

Review 1 – Referral management for surgical patients

Table 1.1: Summary of characteristics of included articles with the overall risk of bias evaluation

Study	Country	Research method	Elective surgery	Objectives	Research setting	Research period, and intervention and results	Conclusions & recommendations	Risk of Bias*
Damani (2019)	Canada	Quasi-experimental approach with pre-post cohort design	Total knee/hip replacement (TKR) surgery	Evaluate waiting time variations among surgeons, proportion of patients receiving surgery within benchmark, Influence across five dimensions of quality of care based on system-level and patient-centred outcomes.	Provincial health authority	Data were collected both before (June 2011-June 2012) and after implementation (September 3013-September 2014). Improve patient access to surgery by distributing referrals to the surgeon with shortest waiting time (next- available surgeon) and increase the proportion of patients treated within benchmark.	Intervention helped to improve accessibility by reducing waiting time variability among surgeons, all waiting times for TKR and increasing proportion of TKR within benchmark (5.9%).	ROBINS-I Moderate
Gabbay (2019)	Israel	Quasi experimental approach with historical prospective study	Cataract surgery	Evaluate the efficiency of referral triage system which schedules most cataract patients to surgery based on referral letters.	A Tertiary referral hospital	Evaluated the performance of the new referral triage system (2015, 12 months) by studying the reason for day-of surgery cancelations against retrospective system.	The preoperative triage using referral letters for scheduling surgery, thus minimizing both patient and physician time prior to surgery and direct referral could shorten both costs and time to surgery.	ROBINS-I Moderate

Coyle (2018)	Canada	prospective, blinded, randomized controlled study	Neurosurgery; Elective Lumbar Spinal Surgery	To evaluate whether a self- administered 3- item questionnaire (3IQ) could reprioritize referral appointments and reduce wait times.	Canadian academic tertiary care centre	280 patients included within 24 months. Randomly assigned to surgeon triaged and patient triaged two groups, assessed for re- prioritisation status and the waiting time.	Reduced the waiting time of intervention group and to identify non-surgical candidates for appropriate managements. Demonstrated the benefit of patient- reported assessments in prioritisation.	ROBINS-I Low
Do (2018)	Australia	Cross- sectional study with longitudinal follow-up	Cataract surgery	To determine the content and diagnostic accuracy of cataract referral letters and assessed whether referral information had sufficient detail to inform surgical prioritization.	Two metropolitan public hospitals	A review of referral letters and hospital medical records was undertaken for a total of 400 (2014). Reviewed same after 1 year. Current referral letters do not have sufficient detail to inform prioritization, and any efforts to prioritize waiting lists will require standardization of cataract referrals.	Development of standard referral templates and resources to triage referrals may improve access to surgical services in a timely manner.	ROBINS-I Moderate
Loginov (2018)	USA	Observational study	Elective surgery	To examine patient perspectives on surgical case scheduling, referral and wait time.	Mayo Clinic	135 respondents completed the survey (2011-2016). The survey had three attributes; patient desired maximum waiting time, choice of date and option to change the surgeon.	Positive association between the maximum waiting times sufficient to discuss having another surgeon perform the procedure.	CASP Moderate

Diamant (2015)	Canada	Retrospective study	Bariatric surgery	To examine the impact of patient and operational factors on wait times in a multidisciplinary bariatric surgery program.	Toronto Western Hospital	1664 referred patients included for the survey (June 2008-July 2011). Waiting time associations screened for the 724 who underwent surgery. Specific patient profiles and longer waiting are associated. Waiting time did not depend on BMI, age, sex and distance, but substance use was associated with longer preoperative evaluation.	Certain types of patients (long optimisation) should be identified early in the referral process.	ROBINS-I Moderate
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**Risk of bias in intervention studies were assessed using the ROBINS-I tool and the observational study was assessed with the relevant CASP checklist. Overall quality measurement was reported considering all risk of bias domains for the study.*

Table 1.2: Study characteristics of the three systematic reviews

Study	Objectives of the systematic review	Search criteria			No of eligible articles and study designs*			Countries of included articles	Conclusions (%) & recommendations
		Data sources	Search date and search period	Languages	RI	NRI	OB		
Bachelet (2019)	Scoping review to identify and describe the interventions that have been implemented to reduce waiting times for major	MEDLINE/PubMed, EMBASE, Cochrane Library, SciELO, DARE-HTA, and Google Scholar	All articles up to 2017 were	Only English and Spanish	1	6	5	Canada, Costa Rica, UK, Spain,	All the studies had methodological limitations. According to the evidence found for this review, interventions most likely should be multidimensional, with prioritization strategies on the waiting

	elective surgery and to synthesize the best available evidence on the effectiveness of some interventions that were prioritized by our ministerial counterpart.		searched in December 2017						Nordic countries	lists to incorporate equity criteria, together with quality management improvements of the surgical pathways and the use of operating rooms, as well as improvements in the planning of the surgical schedule.
Damani (2017)	To review and summarise existing research evidence on the scope, use and implementation of SEMs for elective surgical services, specifically with respect to the influence of SEMs on patient flow and waiting times for elective procedures in adults and acceptability of SEMs to patients and providers (general practitioners (GPs) and surgeons).	MEDLINE, EMBASE, CINAHL, the Cochrane Database for Systematic Reviews, CENTRAL (Cochrane Central Registry of Controlled Trials) and Abstract Business Information (ABI)/Inform	All articles up to July 2016 was searched in June 2016	No restrictions	0	5	6		Canada, UK, Australia	This review demonstrates a potential ability for SEMs to improve timeliness and patient-centeredness of elective services; however, the small number of low quality studies available does not support firm conclusions about the effectiveness of SEMs to improve access.
Ballini (2015)	To assess the effectiveness of interventions aimed at reducing waiting times for elective care, both diagnostic and therapeutic.	Cochrane, MEDLINE, EMBASE, CINAHL, ABI Inform, the Canadian Research Index, The Science, Social Sciences and Humanities Citation Indexes, Pro quest, Trial Registries, Grey literature	All up to 2013	No restriction	3	5	0		Not reported	As only a handful of low-quality studies are presently available, it was unable to draw any firm conclusions about the effectiveness of the evaluated interventions in reducing waiting times. However, interventions involving the provision of more accessible services (open access or direct booking/referral) show some promise.

*RI: Randomised Controlled Interventions, NRI: Non Randomised Controlled Interventions, OB: Observational studies

Review 2 – Patient prioritisation in waiting lists

Table 1.3: Summary of study characteristics of included articles with the overall risk of bias evaluation

Study (1 st author and year)	Country	Research method	Elective surgery	Objectives	Research setting	Research period, intervention and results	Conclusions & recommendations	Overall quality*
Laberge (2019)	Canada	Observational study	Orthopaedics - Elective Joint replacement (TJR) surgery	To estimate the effect of delays /wait time for surgery and to identify factors contributing to more efficient operations and challenges to their implementation.	Health system	2014-2015. key factors identified through interviews and observations within the current hospital budget constraints, to improve efficiency and improve timely access for TJR surgery.	Identified many factors; Patient prioritization, Standardization of prosthesis, centralized and pooled resources, teamwork, patient preferences, Post- operation and discharge resources, Information management.	CASP Moderate
Casimiro- Pérez (2018)	Spain	Observational Study	Bariatric Surgery	To establish a prioritization system in morbid obese patients with a higher degree of severity, to reduce morbimortality as a result of protracted WT.	Health system	Developed an Obesity Surgery Score (OSS) with 3 main variables; BMI, obesity-related comorbidity and socio- labour impact.	Retrospective analysis confirmed that the OSS scoring system allows prioritization of patients at greater risk, improves patient prognosis, and optimizes costs and available health resources.	CASP Low

Hunter (2018)	New Zealand	Comparative study (QE)	General Surgery	Pilots the General Surgery Prioritization Tool (GSPT) and compares it to the existing triage system of clinical judgement.	Hospital	Tested the GSPT (surgeon and patient derived criteria) with 392 non-cancer patients and 18 general surgeons in July 2015-Feb 2016.	These results have shown that the GSPT reflects clinical judgement. It was not biased by patient age, gender, and ethnicity or by the prioritizing surgeon.	ROBINS-I Moderate
Nganga (2018)	Australia	Retrospective cohort study	Orthopaedics - Total Joint Replacement surgery	To evaluate the Multi-Attribute Prioritisation Tool (MAPT) as a prioritisation tool for TJR.	Hospital	MAPT was designed and to aid in the construction of a systematic waiting list based on urgency. June 2008–March 2009 308 patents (114=total hip, 194=total knee).	There was a strong relationship between high priority patient improvement after surgery and the waiting time of patients. If high priority patients who waits for extended periods would more likely to show less pre-operative improvements.	ROBINS-I Moderate
Selvaggi (2017)	Sweden	Review	Plastic Surgery	To discuss moral principles that can be used as a guide for health professionals to revise and create policies for plastic surgery patients.	Health system	Discuss in detail on patient-cantered operating system and patient's informed preferences which might be implemented in the process of prioritizing health.	A specific anatomical feature is not always an indicator of patient's well-being, good policies should identify the worst-off, and those who can mostly benefit from surgery such as a patient-centred operating system, and patient's informed preferences.	CASP Moderate

Tuulonen (2016)	Finland	Interrupted time series	Eye surgery	To improve access to care and improved productivity of eye care	Hospital	Revised operational concepts and new facilities together with a 15% increase in work contribution led to a 46% increase in overall productivity the clearance of delayed services.	Identification of high-volume patient groups, priority setting, Standardization, efficient care protocols, Shared care are effective.	ROBINS-I Serious
Gangstøe (2016)	Norway	Retrospective descriptive study	Neurosurgery	To study variation in priority status and waiting times across different medical disciplines for elective patients.	Health System	Data extracted from Norwegian Patient Register (NPR) on elective referrals to 41 hospitals in 2010. Variations in prioritization practice/registration practices were found across different medical specialties.	Introduction of maximum waiting times may have contributed to push the actual waiting time towards the maximum assigned waiting time.	CASP Moderate
Gunaratnam (2016)	Canada	Qualitative study	Neurosurgery	To examine neurosurgical patients views on the prioritization of patients for OT.	Hospital	Semi-structured open-ended interviews were completed from 37 patients up to data saturation.	The participants were in favour of having a prioritization list based on fairness and good reasons.	CASP Low
Sutherland (2016)	Canada	Prospective cross-sectional study	Elective surgery	To understand the health status of patients, potential gaps, how different patients are affected and	Health System	Data 2012-2016. The high rates of pain and depression not only have implications for patients' immediate health, but may also	Policy options include re-examining the surgical triage system and expanding surgical capacity to match self-reported health.	CASP Low

				provide insight into policies for refining surgical wait time policies.		affect long-term surgical outcomes.		
Chan (2016)	New Zealand	Cohort study	Orthopaedic surgery	To determine whether the Impact of Life (IOL) patient rated questionnaire is a reliable and valid prioritisation tool.	Hospital	5 month in 2013; Semi-structured open-ended interviews completed by 146 patients and 14 surgeons.	IOL as a valid and reliable method of assessing patient-rated quality of life and recommend its use in the Orthopaedic Clinical Priority Assessment Criteria score.	ROBINS-I Moderate
Gutacker (2016)	UK	Descriptive study	Orthopaedic hip and knee replacement surgery	How patients are actually prioritised in hip and knee replacement?	Health System	Paper based questionnaire before and after 6 months for the surgery (2009 - 2014). Estimated the severity gradient in waiting time.	English NHS has not formal national prioritisation policy for replacement surgery. Prioritisation is more pronounced in long-wait hospitals.	CASP Low
Tebé (2015)	Spain	Retrospective evaluative study	Primary knee arthroplasty (PKA)	To evaluate the use and impact of the application of prioritization systems on waiting lists for PKA	Health System	A description of patients (2003-2009) on waiting lists was made and the association between priority scoring and waiting time and the order of operation analysed.	The study concludes that although the fulfilment of the priority system is significant, its impact on the order of operations performed is not, which does not seem to differ from a FIFO system.	ROBINS-I Moderate

Gill (2014)	Canada	Observation study	Bariatric surgery	To examine patients' perspectives regarding prioritization for surgery and willingness to pay for faster access.	Health system	99 respondents (2010-2011) to questionnaire with hypothetical priority list.	Most patients waiting for bariatric surgery consider greater clinical severity and functional impairments related to obesity to be important prioritization indicators and disagreed with paying for faster access.	CASP Critical
Johar (2014)	Australia	Interrupted time series	Elective surgery	To study how the introduction of an explicit prioritization guideline affected the prioritization behaviour of doctors.	Health system	This study exploits a policy change created by the publication of Advice for Referring & Treating Doctors - Managing Elective Patients/Waiting Lists (2004 to 2010).	The presence of a simple clinical priority guideline at the procedural level has not produced systematic, clinically based prioritization behaviours among doctors.	ROBINS-I Serious
Ng (2014)	Sweden	Interrupted time series	Cataract surgery	To evaluate waiting times for first-eye cataract surgery following adoption of NIKE tool for prioritizing patients.	Health system	NIKE indication classification model was developed as a tool to prioritize patients for cataract surgery using patient-reported disabilities in addition to visual acuity (2009-2011).	NIKE reduces waiting times for those with the greatest need.	ROBINS-I Moderate
Rahimi (2018)	NA	Systematic review	Elective procedure	To assess the prioritization of elective surgical patients that would consider the prioritization of individual	NA	OVID MEDLINE, EMBASE, and Web of Science databases were searched (2017) for studies evaluating developed and/or used tools for prioritization of surgical patients. No	1 article included. Develop suitable tools for prioritization of individual surgeons' patients is recommended. Prioritization tools needs to be consistent with the payment system of fee for service payments.	AMSTAR 2 Low

				surgeons' patients		restriction was placed on publication date or language.		
Bachlete (2019)	NA	Systematic review	Elective surgery	To identify and describe the interventions that have been implemented to reduce waiting times for major elective surgery.	NA	MEDLINE/PubMed, Embase, Cochrane Library, SciELO, DARE- HTA, and Google Scholar were searched.	12 were included. Interventions most likely should be multidimensional; Prioritization strategies to incorporate equity criteria, quality management improvements of the surgical pathways, improvements in the planning of the surgical schedule.	AMSTAR 2 Moderate

*Overall ROBINS-I stated as indicated in the tool and overall assessment for CASP tool was reported considering the answers to the checklist.

Review 3: Preventing scheduled surgery cancellations

Table 4.13: Summary of study characteristics of included articles with the overall risk of bias evaluation

Study	Country	Research method	Elective surgery	Objectives	Research setting	Results and observations	Conclusions &	Recommended strategies and interventions	Risk of Bias*
Wood (2019)	Australia	prospective observational cohort study	Elective surgery/ Urology	Evaluates the reasons for elective urology theatre cancellations within 24 hours and potential strategies to minimize such cancellations.	Queensland Health ORMIS database	12 month (October 2012 and September 2013) Total of 2245 elective bookings and 633 surgeries cancelled. 152 were within 24 hours (6.77%). 57.23% were considered potentially avoidable, and only 42.76% were considered unavoidable.	The 3 most common potentially avoidable reasons; No OT Time, (2) Patient Medically Unfit, patient Inadequately Prepared.	Proper preoperative planning	CASP Moderate
Talalwah, (2019)	NA	Systematic review	Elective surgery	To analyse cancellations of surgeries and identify evidence based interventions to address this issue.	NA	CINAHL, PubMed, Embase and Cochrane are searched from January 2011 to January 2016. Twenty-three studies were identified. Causes of cancellations were classified into three categories: hospital-related, patient-related, and surgeon-related.	Prioritizing emergency cases was identified as the cause for cancellation in 9%. Evidence confirmed most cancellations were avoidable.	Preoperative Telephone Confirmation, separating emergency from elective cases, preoperative nurse for communication s.	CASP-Moderate
Talalwah (2019)	Saudi Arabia	Pre-post intervention study	Elective surgery	To analyse the cancellation of elective surgeries and identify the best evidence-based interventions.	Tertiary hospital	Quality improvement project from 2016-2017. Conducting a preoperative call 2 days before surgery and doing a weekly review of the surgery schedule reduced cancellations from 3.8% to 3.5%. Patient-related	Understanding the causes of cancellations is important to devise an effective intervention to address this issue.	Pre-operative call and weekly review of the surgery schedule.	ROBINS-I Critical

Antoniou (2019)	UK	Pre-post study with intervention	General surgery	Waiting times across OECD countries and explores trends and health policies aimed at reducing waiting times in the last decade.	District General Hospital	Cancellations reduced from 81% to 79.7% and hospital-related reasons reduced from 17.5% to 15.9%. Retrospective data for 3 months and created a reserved waiting list, fast track pre-anaesthetic assessments and appointed a waiting list coordinator (2018). An average of 11.5 hours efficiently reallocated per month, or a 42.6% improvement. This reduction in inefficiency led to reallocation of OT hours, to the annual value of £345000.	Reserved surgical waiting list reduced the idling OT time.	Simple protocol changes can lead to large improvements in the efficient running of theatres.	ROBINS-I Moderate
Appau (2019)	Oman	Retrospective observational study	Elective surgery	To report the rate and reasons for surgical cancellations and no-shows in a large regional hospital in Oman.	regional hospital	26% elective procedures were cancelled (2014). Patient no-shows were the most prevalent (63%), followed by surgical reasons (17%), OT-associated reasons were responsible for only 2% of cancellations.	Regular audits, quality management projects and the appointment of a dedicated booking coordinator may enhance proper utilisation of the OT.	Regular audits, quality management projects, booking coordinator	CASP Moderate
Asmal (2019)	South Africa	Prospective audit	Day surgery	To measure operating OT utilisation and the rate of day-of-surgery cancellations	Durban regional hospital	Evaluated theatre elective lists and shared emergency lists in February –April 2018. Late first-case starts, prolonged changeover time, anaesthetic time, OT utilisation time and number of elective cases cancelled on the day of surgery were measured.	Operating theatre utilisation was suboptimal when compared with the international benchmark of 70 – 80%. It was determined that 62/136 (46%) were avoidable.	Institutionally based performance benchmarks, regular monitoring of OT efficiency data (electronic recording systems).	CASP- Low

Bhuiyan (2019)	South Africa	Prospective descriptive study	General surgery	To determine the rate and reasons for cancellations, estimate the cost incurred by such cancellations and recommend possible solutions.	Pietersburg (PTB) Hospital	1-year period (2014) 44.5% of elective operations were cancelled, 64.4% due to an emergency operation. theatre equipment failure and lack of consumables n=17 (7.1%), non-theatre equipment failure n=10 (4.2%), prolonged time of operations n=13 (5.4%) etc.	The cost incurred due to cancellations was about ZAR 6 million for the hospital, with additional cost and emotional trauma for the patients.	OT dedicated to emergencies.	CASP-Low
Caesar (2019)	Sweden	Retrospective observational study	Orthopaedic surgery	To evaluate the reasons for cancellations in elective orthopaedic surgery.	University hospital Surgeries	From 2007 to 2011, 17,625 patients scheduled for elective surgery, 6,911 (39%) had their procedure cancelled at least once. A quantity of 4,008 (58%) had their procedure cancelled once, 1,935 (28%) twice, 622 (9%) three times, 208 (3%) four times and 138 (2%) more than four times.	Common reason is prioritised emergencies. An overloaded surgical schedule might be avoided using an operating room reserved for emergency cases only.	Person dedicated to update lists, Dedicated emergency OT	CASP Low
Cho (2019)	Korea	Retrospective observational	Elective surgery	To investigate the factors related to surgery cancellation and the reasons for the same.	University hospital in Korea	Among the cancelled 4834 cases, the surgery cancellation rate for the reasons of patients was 93.2% and the surgery cancellation rate for the reasons of a hospital was 6.8% (2007-2016).	Continuous monitoring of cancellation rates and quality control systems to accurately analyse the reasons for cancellations and address cancellation rates are necessary.	Continuous monitoring of cancellation rates and quality control systems, pre-operative Reminder Call system, detailed operating room management systems.	CASP Moderate
Tan (2019)	Singapore	Retrospective cohort study	Elective surgery	To identify factors associated with cancellation within 24 h of scheduled	Ambulatory Surgical Centre	June 2015 - December 2016 Of total 4060 scheduled surgeries 398 (9.8%) were cancelled. Cancellation within 24 h of surgery was associated with	Attendance at preoperative anaesthesia assessment clinic was associated with	Dedicated perioperative anaesthesia clinic.	CASP Moderate

				surgeries in a tertiary hospital		history of heart failure, advanced chronic kidney disease, or a history of hip fracture, low socio-economic status, history of ≥ 4 cancelled surgeries in the past 3 years, and scheduled time in the afternoon and evening, compared to the morning.	reduced likelihood of cancellation.			
Cohen-Yatziv (2019)	Israel	Prospective descriptive study	Elective surgery (ambulatory)	To assess and characterize the no-show events in ambulatory clinics and the non-utilised appointments.	Jerusalem-based Shaare Zedek Medical	August 2016 and January 2017; patient health issues, patient surgery postponement and surgery schedule overload (together accounting for 52% of cases and 72% of known reasons).	Improving the hospital's information and computing systems in order to identify patients who are susceptible to a no-show incident.	Appointment management systems, Identify no-show patients.	CASP Low	
Lorenzo-Pinto (2019)	Spain	Observational, retrospective study	Electives surgery	To calculate the rate of cancellation of elective surgical procedures due to inadequate management of chronic medications.	Hospital	Of 5415, 793 (14.6%) were cancelled; July-October 2017 (90.7% suspensions and 9.3% reassignments). Lack of resources (44.0%), patient's decision to refuse surgery (23.5%) and an acute disease (13.4%)- July and October 2017,	Inadequate management of chronic medications are not the most frequent cause but one of the easiest to avoid antiplatelet drugs.	Management of chronic medications is important.	CASP low	
Solak (2019)	Bosnia and Herzegovina	Retrospective review	Elective surgery	To determine the percentage and reasons for cancelling elective procedures and provide adequate measure to reduce and to identify ways to improve the	Major referral hospital in the city of Sarajevo	The Out of the 8201 planned elective cases (3893 in male patients and 4308 in female patients), 7825 were performed, whereas 376 (4.58%) elective cases were cancelled on the day of the surgery.	The most common reason was "lack of time to perform surgery", 33.51% out of the total number of cancelled cases.	Proper preoperative patient assessment	CASP Low	

patients' satisfaction level.									
Sweetman (2019)	UK	prospective study	Urology surgery	To determine the last-minute cancellation rates in a tertiary urology department, to analyse the reasons driving cancellations, and to implement targeted solutions.	Royal Surrey Hospital	Reasons were categorised as 'hospital', 'clinical' or 'patient'. Their top reasons for cancellation were 'patient related' (patient did not attend on the day of surgery, patient declined surgery on the day, patient found the appointment inconvenient last-minute) and 'change in medical condition'. Facility characteristics-related issues such as availability of OT time and scheduling do associate with whether or not patients cancelled same-day surgery cases (2014 January to December). Some highly specialized clinical procedures being more susceptible to the day of surgery cancellations compared to general procedures.	The patients failed to attend (22%) causes for highest cancellation.	Reminder telephone call covering admission instructions and improved identification of UTIs.	ROBINS I Moderate
Da'ar (2018)	Saudi Arabia	Retrospective cross-sectional study	Electives surgery	To examine the association between the frequency of same-day surgery cancelation and covariates including patient demographics, time-related variables, healthcare provider reason for cancelation, and clinical procedures.	King Fahad National Guard Hospital	462 patients were scheduled for elective surgical operations (March 1–20, 2018). Among those, nearly almost one-third 146 (31.6%) of the operations were cancelled.	Hospital facilities need to incorporate patient preferences, reduce waiting time by regularly reviewing their staffing policies, workflows, and shift system.	Hospital facilities need to incorporate patient preferences, regularly reviewing their staffing policies, workflows, and shift system.	CASP Low
Desta (2018)	Ethiopia	Prospective Hospital-based cross-sectional study	Elective surgery	To assess incidence and reasons of cancellations of elective operation on the intended day of surgery.	Hawassa university comprehensive specialized hospital	Improper scheduling, lack of equipment, deficiency in pre-op assessments and communication gaps were mainly contributed for the cancellation.	Proper preoperative assessment, proper scheduling, necessary OT equipment's and, early		CASP Moderate

Yu (2017)	China	retrospective review	Elective surgery	The effect of contributing factors and recommended hospital interventions to facilitate case cancellation.	Tertiary care referral hospital	They identified and compared the preventable and unpreventable cancellations to find the preventive measures. The overall CR was 17.5%, representing 1984 cancelled cases out of 11,331 scheduled surgeries.	Well-designed preoperative diagnostic assessment process to reduce cancellations caused by assessment related issues and information sharing among the related staffs.	communication with OT team. Well-designed preoperative diagnostic assessment process, effective coordination and good communication.	CASP Low
Hadeed (2019)	USA	Retrospective review	Orthopaedic surgery	Comprehensively evaluate cancellations to define actionable ways to improve efficiency, with the goal to develop evidence-based, transparent rescheduling policies.	University Hospital	There were 7,215 elective surgeries, 13% of which were cancelled prior to surgery. Forty-four percent of surgeries were cancelled within 3 days of the surgery. Of those that were cancelled, 53% were rescheduled, 21% of which had cancelled again, which was significantly higher than the comparison group of first-time cancellations.	When scheduling, it is more efficient to preference surgeries that have not been previously cancelled, and among previously cancelled surgeries to preference those with a correctable reason for cancellation.	Evidence base for rescheduling policies.	CASP low
Rajaguru (2019)	Tanzania	Retrospective review	General, gynaecology and orthopaedics	To evaluate the operations and financing of the main OT at a tertiary referral hospital in Sub-Saharan Africa.	Tertiary referral hospital in Sub-Saharan Africa	2018 (12 months), 3817 total procedures, with elective procedures (2385) outnumbering emergency procedures (1432). We observed inefficiencies that can be addressed to reduce case cancellations and improve capacity for the benefit of patients accessing surgical care.	There are significant barriers to accessing care in this region, orthopaedic theatre overflow, a high cancellation rate, inefficient workflow, and the inability for patients to pay for services.		CASP Low

Huynh (2019)	France	Pre-post method	Orthopaedic surgery	To evaluate the notification of the risk of supply shortage for instrumentation, To determine whether it could reduce by at least half operating room disruptions such as delays or surgery cancellation.	University Hospital	2015-2017 The main outcome was the number of notifications of potential supply shortage with and without JIT over a 10-week period.	JIT approach (instrumentation management tool and working group) is effective at preventing instrumentation supply shortages.	The implementation of instrumentation management tool, or a just-in-time approach.	ROBINS I Moderate
Naik (2018)	India	Quality management interventions	Elective surgery	To achieve a high level of utilization in the OT, it is necessary to efficiently coordinate number of activities and personnel.	Tertiary Care Rural Hospital	(2 months study) Lack of operating room time in 62.22%, medical reasons of the patient (14.44%). The most common reason was patient getting shifted late from the ward, followed by administrative causes, medical condition of the patient, and operating surgeon reporting late.	Cancellations were avoidable with proper preoperative planning and optimization of patients and resources and good communication between surgeon anaesthesiologists and the nursing staff.	Proper preoperative planning and optimization, Improve communication.	CASP Low
Wong (2018)	UK	Prospective cohort study	Elective surgery	This study describes the incidence and reasons for cancellation of inpatient surgery in the UK NHS.	245 NHS hospitals.	In 7 consecutive days in March 2017, 10% of patients attending hospital for planned inpatient surgery had previously experienced at least one cancellation for the same procedure. Previous cancellations were attributed to non-clinical factors such as capacity or other hospital factors, and ~30% were attributable to clinical reasons.	Association between treatments in a hospital with an emergency department increased the risk of cancellation.	The structural reconfiguration to separate elective and emergency care and seasonal planning of resources will be effective.	CASP Moderate

Herron (2018)	UK	Pre-post method with a trial intervention	Elective surgery	Extended operating hours to introduce efficiency to the surgical care group by reducing 'on the day' cancellations	3 clinical care groups (CCGs)	Streamlining of pre-assessment pathways resulted in less need for cancellation on the day of surgery (2015).	Extended operating periods increased productivity on average from 2.8 patients per session to 3.2 patients per session, leading to savings of just over £2.4 million per fiscal year.	Extended operating times in OT increased productivity.	ROBINS I Moderate
Santos (2017)	Brazil	Descriptive and retrospective study	Elective surgeries	What are the clinical and non-clinical reasons that contribute to the cancellation of elective surgeries in a Public Hospital	Public Hospital	Out of the 8,443 6.79% were cancelled. Out of these 573 48.33% were cancelled for clinical reasons and 46.40% were for non-clinical reasons.	Possible to reduce it from 6.79% to 1.36%, considering that 80% of the reasons for cancellation are avoidable.	Understand the experience of the actors involved in the cancelled elective surgery is important.	CASP Low
Abeeleh (2017)	Jordan	Retrospective study	Elective surgery	To report rates, reasons for operation cancellation, and to prioritize areas of improvement.	Jordan University Hospital	From 2012- 2016, assigned into 3 groups: patient no-shows, patient related, and hospital related reasons. A Pareto analysis showed that around 80% due to a lack of OT time (30%), incomplete preoperative assessment (21%), upper respiratory tract infection (19%), and high blood pressure (13%).	Patient no-shows accounted for 62.52% of cancellations.	Institution specific interventions to prevent patient-no-show.	CASP-Moderate
Prin (2017)	Malawi	Retrospective review	Elective surgery	To evaluate the proportion of elective surgery that is cancelled and the associated reasons for cancellations.	Tertiary hospital in Malawi.	Of 10,730 scheduled surgeries scheduled in 2011- 2015, 4740 (44.2%) were cancelled.	Infrastructural limitations (84.8%). Provider limitations accounted for 16.5%, Preoperative medical conditions contributed to 26.3% of cancellations.	Investment in medical infrastructure and staff retention.	CASP Low

Lonkoande (2016)	Belgium	Prospective study	Elective surgery	To assess the incidence of elective surgery cancellation in order to make proposals for healthcare improvement.	Teaching hospital	Hospital-related cancellation accounted for 63.9%. Cancellation was avoidable in 68.5% of cases. A financial cause was relevant for 16.6% (n = 6) and 2.6% of cancellations were due to a 'long preceding intervention'.	The impact of cancellation is high.	Improve organisation and communication.	CASP	Low
Kaddoum (2016)	Lebanon	Prospective audit	Elective surgery	To establish the rate of elective surgical cases cancellations on the day of surgery (DOS) and the reasons (stratified by avoidable versus unavoidable) as well as recommend appropriate solutions.	Tertiary care hospital in Lebanon	January 1, 2013-August 30, 2013; 5929 elective surgeries were performed, of which 261 cases (4.4 %) were cancelled on the day of surgery. 187 cases (or 71.6 %) were judged as potentially avoidable cancellations versus 74 (28.4 %) that were judged as unavoidable.	Financial clearance, Incomplete medical evaluation, Patient did not show up, OR behind schedule.	Determining the major avoidable and developing appropriate interventions.	CASP	Low
Mei (2016)	Taiwan	Prospective audit	Elective surgery	To establishment of an effective planning system for surgery scheduling could ensure the provision of accurate surgical scheduling and the elevation of both use efficiency of OT performances.	University hospital in central and southern Taiwan.	2013-2014, The completion rate for the surgeries scheduled elevates from 93.8% to 96.5%., The time rate for the first surgery is elevated from 95.4% to 98.1%, The cancellation rate for the surgeries is lowered from 6.4% to 4.2%. The accumulated leave hours is lowered from 726 hours to 128 hours, which is the best improvement.	Effectiveness-oriented surgical scheduling can provide fast and effective aids with the help of advanced technology to elevate the performance of services and business.	Effective planning system for surgery scheduling.	ROBINS I	Critical
Mosadeghrad (2016)	Iran	Before and after study	Elective surgery	To reduce cancelled surgeries in Shahid Rajaei Hospital in Tehran using a	University Hospital	Period: April 2013 and March 2014. Using a checklist, the reasons for operations cancellation were investigated and an action plan was	The plan was implemented using the action research cycle. Period: The number of surgeries	Quality management strategy.	ROBINS-I	Critical

				quality management model.		developed. Surgeon and anaesthetist related factors, over-running of previous surgery, changes in patient clinical status and lack of intensive care unit beds were the main reasons.	increased by 4.06 percent and operations cancellation was reduced by 32.4 percent.			
Dhafar (2015)	Saudi Arabia	Retrospective cross-sectional study	Elective surgery	To find out frequency and reasons for cancellations of elective surgical cases in 25 hospitals.	25 hospitals	2013; categorized into patients' reasons, facility, work-up, anaesthesia, surgeons, miscellaneous. 42.81% rate of cancellation was patient related, 20.03% facility related, 9.45% due to improper work-up, 1.45% associated with anaesthesia, 7.19% related to surgeons, and 18.90% other/ and not recorded reasons.	Present study found 7.6% cancellation rate and three most common causes for cancellations were patients related, facility related and improper work-up.	Establish a pre-admission clinic to assess the patient and increase awareness of patient.	CASP	Low
Simon (2014)	USA	pre-test post-test evaluations	Orthopaedic surgery	A quality improvement project to develop a safe, effective, patient-centred, timely, efficient, and accurate orthopaedic scheduling process.	Large academic medical centre	February 2010 to March 2011 On line surgical scheduling, reduce cancellations to 35%-3.3%, 70% reduction in schedule changes, Pt satisfaction increased 67%-84%.	New orthopaedic scheduling process; reduced cancellations day-before and day-of-surgery, reduced procedure sequence changes, increased patient satisfaction, and eliminated the disorganized schedule.	Structured Lean problem-solving techniques.	ROBINS I	Critical
Singhal (2014)	UK	pre-test post-test evaluations	Orthopaedic surgery	To determine the impact of administering a questionnaire, by phone to elective orthopaedic	Teaching district NHS Hospital	The questionnaire was administered to elective orthopaedic patients over a nine month period (2011). Administering the questionnaire reduced the same day cancellations due to patient	The impact of the communication with the patients closer to the scheduled date of operation in reducing the rate of	Improve communication systems with patients	ROBINS I	Moderate

				patients, the week prior to surgery.		reasons from 11 out of 110 (10%) to 2 out of 118 (1.60%) (p = 0.01).	cancellation from 10% to 1.6%.		
Smith (2014)	USA	Retrospective analysis	Cardiac operations	To examine same-day cancellation, determining the cancellation rate; identifying the incidence and causes of foreseeable cancellations; and quantifying the operative delay.	Academic tertiary referral centre.	Retrospectively reviewed all same-day cancellations of cardiac operations requiring cardiopulmonary bypass from 2010 to 2012. Of 7081 cardiac operations, 134 patients experienced 142 same-day cancellations of cardiac surgery.	Comprised only a few of cancellations (2%).	Successful multidisciplinary perioperative approach to identify foreseeable causes.	CASP Low
Dell'Atti, (2014)	Italy	Prospective study	Elective surgery in urology	To analyse the number of elective surgery cancellations, identify and compare potential emotional trauma and satisfaction between older (≥ 65 years) and younger (< 65 years) patients.	Teaching department of the University of Ferrara	January 2011 to February 2013- 157 (11.6%) of these 1352 surgeries were cancelled: 79 (5.8%) cases on the day of the preoperative assessment; 17 (1.2%) cases at the time of pre-surgical anaesthetic assessment, on the day before the operation; 57 cases (4.2%) on the day of surgery and 4 (0.3%) cases directly in OT.	The most frequent reason was related to less hospital bed occupancy in 58 (37%) cases. significantly lower satisfaction in elderly patients with depression and with anxiety compared to younger patients.	The surgeon has to pay attention not only to the good success of the procedure, but also to efficient the entire process.	CASP Moderate
Dexter (2014)	USA	Retrospective audit	Elective surgery	Audit data with timestamps of the entire scheduling /rescheduling /cancellation history for each case,	21 facilities of a non-academic health system	8-13week, More than half the cancelled minutes ($54\% \pm 1\%$, $P = 0.006$) were due to cases scheduled within 1 workday prior to the day of surgery. Inpatient cancellation rates, measured in minutes, were several-fold larger than outpatient rates ($P < 0.0001$)	Improve facilities can achieve a $\leq 2\%$ cancellation rate. Very few attending a preoperative clinic and provided a virtual evaluation and by phone.	Monitor hospital systems for perioperative management,	CASP Moderate

*Overall ROBINS-I stated as indicated in the tool and overall assessment for CASP tool was reported considering the answers to the checklist.

Review 4 - Perioperative time management in the operating theatre

Table 4.17: Summary of study characteristics of included articles with the overall risk of bias evaluation

Citation	Country	Research method	Elective surgery type	Objectives	Research setting	Research period and intervention	Conclusions & recommendations	Overall Risk of Bias*
Asmal (2019)	South Africa	Prospective audit	Elective surgery (Day surgery)	To measure OT utilisation and the rate of day-of-surgery cancellations.	Durban regional hospital	Evaluated elective lists and shared emergency lists in February –April 2018. Late first-case starts, prolonged changeover time, anaesthetic time, theatre utilisation time and number of elective cases cancelled on the day of surgery were measured.	Operating theatre utilisation was suboptimal when compared with the international benchmark of 70 – 80%. It was determined that 62/136 (46%) were avoidable.	CASP - Low
Hoffman (2019)	USA	Retrospective observational study	Elective surgery	To probe the determinants of first case delays in start-time in OT.	Tertiary referral centre	Observations July 2013 to February 2018. The analysis identified day of the week, days of training, attending surgeon, and anaesthesiology resident had a trivial impact on operating room first case start-times.	This study observed seven predictor variables and their relationships with workflow efficiency as defined by scheduled first cases beginning in a timely manner. Days of anaesthesiology residency training.	CASP – Low
Haldar (2019)	India	Evaluation study	Elective surgery	To evaluate the common reasons for delay in transporting patients to the neurosurgery theatre and its consequent effects.	Theatre complex of a tertiary care teaching hospital	The evaluation phase (3 months) compared with the same in the implementation phase in 2017. Appreciation of the common reasons for delays in patient transportation; Absence of	Patient transfer reflects the working architecture of hospital administration and can improve theatre time utilization. Demonstrated the intricate interrelationship of task	ROBINS I Moderate

Naik (2018)	India	Prospective observational study	Elective surgery	To achieve a high level of utilization in the OT, it is necessary to efficiently coordinate number of activities and personnel.	1000- Bedded Tertiary Care Rural Hospital, eight OT tables	porter during changeover time, transportation lift not free, patient from paediatric ward, miscommunication regarding patients, miscellaneous. Two months observational study. The most frequent cause of cancellation of surgery was found to be lack of operating room time in 62.22%, followed by medical reasons of the patient (14.44%). The most common reason for delay in starting the operation table was patient getting shifted late from the ward, followed by administrative causes, medical condition of the patient, and operating surgeon reporting late.	force, infrastructure, communication, policies, working culture, and the training and education levels of the health-care workers and its continuous upgradation. Most of the causes of delays and cancellations of surgeries were avoidable with proper preoperative planning and optimization of patients and resources and good communication between surgeon anaesthesiologists and the nursing staff.	CASP - Low
Tiwari (2018)	USA	Intervention study	Elective surgery	To analyse a successful FCOTS (first-case on-time starts) programme to determine whether the process improved or simply started earlier.	University Medical Centre	3 year process intervention study. Improvement occurred both as a result of better process control as evident in the squeezing of the distribution with a reduction in the median time from 5 to 2 min,	The perioperative system design must recognise this matrix organisation initiatives that disrupt or alter the function of adjacent and connected processes require constant energy and supervision to initiate and sustain.	ROBINS I Low

						and the IQR from 13 to 10 min, and by patients arriving in the OR earlier (the leftward shift of the distribution median) without requiring the preoperative work to begin earlier.		
Nakata (2018)	Japan	Cohort study (historical)	Elective surgery	To evaluate the pure impact of the fee revision on surgeons' productivity	Teikyo University Hospital	2015 September to August 2016. A total of 87% of cases started more than 10 min off their originally planned time. Cases starting second tend to have the longest delays, compared to first and all to-follow cases.	Study demonstrated that the revision of surgical fee schedule has various effects on the change in productivity, efficiency and technique.	CASP - High
Swafe (2018)	UK	Prospective study	General surgery	To identify and gain insight into main factors affecting theatre efficiency.	University Hospital Lewisham London	Identified common themes for impaired theatre efficiency for 2 months. Most delays occurred pre-operatively (24%) and commonest causes included late arrival of patient (6%), delays in consenting (3%) and lack of rooms to see patients in pre-operatively. 18% of delays were caused intra-operatively and were mostly caused by staff issues.	A team-based approach in order to identify causes leading to theatre efficiency and addressing these factors involving all team members, has the potential to greatly improve theatre efficiency.	CASP - Low
Ray (2017)	India	Prospective observational study	Cataract surgery	To measure the inpatient waiting time, identify the factors that affect the inpatient waiting	Kolkata Medical College and Hospital	The median waiting time of inpatients before elective surgery was 12 days. Significant inequalities in the waiting time between Below-	This study identified root causes of such delays in the inpatient waiting time and recommended pragmatic solutions to the problem.	CASP - Low

				time, and recommend the ways of reducing the waiting time of inpatients before elective surgical procedures.		poverty and Above-poverty. This study (2 months in 2015) has revealed that sicker patients waited more than less sick patients due to lab delays.		
Balzer (2017)	Germany	Observational study	Elective surgery	To analyse the for deviations from planned times for all electively planned cases in relation to order, duration, and start-time	Universität Greifswald Hospital	2015-2016 1 year, Of total of 87% of cases started more than 10 min off their originally planned time. Cases starting second tend to have the longest delays, compared to first and all to-follow cases.	Deviations from start-time are also associated with deviations in duration of a case, with both parameters being lowest in the group of 61–90 min. While planned vs. actual start-times differ widely over surgical specialties. Early planning of medium-length cases results in the most predictive procedure in terms of start-time and duration of the case.	CASP - High
Mei (2016)	Taiwan	Before and after study	Elective surgery	To establishment of an effective planning system for surgery scheduling could ensure the provision of accurate surgical scheduling and the elevation of both use efficiency of operation room and performances.	University hospital in central and southern Taiwan.	2013-2014, Data from medical information systems about surgeries are collected to undergo investigation and analyses. The completion rate for the surgeries scheduled elevates from 93.8% to 96.5%. The time rate for the first surgery is elevated from 95.4% to 98.1%. The cancellation rate for the surgeries is lowered from 6.4% to 4.2%. The	Effectiveness-oriented surgical scheduling can provide fast and effective aids with the help of advanced technology to elevate the performance of services and business.	ROBINS I Critical

						accumulated leave hours is lowered from 726 hours to 128 hours, which is the best improvement.		
Doll (2016)	Germany	Retrospective study	General surgery	Hypothesis: The interplay between anaesthesiologists and surgeons would affect operating room turnaround times, and teams that worked together over time would become more efficient.	St. Marien hospital in Vechta, Germany	2007-2013, The turnaround times derive from complex interactions and include additional factors such as preparation of surgical instruments, timely availability of staff, time of day, or cleaning procedures.	Choosing appropriate team members is a key issue of leadership. Giving a surgeon the best fitting anaesthesiologists might reduce turnaround times and thus have implications for OR management aiming to reduce over utilized OR time of a surgical list.	CASP - Moderate
Cognetti (2017)	USA	Descriptive study	Otolaryngology, Head and Neck Surgery	To identify the prevalence of the practice of multiple-room surgery as well as opinions regarding the potential impact of restriction of the practice.	American Academy of Otolaryngology—Head and Neck Surgery survey	This survey found that 40.4% of respondents perform multiple-room surgery. Multiple-room surgeries are performed and two-thirds of these individuals do so at least monthly, then thousands of otolaryngologists could experience backlogs.	Patient safety concerns are the most commonly cited arguments against multiple-room surgery.	CASP - High
Nagendran (2016)	UK	Three audits	Eye surgery	To identify factors influencing theatre efficiency.	Oculoplastic theatres in a tertiary centre	2011, 2014 and 2015, information entered into the hospital database, including time of arrival, induction, first cut and close of operation. The primary outcome measure was the operating list utilization rate, a	The theatre utilisation rate was significantly higher ($p < 0.01$) for whole-day lists (85%) compared to half-day lists (75%), suggesting that whole-day lists were more efficient.	CASP - High

						combined value of anaesthetic and surgical time as a proportion of the total planned session time.		
Mizumoto (2016)	Australia	Single-blinded, randomised controlled intervention	General surgery	To trial a standardised surgeon-led model that will reduce the patient change-over-time, and its impact on theatre efficiency.	General Surgery Department at Caboolture Hospital	July 2014 - June 2015, 1265 patients were randomised into 5 general surgical lists. A rapid and efficient turnover will likely gain the most benefit in time savings for lists having a multiple number of smaller cases.	Collaboration of teamwork and utilising key aspects of parallel processing significantly reduced the change-over-time between patients.	ROBINS I Low
Saikia (2016)	India	Prospective observational study	Neurosurgery	This study evaluated the neurosurgical operation theatre utilization in a neurosciences teaching hospital.	Bangalore, a tertiary care government teaching hospital.	78 days data included operation theatre start-time, delay in start, anaesthesia induction time, surgical preparation time, anaesthesia recovery time, operating time, time between cases and theatre closing time.	Overall, there is a need to incorporate the relevance of the 4Ps; pathology, patient, paraphernalia (equipment), and physician related factors into the decision-making process for optimal OT time prioritization and utilization.	CASP - High
Saw (2015)	USA	Historical pre-post study	General surgery	To evaluate the effect of a multidisciplinary initiative to improve first patient in the room (FPIR) and first case on time start (FCOTS) metrics in a tertiary care setting.	Tertiary care Hospital	2007 and 2014. There was a statistically significant improvement in FPIR and FCOTS. Surgical consent completion rate increased.	A multidisciplinary initiative to improve first case surgical starts in an academic setting. Strategies included establishing concrete, time-specific goals and posting them visibly, empowering individuals to fulfil them,	ROBINS I Low

and ensuring no compromise in patient safety.

Mathews (2015)	USA	Case-control	Neurosurgery	An operating room (OR) process improvement project to increase first case on-time starts (FCOTS) in the neurosurgical operating rooms..	Tertiary care academic medical centre	2009-2011, Factors predicting delayed start were also identified. During the same period, first cases performed outside the neurosurgical theatres served as a control group. A new service manager and a focused shared effort on improving FCOTS.	Successfully increased the FCOTS rate in our neurosurgical theatres from 33% to 68%.	ROBINS I Moderate
Kamat (2015)	New Zealand	Retrospective, observational study	Neurosurgery	To explore some of the factors that lead to delays in the perioperative period by determining whether there has been a trend in the increasing length of case time over a fifteen-year period.	Regional Hospital	1998-2012, The mean anaesthetic time per operation was deemed to be trend upwards and no statistically significant trend in time consumed by the surgical team in the analysed 15 years. The surgical cancellation rate was 6% in 1998. There is an increased to 13.6% in 2012.	For a given operation, anaesthetic time seems to be relentlessly increasing and has effectively doubled over a 15-year.	CASP - High

Han (2015)	USA	Pre-post study	Neurosurge ry	Neurosurgery resident-incentivized quality improvement initiative to improve on-time first-case starts on the neurosurgery service.	Tertiary referral centre	(July 2009-June 2010) The average delay across all neurosurgery first starts decreased from 9.67 minutes to 7.17 minutes.	During the 3 months that followed immediately after the conclusion of the program, the mean length of delay for first-start cases on the neurosurgery service was 8.04 minutes, which was significantly shorter than delays during the period before the start of the incentive.	ROBINS I Moderate
Austin (2014)	USA	Retrospec tive cohort study	Elective surgery	To compare turnover times for a series of elective cases with same-surgeon turnover or as a different-surgeon turnover.	Universit y-affiliated teaching hospital	ent-surgeon turnovers. The , change in subsequent over frequency per operating	A flexible scheduling policy allowing surgeon swapping rather than requiring full blocks incurs minimal additional staffed time during the theatre day while allowing the schedule to be filled with available elective cases. (Same-surgeon turnover or as a different-surgeon turnover).	CASP - High

*Overall ROBINS-I stated as indicated in the tool and overall assessment for CASP tool was reported considering the answers to the checklist.

Review 5 - Public-private partnerships for elective surgeries

Table 4.20: Summary of study characteristics of included articles

Author and year	Country	Research method	Elective surgery	Objectives	Research setting	Research period and intervention	Conclusions & recommendations
Gill (2014)	Canada	Observational study	Bariatric surgery	To examine patients' perspectives regarding prioritization for surgery and willingness to pay for faster access.	Provincial health authority	Nov. 2010- March 2011, Patients were assessed with a hypothetical priority list and scale to assess willingness to pay.	Most patients waiting for bariatric surgery consider greater clinical severity and functional impairments related to obesity to be important prioritization indicators and disagreed with paying for private sector for faster access.
Hagen (2017)	Norway	Observational study	Elective surgery	To analyse the effect of introducing competitive tendering on the prices paid to PFP hospitals.	Tertiary referral hospital	Data on absolute prices, volume, and DRG (Diagnosed-related-group prices) were obtained from the contracts the Regional Health Authorities awarded the PFP hospitals from 2002 to 2011.	The prices in PFP hospitals were on average 26% lower than in public hospitals. Competitive tendering triggered PFP hospitals to provide services at lower prices than public hospitals.
MacKinnon, (2017)	Canada	Observation study	Elective surgery	What prompted the Canadian government to address the issue? What strategies have been successful in reducing wait times?	Canadian health system	The criteria for selecting the clinics—credentials and experience, service factors, implementation schedules, and pricing—were made public as were the principles for their operation.	The clinics were a success on reduce wait times. The total cost of performing the 34 procedures in the clinics was 26% less than the cost of performing.

Review 6 – Quality Improvement (QI) methods for surgical care pathways

Study	Country	Research method	Elective surgery	Objectives	Research setting and period	Methods and results	Conclusions & recommendations
Ray (2017)	India	Prospective observational study	Elective surgery	To measure the inpatient waiting time, identify the factors that affect the inpatient waiting time, and recommend the ways of reducing the waiting time of inpatients before elective surgical procedures.	Kolkata Medical College and Hospital (State teaching hospital) A total of 219 surgeries were completed during the study (Jan-Feb 2015).	The median waiting time of inpatients before elective surgery was 12 days. Significant inequalities in the waiting time between Below Poverty and Above Poverty. Sicker patients waited more than less sick patients due to lab delays.	Identified root causes of such delays in the inpatient waiting time and recommended pragmatic solutions to the problem.
Valsangkar (2017)	USA	Pre-post/interrupted time series intervention study	General surgery	To identify whether lean processes can be used to improve wait times for surgical procedures.	Tertiary care Veterans Affairs medical centre 2011-2014	Wait times for elective general surgical procedures and clinical volume before, during, and after implementation of lean processes. Wait list reduction from 33.4 days to 12.0 days for patients waiting for elective general surgical procedures. By reducing systemic inefficiencies, intervention achieved increased patient throughput, decreased wait lists,	Strategies improved interdepartmental and patient communication to reduce cancelled consultations and cases, diagnostic rework, and no-shows.

and improved patient access in a cost-neutral manner.

Fregene (2017)	UK	Pre-post study iterative interventions	Elective surgery	Quality improvement project to improve the patient experience of elective surgery.	Royal Free London NHS Trust (3 hospitals 11500< E. surgeries/year) 2015-2017.	Conducted in Measurements were taken as 'patient satisfaction indicators '. Used a series of PDSA cycles to improve patient experience in a strategy that included all team members in a multidisciplinary approach.	Long waiting was major factor contributed for patient experience. 'Excellent' or 'Good' patient experience increased from 65% to 96%. Project has delivered shorter waiting times.
Hultman (2014)	USA	Project intervention pre-post study	Plastic surgery	3 year investment project to improve patient throughput and patient satisfaction (Pt access initiative).	University of North Carolina Health System (2005-2008)	Strategies for improving patient throughput were based upon the PDSA innovation cycle using queueing theory and substantial plan for 3-year investment.	Yields significant improvements in access to care, patient satisfaction, physician productivity, and financial performance.
Simon (2014)	USA	pre-test post-test evaluations	Orthopaedic surgery	A quality improvement project to develop a safe, effective, patient-centred, timely, efficient, and accurate orthopaedic scheduling process.	Large academic medical centre February 2010 to March 2011	Using structured Lean problem-solving techniques reduced cancellations to 35%-3.3%, 70% reduction in schedule changes, Pt satisfaction increased 67%-84%.	New orthopaedic scheduling process; reduced cancellations day-before and day-of-surgery, reduced procedure sequence changes, increased patient satisfaction, and eliminated the disorganized schedule.

Review 7 – Waiting time targets for hospitals

Table 4.26: Summary of study characteristics of included articles

Study	Country	Research method	Elective surgery	Objectives	Research setting and period	Methods and results	Conclusions & recommendations
Amar (2015)	Canada	Retrospective survey with multiple case studies	Hip and Knee surgeries (HKS)	To elucidate the contextual and organizational factors that enhance or inhibit wait time management strategies (WTMS) sustainability for HKS in Canadian provinces to reduce wait times for these services.	Canadian Health care organisations (HCO) (2010-2012).	Findings indicate that the hospital that was able to maintain compliance with the wait time requirements had specific characteristics.	A strong team-building spirit and culture are also essential components for sustaining the wait time initiative
Blacket (2014)	New Zealand	Retrospective survey	Hip and Knee surgery	To quantify the number of patients declined surgery due to scoring below the financial threshold, when presenting for total hip or total knee arthroplasty.	Two New Zealand District Health Boards (DHBs) (2012-2013)	The mean New Zealand Orthopaedic Association (NZOA) prioritisation score were also significantly higher in the patients booked for surgery (M=76.96) compared to those declined (M=64.66; $p \leq 0.001$).	36% of patients who were suitable for hip or knee arthroplasty were declined elective surgery for being below threshold. Many of these patients have significant pain and disability.
Siciliani (2014)	12 OECD countries	Retrospective survey	Elective surgery	To provide comparative evidence of waiting times across OECD countries and explores trends and health policies aimed at reducing waiting times in the last decade.	Health systems 1999-2012	Waiting times appear to be low in the Netherlands, Denmark and UK, Finland and Netherlands and can be attributed to a range of policy initiatives, including higher spending. The negative trend in these countries has, however, halted or reversed in recent years.	With limited resources, enforcement of maximum waiting time guarantees is difficult. Setting realistic maximum waiting times compatible with available budgets will be critical.

