	Various	Not reported	• Eight key performance indicators are measured and monitored in each district health board (DHB) • The indicators are: - DHB services that appropriately acknowledge and process patient referrals within required timeframe - Patients waiting longer than the required timeframe for their first specialist assessment - Patients waiting without a commitment to treatment whose priorities are higher than the actual treatment threshold - Patients given a commitment to treatment but not treated within the required timeframe - Patients in active review who have not received a clinical assessment within the last six months - The proportion of patients treated who were prioritised using nationally recognised processes or tools	Not reported

Table S16. Regular validation of wait lists

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Wait list validated	Description	Impact
Australia- South Australia(6, 198)	Regional (2013) State (2017)	Various	To provide more accurate information for family doctors	Consultation	• In 2013, a regional authority implemented the approach where a team was in charge of a process of checking with patients and their family doctors on the outpatients waiting list to determine if they had either been seen elsewhere or no longer needed appointment	*Grey literature:** • According to an annual report from 2013/14, the number of outpatient occasions of service (any service provided to a patient) reduced by 4% from 2013 to 2014 in the Southern Adelaide Local Health Network • According to an anecdote from a media release the time from referral to specialist for renal patients at one hospital was reduced by 93% after expansion of the approach to the state level (mean wait of 594 days before approach to 41 days after approach) *Note: impact based on implementation alongside other approaches

Table S17. Web-based specialist directories

Jurisdiction	Healthcare Setting (year)	Purpose	Specialty area	Description	Impact
Australia- Queensland(101)	State (2018)	Various	To reduce the number of patients waiting longer than clinically recommended for initial specialists' appointments	• An integrated online directory was established within the Smart Referrals program (an electronic referral system) providing family doctors with access to real-time information about where they can refer their patients and how long the wait time is	*Grey literature:* • The directory is seen as an investment for improvements in the patient journey • The system provides an easy and convenient way for family doctors to track referral and ensuring that nothing gets lost or duplicated • It is expected that this process will lead to improved safety and quality of care, workflow efficiency, patient experience, family doctor experience, clinician experience, and financial benefits
Canada- Alberta(199)	Provincial (Not reported)	Various	To reduce patient wait times, reduce work load burden, save time, reduce operating costs and improve patient satisfaction and safety	• The Alberta Referral Directory was established to provide information about service and consultant demographics, referral guidelines, referral forms and detailed instructions to facilitate referral acceptance without delay • With Connect Care, providers will be able to easily access the ARD when making referrals • Information listed in Consultant Profiles originated from the College of Physicians and Surgeons of Alberta (CPSA) and the Alberta Health Provider Registry • Profiles were updated by consultants and/or their delegates to include areas of specialty, site services performed at, associated services, contact information, languages spoken, etc. • Private services were also listed by completing a service request form • Service Editors were encouraged to update their profiles to include referral guidelines (reasons for referral, required tests/ investigations and information), referral processes and forms, approximate routine wait times and eligibility requirements, and communication turnaround targets	Not reported
Canada- British Columbia(200)	Regional (2017)	Various	To streamline the referral process	• Fraser Northwest Division of Family Practice developed a web-based directory called Pathways for family doctor to specialist referrals • After a successful pilot, the program was expanded to all family doctors and specialists within Vancouver Division of Family Practice	*Grey literature:* • As of July 2017, the directory had 3723 specialists and 970 clinics listed • New resources and forms have been continually added for improvement • 94% of Division members have implemented Pathways within their settings • As of August 2017, the patient was integrated in the directory and is able to receive email communication

Table S17. Web-based specialist directories

Jurisdiction	Healthcare Setting (year)	Purpose	Specialty area	Description	Impact
					• Due to the success of the implementation, a full province-wide implementation was expected by mid-2018 • Web-based directories have allowed for all information and interactions to occur in one place and thus minimizing the possibility of missed referral
Canada- Manitoba (interview)	Provincial (Not reported)	Not reported	Not reported	• The province implemented an online catalogue for specialists, showing what each specialist does and/or does not do	*Interview:* • Catalogue was dependent on specialists self-updating their data, which was difficult to manage and ultimately not successful
Canada- Quebec(35)	Provincial (2016)	Various	To streamline the referral process between general practitioners and specialists	• A web-based directory was developed alongside Montreal's Service Request Distribution Center (CRDS) • family doctors were required to register in the directory to use the distribution centre	Not reported
Canada- Saskatchewan(201, 202)	Provincial (2010)	Various	Various To improve experiences for surgical patients and to reduce the wait times of patients waiting for a surgery	• A patient referral guide website was developed so family doctors can access information about specialists and their practice • family doctors can select the most appropriate specialist for the patient •The directory provides real-time information about the specialist' wait times so patients can choose how long they would like to wait to see a particular specialists	*Grey literature:* • Number of patients waiting over 18 months was reduced by 57% • Number of patients waiting over 12 months was reduced by 37% • Year one target was not met due to various factors • The directory is able to help patients and family doctors make the best choices for care. • Although, the set targets have been seen as challenging, the goal is to continue working on them and to allow sufficient time to accomplish the goals

Table S18. Appointment reminders for consultation

Jurisdiction	Healthcare Setting (year implemented)	Specialty area	Purpose	Description of Service	Impact
United Kingdom- Northern Ireland(61, 203)	National (2017/18)	Various	To reduce no-show appointments, which lead to longer wait times as those appointment spots are not filled with patients requiring care	• Health and Social Care Trusts implemented text and voice messaging services to remind patients of their upcoming appointments	*Grey literature:* • Report shows that there was a decrease in missed appointments from 2013/14 at the rate of 10.3% to 2015/16 at the rate of 8.3% • The text and voice service has contributed to the decrease of missed appointments • If the service is provided on a regional basis it might lead to higher improvements

Table S19. Cancellation lists

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Description	Impact
Canada- Alberta (interview)	Surgeon-specific	Not reported	• Some surgeon's offices have implemented a cancellation list, where patients on the list can receive consultations or surgeries on short notice (after another patient cancels).	Not reported

Table S20. No-show policies

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
Canada- Newfoundland(204)	Provincial (2016)	Various	To discourage no-show appointments	• Regional Health Authorities in Newfoundland have implemented a no-show policy • Patients who miss an appointment or who don't cancel with sufficient notice (at least 48 hours) will be required to obtain another referral letter or an update referral from their physician in order to get a new appointment • Exceptions included family emergencies, severe weather conditions, and if patients cancel with sufficient notice	Not reported
United Kingdom – Scotland(158)	National (2004)	Various	To calculate waiting times in a way that will be fairer, more open to scrutiny, more understandable, and which will help put patients at the centre of their care	• Process was implemented where periods of patient unavailability were reviewed regularly, so that no-one remained unavailable for treatment for more than 3 months without a check on their status • New arrangement also meant that patients had to take responsibility for accepting and keeping a reasonable offer of an outpatient consultation or hospital admission for treatment •Patients who failed to turn up for an appointment or admission without prior warning will return to the start of the waiting queue, unless there were clinical or other compelling reasons for treating them more quickly • Effectively they would have their waiting times "clock" returned to zero	Not reported

Table S21. Operations research/ resource planning tools

Authors, year, country	Jurisdiction	Healthcare setting and types of elective surgeries addressed	Problem/issue addressed through simulation modeling	Purpose of modeling	Model type/ method	Main assumptions of the model	Information sources/inputs into the model	Findings	Implementation of findings/ impact
Abasolo et al 2014(205) Spain	Spanish National Health System	Healthcare regions • Cholecystectomy • Carpal tunnel release • Inguinal/femoral hernia repair	•Heterogeneous reporting of wait times across regions • Total wait times not reported – instead, waiting times reported for each stage in a patient pathway to surgery (family doctor referral to specialist consult to completion of diagnostic tests to second specialist consult to scheduling of surgery date)	1) To determine total wait times for three elective surgeries 2) Demonstrate impact of determining wait time for each subsequent stage based on time waited to complete previous stage (alternative wait time management system)	• Used Software Easyfit 5.3 Professional and MatLab • Simulated waiting time distribution for each stage • Added simulated wait time for each stage to calculate total wait time • Created a hypothetical patient cohort to run a simulation exercise in which wait time for subsequent stage depended on time waited in previous stage (i.e., those who waited longer for first visit received greater priority for second visit)	• Data from two regional health services were representative of all regional health services • All patients in hypothetical cohort had same clinical need • No increase in use of healthcare resources	• Published wait time data for each stage from two regional health services in 2009	• Estimated average total wait times: - Cholecystectomy: 331 days - Carpal tunnel release: 355 days - Inguinal/femoral hernia repair: 137 days • Estimated maximum reduction in wait times based on alternative wait time management system: - Cholecystectomy: 11% - Carpal tunnel release: 15% - Inguinal/femoral hernia repair: not reported • Through alternative system, overall variability and maximum wait times could be reduced with no additional costs	No information found
Januleviciute et al 2013(186) Norway	Norway and Scotland	Regional health authorities (RHAs) in Norway Regional health boards • Inpatient surgical and non-surgical services	Both countries have introduced reforms, the effects of which had not been assessed • Scotland: introduced blanket maximum waiting time targets • Norway: passed act in which	To assess consequences of two different waiting time strategies, one in Norway (vertical prioritization) and one in Scotland (blanket prioritization)	• Assigned ICD-10 codes to medical conditions of patients in both the Norwegian and Scottish registers • Patients assigned to maximum acceptable waiting time groups based on ICD-10 code • Used exact matching to construct pre and post-reform groups with similar observable characteristics	• Impact of policy change (reform) observable within a two year period (pre and post reform)	•National administrative data pre and post-reforms in each of the countries (2003-2006)	• Norway - Wait times for highest priority patients increased by 6 to 9% post-reform - Wait times for low and no priority groups decreased by 4 and 7 days, respectively post reform • Scotland - With the exception of the highest priority group, wait times	No information found

Table S21. Operations research/ resource planning tools

Authors, year, country	Jurisdiction	Healthcare setting and types of elective surgeries addressed	Problem/issue addressed through simulation modeling	Purpose of modeling	Model type/ method	Main assumptions of the model	Information sources/inputs into the model	Findings	Implementation of findings/ impact
			assessment of a patient for elective services must consider: 1) severity of the condition, 2) whether a suitable treatment exists, and 3) cost-effectiveness of treatment; assessment must take place within 30 days of referral	•Are more severely ill patients prioritized better where vertical prioritization is implemented through differential maximum waiting times?	• Undertook weighted regression of patient level waiting times on patient characteristics • Performed multivariate regression analyses to compare changes in conditional mean waiting times over time			were longer pre-reform - Waiting times for highest priority patients were unaffected by reforms • In both countries, patients with lowest priority benefited most from reforms	
Tako et al 2013(206) United Kingdom	National Health Service in England	Multidisciplinary obesity centre providing non-surgical and surgical services to same patient population within Academic Health Science Centre • Bariatric surgery	Number of referrals received was rapidly growing, increasing pressure on the Centre to meet demand and achieve the 18 week target from referral to treatment set by the UK government	To examine the effect of alternative resource configurations on patient wait times to inform prioritization of planned investments in new capacity	• Discrete event simulation (Simul8 software) • Constructed a series of models that explored increasing capacity to meet demand or managing demand through a reduction in referral rates • Incorporated care pathway that included all non-surgical and surgical treatment options • Simulations based on one year with time unit of one day • Obesity care team determined six feasible scenarios to be represented in models – involved varying number of physicians and number of surgeons, and reducing referrals to half of baseline figures	• Capacity modeled as available patient appointments/slots • No patient attends two clinics in one day • Capacity relevant to study related to the number of physicians and surgeons and infrastructure components • Repeat outpatient appointments for follow-up after treatment excluded • Surgery allocation based on first in first out rule	• Clinic records of patients seen at the Centre • Administrative data collected by the Centre • Expert opinion (waiting time between clinics)	• Increasing capacity of pharmacotherapy clinics by adding one physician reduced waiting times for pharmacotherapy treatment but increased waiting times for surgery • Increasing surgical capacity by adding two surgeons reduced the proportion of patients waiting longer than 18 weeks to 8% • Reducing referrals to only patients with sleep apnea, diabetes, high cardiovascular risk or infertility reduced the proportion of patients waiting more than 18 weeks to 0 by the last month of the first year	• Based on the findings, the Trust decided to: 1) Add more surgeons, rather than physicians, alone 2) Change the eligibility criteria for surgery 3) Build a new operating theatre

Table S21. Operations research/ resource planning tools

Authors, year, country	Jurisdiction	Healthcare setting and types of elective surgeries addressed	Problem/issue addressed through simulation modeling	Purpose of modeling	Model type/ method	Main assumptions of the model	Information sources/inputs into the model	Findings	Implementation of findings/ impact
					• Models considered the following performance indicators: 1) Waiting list size for introductory group session 2) Waiting list size for pharmacotherapy clinic 3) Waiting list size for surgery 4) Waiting time to surgery 5) Proportion of patients waiting more than 18 weeks from referral to treatment				

Table S22. Organization incentives

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
Pay-for-performance (financial)					
Norway(207, 208)	National pilot (2014)	Various	Not reported	• Introduced in 2014 as a pilot project and represented only 0.5% of the budget (NOK 500 million) • The system used a point system of up to 100,000 and each Health Authority was rewarded with points based on a set of quality indicators and performance criteria • Indicators and performance criteria included: five-year survival for specific types of cancer; 30-day survival after hospital admission; waiting time violations; treatment of cancer performed within the wait time targets (from referral to surgery); and patient satisfaction • Payment was redistributed between Health Authorities depending on their performance levels and improvement relative to the other Health Authorities	Not reported
Sweden (162)	National (2008-2011)	Various	To reduce wait time for elective surgery	• An economic incentive was introduced in 2008 • Money was given to counties that reached the wait time targets: wait times 1 and 2	*Grey literature:* • The number of patients waiting more than 90 days to see a specialist declined during this period • The number of patients waiting more than 90 days to receive treatment also declined during this period
Non-financial					
United Kingdom – England(169)	National (2000)	Various	To reduce wait times for elective surgery	• As part of National-level wait time guarantees, the Government introduced incentives and sanctions • Waiting times from referral to inpatient admission, with a limited set of other key targets and a 'balanced score card' of a wider set of indicators, were used to calculate an annual star rating (which ranged from zero to three) for each NHS hospital • These were published and used as a basis for direct sanctions and rewards • The sanctions were the dismissal of key managers of hospitals for poor performance against these targets and the rewards were the granting of greater autonomy (the freedom to keep certain surpluses and less central control) for hospital managers who performed well	*Peer reviewed literature:* • One retrospective study based on census and hospital data compared wait time reductions after 2001 between England and Scotland • The study reported that the proportion of patients waiting longer than 6 months for treatment fell by 6 to 9% points more in England than Scotland. The study also reported that the percentage of patients waiting more than 6 months for care was 14% in those with the ASC code and 28% for those patients in Scotland without the Availability Status Code • An ASC is assigned to patients who were not available or suitable for treatment

Table S22. Organization incentives

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
Negative financial incentives					
United Kingdom – England(98, 162)	National (2011)	Various	To reduce wait times for elective surgery	• A wait time guarantee was given to all patients • The guarantee covers the whole patient journey from referral to initial treatment. • By law, patients are given options of other providers (public or private) if guarantee cannot be fulfilled. • NHS also sets operational standards in which at least 90-95% of patients have to start treatment within 18 weeks of referral. • Providers are monitored on a monthly basis and breach of the operational standard will result in up to 5% reduction in revenue	*Peer reviewed literature:* Interviews with family doctors, oncologists and surgeons about the wait time targets were conducted. Overall, they were positive about the targets. However, the following concerns were raised: wait time targets take a 'one-size fits all' approach; providers are under considerable pressure; waiting time targets over-rode patients and providers choice(98).

Table S23. Post-discharge follow-up by telephone

Jurisdiction	Healthcare setting (year implemented)	Specialty area	Purpose	Description	Impact
Canada- Alberta (interview)	Clinic (Not reported)	Various	Not reported	• Some surgeons' offices have followed-up with patients by phone; however, this is not standard across the province	Not reported
Ireland(209)	Hospital (2010)	Various	To reduce unnecessary outpatient follow up and increase surgical consultation slots of new referrals	• In a pilot study, patients were sent a standardized "outpatient text message" at 2 weeks after their discharge from hospital enquiring their progress • Depending on the response received, the patient was either discharged back to family doctor or returned to the next scheduled outpatient clinic • Phone used for discharge was also carried by different members of the surgical team • Patients had access to the phone number for medical queries should they wish to contact their surgical team directly	*Peer reviewed literature:* • Pilot study of 55 patients • Before the scheduled 2-week interval had passed, 9 patients called the phone number • Of these patients, 8 were scheduled for the next outpatient clinic and 1 was asked to attend the ER for direct admission by the surgical team • 41 (74.5%) patients replied that they were well and were discharged from follow up, thus 41 visits to outpatients were avoided • 5 (9.1%) patients did not reply the text and were scheduled an outpatient clinic • 29 (52.7%) patients responded a satisfaction survey and all rated the service as either "extremely useful" or "very useful"
Ireland(210)	Hospital (2010)	Various	To reduce unnecessary outpatient follow up and increase surgical consultation slots of new referrals	• In a study at a single clinic, patients were randomized to either receive histologic results by phone or in person • Any further intervention required was arranged during the telephone follow up call	*Peer reviewed literature:* • 79 patients were randomized to clinic of whom 56 attended: - 70% were discharged to primary care - 17% were booked for surveillance endoscopy - 5% were referred to another service - 7% required general surgical follow up • 108 patients were randomized to phone follow up of whom 98 were contactable: - 90% were discharged to primary care - 5% required further clinic appointments - 5% required further surgical procedures

Table S24. Public reporting of wait times

Jurisdiction	Specialty area	Wait 1	Wait 2	Description	Wait time measures	Impact
Canada- Nova Scotia(211)	Cardiac Dental ENT General Neurosurgery Obstetrics/ gynecology Oral maxillofacial Orthopedic Plastic Thoracic Urology Vascular	Yes (referral to first appointment with surgeon)	Yes (decision to treat to completion of procedure)	• Reported by procedure, for province and by hospital and surgeon	• 50th and 90th percentile wait times	Not reported
Canada- Ontario(212)	Cardiothoracic Ophthalmology Orthopedic Oncology Pediatric	Yes (from referral to first appointment with surgeon)	Yes (decision to treat to completion of procedure)	• Reported by procedure or urgency, for the province and by hospital, city, and postal code • Data source: Wait Time Information System, which is built on point-of-care data entry	• Average wait time • % of patients treated within target time	Not reported
Denmark(156)	Cardiothoracic ENT Gastrointestinal General Obstetrics/ gynecology Oncology Oral maxillofacial Ophthalmology Neurology Plastic Respiratory Urology	Yes ("wait for examination")	Yes ("wait for treatment")	• Reported by procedure and hospital • Overall patient satisfaction also reported	Not reported	*Grey literature:** • In Denmark, only 5% of the patients exercised their right to choose their provider • Aggregate mean waiting time increased before it decreased *Note: impact based on implementation alongside other approaches (i.e. patient choice of surgeon)
Netherlands(213, 214)	Not reported	Yes	Yes	• Since 2009, the Dutch Healthcare Authority requires hospitals and freestanding clinics to publish monthly consumer information about waiting times in weeks (rounded off upwards, implying a minimum waiting time of one week) for a specified list of medical specialties and treatments using the following definitions:	Not reported	*Peer reviewed literature:** • Despite the availability of public information about waiting times and health insurers' mediation services, for several procedures waiting times 2 substantially vary across hospitals *Grey literature:** • For 50% of the hospitals and specialists the interest for waiting times, urged them to take extra measures on organization, efficiency and consultation

Table S24. Public reporting of wait times

Jurisdiction	Specialty area	Wait 1	Wait 2	Description	Wait time measures	Impact
				• Waiting time out-patient clinic – The number of weeks between the moment the patient makes an appointment with an out-patient clinic and the third opportunity he/she can visit the out-patient clinic according to the clinic's appointment registry • Waiting time hospital treatment (day-case and inpatient admission) – The number of weeks between the moment the patient is indicated for treatment by a physician (in the out-patient clinic) and the third opportunity he/she can be admitted to, or treated in, the hospital according to the hospital's appointment registry. In case of multiple treatments, the waiting time for the most common treatment has to be provided		• 60% of patients chose to stay at their own hospital, even though wait time was longer; 40% chose to go to a different hospital if the wait time at the other hospital was shorter • During the experiments, the number of people on the waiting list dropped by 10% *Note: impact based on implementation alongside other approaches (i.e. patient choice of surgeon)
New Zealand(215)	Various	Yes	Yes	• Eight key performance indicators are measured and publicly reported monthly • Reported by district health board (DHB)	• DHB services that appropriately acknowledge and process patient referrals within required timeframe • Patients waiting longer than the required timeframe for their first specialist assessment • Patients waiting without a commitment to treatment whose priorities are higher than the actual treatment threshold • Patients given a commitment to treatment but not treated within the required timeframe • Patients in active review who have not received a clinical assessment within the last six months • The proportion of patients treated who were prioritised using nationally recognised processes or tools	Not reported
United Kingdom(216)	Various	Yes	Yes	• Patients book appointments through the NHS e-Referral services,	Not reported	Not reported

Table S24. Public reporting of wait times

Jurisdiction	Specialty area	Wait 1	Wait 2	Description	Wait time measures	Impact
				which provides that average waiting times by hospital/clinic for the specialty or service the procedure sits under as a whole (e.g. orthopedic)		

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