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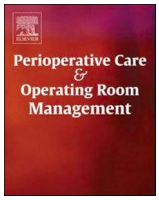

A systematic review on the impact of national guidelines on clinical practice and patient safety in the context of perioperative care

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ABSTRACT

This systematic review identifies and assesses national guidelines that are used to improve clinical practice and patient safety in perioperative care. The authors searched, MEDLINE, Embase, Cumulative Index of Nursing and Allied Health Literature (CINAHL Plus) and Health Management Information Consortium (HMIC) to identify relevant studies published from January 2014 until May 2024. Two researchers screened a total of 727 studies (which yielded 37 eligible studies), extracted data and rated study quality using the Mixed Methods Appraisal Tool (MMAT). The most common national guidelines identified were the Enhanced Recovery After Surgery (ERAS) and the WHO Surgical Safety Checklist (WHO SSC). 13 studies identified improvements in morbidity, 10 a decrease in length of stay and 1 a decrease in readmission. Strength of evidence was high (18 studies rated as high), with most studies being pre-post evaluations. The evidence leans to suggest that the implementation of national guidelines can improve patient outcomes, however, this conclusion should be considered in light of all the available evidence.

1. Introduction

The perioperative period encompasses the surgical care pathway from pre-surgery, during surgery and post-surgery[1]. Patient safety is an area of focus in perioperative care due to the risk of complications, which may lead to mortality, further morbidity, or increased length of stay in hospital[2,3]. Guidelines are often developed to standardise care and share best practice on improving patient safety during the perioperative period[4–6]. Guidelines are commonly developed based on the best available evidence; based on an assessment of their potential benefits and harms; and through multi-disciplinary consensus processes[2–5,7]. Organisational bodies are often responsible for producing guidelines at the local, regional, national, and international level. Developing guidelines can be a time and resource intensive process[3,5,8].

Despite the extensive resources that go into developing guidelines with the hope that they will be implemented to improve patient safety, research has found that failures in guideline implementation are common across many clinical specialties[4]. Some of the key barriers to implementing clinical practice guidelines more broadly are lack of awareness and agreement with the recommendations themselves. Other studies have reported that more time should be invested into providing support on how best to implement the existing guidelines or evaluating the impact of the existing guidelines, rather than producing more guidelines in an already saturated environment[4,5].

Previous reviews have assessed the quality of guidelines used within perioperative care[2] and have assessed the impact of clinical practice guidelines in perioperative care over 10 years ago[9]. To our knowledge, there has not been a more recent systematic literature review evaluating the impact or factors acting as barriers and facilitators of implementing national level recommendations in perioperative care to improve patient safety. The purpose of this systematic review was to map national guidelines implemented in perioperative care, the factors acting as barriers or facilitators in implementation, and the impact of the guidelines on patient safety. The research questions guiding the study were as follows:

1) Are national guidelines within perioperative care being implemented?

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2) Is the impact of national guidelines on patient safety in perioperative care being measured?
3) What is the impact of national guidelines on patient safety within the perioperative care context?

2. Methods

The systematic review was informed by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (M. J.[10]) guidelines and a protocol was prospectively registered on PROSPERO: CRD42024548121.

2.1. Search strategy

Search terms were developed based on previous reviews[2,9] and informed by PICOS. We used a combination of relevant key words and subject heading searches based on the search words 'patient safety,' 'recommendation,' 'guideline,' and 'perioperative care.' The full search strategy can be found in Appendix A.

Searching was conducted on four scientific databases, MEDLINE, Embase, Cumulative Index of Nursing and Allied Health Literature (CINAHL Plus) and Health Management Information Consortium (HMIC), all of which were searched for articles published between 1st January 2014 to 30th May 2024.

2.2. Selection criteria

This review focused on articles which had been published in peer-reviewed journals. We included all types of study design: qualitative, quantitative and mixed methods. We limited the search to humans and the past 10 years. We defined 'guideline' as clinical guidelines that are designed or developed to aid healthcare professionals to deliver care for patients in a clinical setting and, 'national guidelines' was defined as guidelines that had been recommended for use nationally across a country. Perioperative care was defined as the care of patients prior, during and after completion of surgery and, finally, patient safety was defined as reducing or preventing the risk of harm to patients whilst they receive healthcare. No limits were placed in terms of language and international publications (outside of the United Kingdom) of national guidelines were also included. Included studies also had to meet the following eligibility criteria:

- *Participants:* Participants were patients who have experienced perioperative care within a hospital. In terms of staff perspectives and experiences, any type of Healthcare Professional (HCP) was included (e.g. nurses, midwives, healthcare assistants, doctors, surgeons, anaesthetists).
- *Interventions*: The implementation of national guidelines within the field of perioperative care to improve patient safety, such as reducing mortality, length of stay, postoperative complications.
- *Comparator:* Comparison groups will include usual or routine care prior to implementation of guidelines, or in groups where guidelines were not implemented.
- *Outcomes*: Whether or not national guidelines were being implemented in the perioperative healthcare setting (research question 1). Whether the impact of national guidelines were measured across perioperative healthcare systems (research question 2). The impact national guidelines had on patient safety in the perioperative healthcare setting, such as reduced patient complications, adverse outcomes or routine complications that have adverse effects (research question 3).

2.3. Study selection

The search results were imported into the software Rayyan for de-duplication[11]. The software was then used for the first stage of screening all titles and abstracts, this was done by two researchers, and they cross-checked 25 % of each other's decisions, and discussed disagreements until consensus was reached. Any publication that did not meet the inclusion criteria was excluded. Full text screening was then completed using Microsoft Excel, again by two researchers who cross-checked 25 % of each other's decisions, and discussed any disagreements amongst themselves and the senior author until consensus was reached.

2.4. Data extraction

One researcher extracted data from all included studies into an excel document, which was then cross-checked by a second researcher. The following data were extracted: article characteristics (type of study and country of study), demographic data (patient population, perioperative procedure, HCP population), type of guideline being implemented, and outcome measures from implementing guidelines. Further information on the data extraction fields can be found in Table 1. Intervention details were extracted following the TIDieR checklist[12], which is a 12-item checklist that is used to improve the quality of reporting in intervention studies.

2.5. Quality assessment

One researcher assessed the methodological quality of studies, and this was then cross-checked by a second researcher. The Mixed Methods Appraisal Tool (MMAT)[49] was used to assess all studies as it includes criteria for a heterogeneous range of studies including: qualitative research, randomized controlled trials, non-randomized studies, quantitative descriptive studies, and mixed methods studies. The rating of articles is carried out based on five criteria and articles can be scored from 0 to 5 with 5 being the highest score and adequately addressing all quality criteria.

2.6. Data synthesis

Narrative synthesis was used to analyse and summarise common themes identified in this review.

3. Results

3.1. Article selection

The document selection process is presented in the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) flowchart in Fig. 1. The initial search resulted in 727 of articles, these studies were then screened based on title and abstract, resulting in the exclusion of 592 articles. There were 135 studies that were then screened based on full text, 37 studies met the eligibility criteria and were included in the review.

3.2. Study characteristics

The majority of the studies were conducted in the USA ($n = 9$), Australia ($n = 4$), Netherlands ($n = 3$), Italy ($n = 2$), China ($n = 2$) and South Korea ($n = 2$). Further details of other countries where studies were conducted can be found in Table 1.

3.3. Quality assessment

The MMAT score for each article can be found in Table 1. There were 18 studies that were rated as high quality (4/5 and 5/5), 18 that were rated as medium quality (2/5 and 3/5) and one study that was rated low quality (0/5 and 1/5).

Table 1
Study characteristics, guideline outcomes and compliance findings across 37 studies.

Author, publication year, country, MMAT score	Surgical procedure/ patient compliant	Study design Comparator group	Implemented guideline	Sample and sample size	Outcome of implemented guideline	Compliance with guideline
[13] USA 4/5	Pancreatic adenocarcinoma/ Pancreatic duodenectomy	Cohort study Yes – pre- vs post-guideline implementation	Enhanced recovery after surgery (ERAS) guidelines	Patients Pre-ERAS = 140 Post-ERAS = 40	Hospital Length of stay (LOS): Pre-ERAS = (m=9.5 days) Post-ERAS: (m=9 days) *Not statistically significant.* Death within 30 days: Pre-ERAS = 4 (3%) Post-ERAS = 2 (5%) *Not statistically significant* Readmission within 30 days: Pre-ERAS = 39 (28%) Post-ERAS = 11 (28%) *Not statistically significant*	59.7% compliance with the ERAS guidelines among clinicians.
[14] Australia 4/5	Left and right colorectal resections	Cohort study Yes -pre- vs post-protocol implementation	ERAS protocol	Patients Pre-ERAS = 42 Post-ERAS = 88	LOS Pre-ERAS protocol = 6.5 days Post-ERAS protocol = 5 days in the subgroup that adhered ≥70% of preoperative ERAS guidelines *Statistically significant.* Ileus: Pre-ERAS = 6 (14.3%) Post-ERAS = 11 (12.5%) *Not statistically significant.* Bowel obstruction: Pre-ERAS = 0 (0%) Post-ERAS = 0 (0%) *Statistical significance not assessed.* Nausea: Pre-ERAS = 33 (84.6%) Post-ERAS = 5 (5.8%) *Statistically significant.* Patients that vomited: Pre-ERAS = 15 (35.7%) Post-ERAS = 41 (46.6%) *Not statistically significant.*	Increase from 0% to 43% of patients adhering to ≥70% of preoperative ERAS guidelines post ERAS protocol implementation. *Statistically significant.*
[15] Israel 5/5	Orthopaedic procedures	Cross-sectional study Yes – pre- vs post-checklist	Modified WHO-based surgical safety checklist	Patients Pre-checklist = 380 Post-checklist = 380	Antibiotics administered only post-operatively: Pre-ERAS = 3.2% Post-ERAS = 0% *Statistically significant.* Post-operative fever: Pre-ERAS = 10.6% Post-ERAS = 5.3% *Statistically significant even after controlling for confounding.* Surgical wound infection: Pre-ERAS = 3.2% Post-ERAS = 2.1% *Not statistically significant.* Composite postoperative complications: Pre-ERAS = 25.9% Post-ERAS = 18.9% *Statistically significant, but not after controlling for confounding.* Mortality: Pre-ERAS = 0.8% Post-ERAS = 2.7% *Statistically significant.*	Not reported
Italy 4/5	Resection with anastomosis, lysis of	Cohort study Yes – comparison in	ERAS protocol	Patients Total = 589	Linear correlation between postoperative	Patients' compliance to postoperative items was

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Table 1 (*continued*)

Author, publication year, country, MMAT score	Surgical procedure/ patient compliant	Study design Comparator group	Implemented guideline	Sample and sample size	Outcome of implemented guideline	Compliance with guideline
	adhesion, resection without anastomosis, perforated peptic ulcer repair, by-pass and hollow viscus perforation repair	outcomes based on different levels of compliance of protocol			item compliance of ERAS and reduction in LOS. *Statistically significant.* Laparoscopy was associated with adherence to postoperative protocol. *Statistically significant.* Laparoscopy was associated with an earlier recovery. *Statistical significance not assessed.*	satisfactory with all targets reached one-day later in comparison with what has been reported following elective colorectal surgery. The highest adherence was obtained for operative warming and postoperative nausea and vomiting prophylaxis.
[16] USA 3/5	Otolaryngologic surgery (ear, nose, and throat)	Cohort study Yes – pre- vs post-protocol implementation	Perioperative pain management protocol based on American Academy of Otolaryngology-Head and Neck Surgery	Patients Pre-protocol = 105 Post-protocol = 105	Prescribed morphine milligram equivalent (mean): Pre-protocol = 132.5 Post-protocol = 53.6 *Statistically significant.*	Not reported
[17] Australia 2/5	Adult patients with type 1 or type diabetes whose length of stay was greater than 24 hours on the surgical short stay unit, neurosurgery, and specialty surgery wards	Mixed methods study Yes – pre- vs post-recommendation implementation	The Joanna Briggs Institute (JBI) best practice recommendations for perioperative diabetic management (hospital patients)	Retrospective audit data from 30 patient records and a survey with a convenience sample of 40 nursing staff from the relevant wards. Focus group data with nursing staff and an endocrinologist.	Not reported	7/9 best practice criteria achieved 100% compliance. Overall, there were two out of nine criteria that had less than 30% compliance. This was criterion 6 that examined the regular monitoring of a patient's blood glucose being conducted while in hospital at an appropriate timeframe, which had 27% compliance; and criterion 9 that assessed if healthcare staff had received education and training regarding perioperative diabetes management which had 0% compliance.
[18] USA 3/5	Radical cystectomy	Cohort study Yes – pre- vs post-protocol implementation	ERAS protocol	Patients Pre-intervention = 210 Post-intervention = 109	Novel venous thromboembolism Pre = 13 (6.2%) Post = 1 (0.9%) Statistically significant. Perioperative bleeding: Pre = 73 (35%) Post = 36 (33%) Not statistically significant. 30-day all complications: Pre = 101 (48%) Post = 56 (51%) Not statistically significant. Hospital LOS (median): Pre = 7 days Post = 6 days Statistically significant Readmission: Pre = 44 (21%) Post = 36 (33%) Statistically significant 30-day mortality: Pre = 0 (0%) Post = 2 (1.8%) Not statistically significant.	Not reported
[19] Australia 3/5	Endoscopic cardiac surgery	Cohort study Yes – pre- vs post-ERAS implementation	ERAS strategy	Surveys with Colorectal surgeon = 5 Audit data on patients undergoing	LOS (mean): Pre-implementation strategy = 10.8 days Post-implementation strategy = 8.3 days	Improvement in compliance was observed in four audit criteria: preoperative fasting is minimized (from 0% to

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Table 1 (*continued*)

Author, publication year, country, MMAT score	Surgical procedure/ patient compliant	Study design Comparator group	Implemented guideline	Sample and sample size	Outcome of implemented guideline	Compliance with guideline
		strategy implementation		endoscopic cardiac surgery = 20	*Not statistically significant.* Unplanned readmission: Pre-implementation strategy = 0% Post-implementation strategy = 20% *Not statistically significant.*	15%), early feeding is implemented postoperatively (from 10% to 65%), preoperative carbohydrate drinks are given (from 20% to 25%) and oral supplements are given postoperatively (from 0% to 20%). Compliance for one audit criterion remained constant: patients are screened for malnutrition risk in preadmission clinic (100% for both audits). Two audit criteria saw a drop in compliance: nutrition support is provided preoperatively to malnourished patients (from 60% to 15%) and nutrition education is provided preoperatively (from 60% to 20%).
[20] USA 3/5	Paediatric surgery	Cohort study Yes – pre- vs post-guideline implementation intervention implementation	American Society of Anaesthesiology's guidelines	Patients = 20	Not reported	Compliance with the ASA 'nothing by mouth' instructions increased from 20% to 50%. However promising, the result still meant that half of the patients/parents could not follow the instructions. Compliance with educating and informing patients/ parents of fasting requirements in advance of surgery increased from 75% to 100%.
[21] China 4/5	Short-level posterior lumbar fusion surgery	Cohort study Yes – comparison in patient outcomes when implementing ERAS in different aged groups	ERAS	65 to 79 years of age = 109 80 years and above = 109	According to the comparable physiological condition after propensity score matching, there were significant differences between the two age groups in: - LOS - Postoperative nausea - Vomiting	Not reported
[22] Netherlands 3/5	Pre-operative radiotherapy and surgical resection for rectal cancer	Cohort study Yes – pre- vs post-guideline implementation	The revised Dutch Colorectal Cancer Guideline 2014	Patients Pre-guideline revision group = 7364 Post guideline revision group = 12,057	Surgery alone: Before guideline revision = 1297 (17.6%) After guideline revision = 5475 (45.7%) *Statistically significant.* Short course radiotherapy with immediate therapy: Before guideline revision = 2743 (37.3%) After guideline revision = 1921 (16.0%) *Statistically significant.* Long course chemoradiotherapy: Before guideline revision = 2799 (38.0%) After guideline revision = 13,655 (30.5%) *Statistically significant.* Circumferential Resection Margin	Not reported

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Table 1 (*continued*)

Author, publication year, country, MMAT score	Surgical procedure/ patient compliant	Study design Comparator group	Implemented guideline	Sample and sample size	Outcome of implemented guideline	Compliance with guideline
					positivity (tumour-free resection margin ≤1 mm): Before guideline revision = 385 (5.8%) After guideline revision = 441 (4.2%) *Statistically significant.* Postoperative complication (incl. mortality and impact on length of stay): Before guideline revision = 1656 (22.5%) After guideline revision = 2233 (18.5%) *Statistically significant.*	
[23] USA 4/5	Ambulatory outpatient shoulder arthroscopy	Cohort study Yes – pre- vs post-guideline implementation	Multimodal perioperative pain management protocol based on American Society of Anaesthesiologists (ASA) Task Force on Acute Pain Management recommendations	Patients Pre-implementation group = 132 Post-implementation group = 120	Quality of recovery in 24 hrs and 48hrs:Pre-implementation group: 13.4 and 14.0Post-implementation group: 14.9 and 15.0*Statistically significant. Minimal clinically important difference achieved.* Compared to pre-implementation, post-implementation group reported: • Less overall time in severe pain at 24 and 48 hrs • Lower negative impact of pain on activity and sleep at 24 hours • Fewer feelings of fright and depression at 24 hrs • Less breakthrough oxycodone milligram equivalents taken each day up to 72 hrs postoperatively *All statistically significant.*	Not reported
[24] Netherlands 2/5	Elective abdominal or vascular surgery	Randomised control trial Yes – control group that switches at different timepoints to receiving the IMPROVE intervention	IMPROVE intervention that supports applying the Dutch National Perioperative Safety Guidelines	Patients from 9 hospitals IMPROVE Intervention = 989 Control = 987	Before-after comparisons show that outcomes improved over time almost regardless of the intervention.Mortality rate:Baseline = 1.9% Final = 1.8%*Statistical significance not assessed.* Complication rate: Baseline = 27.9%Final = 26%*Statistical significance not assessed.* Postoperative wound infection:Baseline = 13.6%Final = 2.6% *Statistically significant.* LOS (median, days): Baseline = 8 daysFinal = 6 days*Statistically significant.*The increased compliance to the one guideline 'discharge from recovery room' was however related to: • Decreased mortality • Fewer complications	Use of IMPROVE intervention did not significantly improve guideline adherence – mixed results could be found. Intervention was related to increased compliance with the recommendation 'discharge from recovery room'. *Statistically significant.* Intervention was related to decreased compliance with the recommendation 'hospital discharge.' *Statistically significant.*

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Table 1 (*continued*)

Author, publication year, country, MMAT score	Surgical procedure/ patient compliant	Study design Comparator group	Implemented guideline	Sample and sample size	Outcome of implemented guideline	Compliance with guideline
					• Fewer unscheduled transfers to ICU *All statistically significant.*	
[25] Iran 3/5	General surgery.	Cohort study. Yes – pre- vs post-guideline implementation	Center for Disease Control (CDC) guidelines - Protocol of perioperative narrow-spectrum antibiotics prophylaxis	Patients Pre- guideline implementation: 4380 Post- guideline implementation = 3650	Prevalence of surgical infection: Pre-implementation: 0.7% Post-implementation: 0.6% *Not statistically significant.*	Not reported
[26] Germany 4/5	Surgery	Prevalence study No comparison.	German S3 guideline for the prevention of inadvertent perioperative hypothermia	Patients in 26 hospitals 431 patients overall.	No patient experienced postoperative hypothermia. 13% of patients experienced intraoperative hypothermia.	Recommendation for preoperative active warming of patients only adhered to in 20% of patients. Recommendation for sublingual temperature measurement of patients only adhered to in 7% of patients.
[27] Italy 4/5	Prostate cancer patients treated with robot assisted radical prostatectomy extended pelvic lymph node dissection	Cohort study Yes – pre- vs post-guideline implementation for reporting morbidity.	European Association of Urology guidelines on reporting and grading complications.	Patients Pre-implementation group: 316 Post implementation group: 167	Complication rate: Pre-implementation = 10% Post-implementation= 29% *Statistically significant.* Detection of grade 1 and 2 complications: Pre-implementation = 4.7% and 2.8% Post-implementation = 8.4% and 14%	Not reported
[28] Norway 3/5	All types of surgery except transplantations, cardiothoracic, neuro, ear-nose-throat and maxillofacial, orthopaedic, upper and lower gastrointestinal, urology, vascular, breast and endocrinology, gynaecology, and obstetrics, ophthalmic and plastic and burn surgery	Cross-sectional study. Yes – pre- vs post-implementation programme	WHO Surgical Safety Checklist as part of the Norwegian National Patient Safety Program	Staff: Pre-program implementation = 349 (2009) and 292 (2010) Post-program implementation = 279 (2017)	From pre-programme implementation to post-programme implementation there was a significant improvement for the following dimensions from the Hospital Survey on Patient Safety Culture (as reported by HCPs): • Unit managers • Support to patient safety • Continuous improvement • Teamwork in unit • Error feedback • Non-punitive • Hospital managers support to patient safety • Teamwork across units • Information handoffs and transitions	Compliance was 75% (1767/2367) in orthopaedic, thoracic and neurosurgery in the pre-program implementation group. In the post-program implementation group, overall and for all types of surgery the SSC compliance averaged 88% of the operations.
[29] Spain 3/5	Hip fracture	Cohort study Yes – Pre- vs post-protocol implementation	Protocol on the perioperative management of hip fractures treated with antithrombotic based on American College of Chest Physicians recommendations	Patients Pre-protocol implementation group = 113 Post- protocol implementation group = 101	Bleeding events: Pre-protocol implementation = 68.1% Post-protocol implementation = 68.3% *Statistical significance not assessed.* Thrombotic events: Pre-protocol implementation = 11.5% Post-protocol implementation = 13% *Statistical significance not assessed.*	Moderate to high thromboembolic risk patients, bridging therapy with full doses of enoxaparin (in line with protocol): Pre-protocol implementation = 18.5% Post-protocol implementation = 50% *Statistically significant.*
[30] South Korea 2/5	Gastric cancer surgery	Survey study No	ERAS protocol	Staff Gastric surgeons = 89	Not reported.	Among the ERAS protocols, preoperative education, avoidance of

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Table 1 (*continued*)

Author, publication year, country, MMAT score	Surgical procedure/ patient compliant	Study design Comparator group	Implemented guideline	Sample and sample size	Outcome of implemented guideline	Compliance with guideline
						preoperative fasting, maintenance of intraoperative normothermia, thromboprophylaxis, early active ambulation, and early removal of urinary catheter were relatively well adopted in perioperative care. Other practices, such as avoidance of preoperative bowel preparation, provision of preoperative carbohydrate-rich drink, avoidance of routine abdominal drainage, epidural anaesthesia, prophylactic antibiotics, postoperative high-oxygen therapy, early postoperative diet, restricted intravenous fluid administration, and application of discharge criteria were less well adopted.
[31] USA 4/5	Laparoscopic colorectal surgery	Cohort study Yes – pre- vs post-ERP implementation groups	Enhanced recovery protocol (ERP) for colorectal surgery based on ERAS (anaesthesia section)	Patients Pre-ERP implementation group = 36 Post-ERP implementation group = 36	Post-ERP group was associated with a substantial decrease in perioperative opiate usage compared to pre-ERP group. Without sacrificing postoperative analgesia (subsequent increase in pain score) in the post-ERP group compared to the pre-ERP group. Return to bowel function (hours): Pre-ERP = 33.5 Post-ERP = 13.8 *Statistically significant.* LOS (median days): Pre-ERP = 4 days Post-ERP = 3 days *Statistically significant.* 30-day readmission: Pre-ERP = 27.8% Post-ERP = 2.8% *Statistically significant.* Complications: Pre-ERP = 13.9% Post-ERP = 5.6% *Not statistically significant.*	82% (41/50) compliance with the ERP anaesthesia section after the implementation date.
[32] South Korea 4/5	Upper arm surgery	Randomised control trial Yes – experimental group (receiving guideline recommender care) vs control group	American Society of PeriAnesthesia Nurses (ASPAN) hypothermia guideline	Patients Experimental group receiving care according to guidelines = 26 Control group receiving regular hospital care = 25	Maintenance of normal body temperature (36°C) in the intraoperative and postoperative period: Experimental group: yes Control group: no (perioperative hypothermia) *Statistically significant.*	Not reported
[33] Russia 3/5	Elective craniotomy	Cohort study Yes – Pre- vs post-implementation of protocol	Perioperative blood glucose monitoring and insulin infusion protocol based on the Peri-operative management of the surgical patient with diabetes 2015 guidelines by the	Patients Pre-protocol implementation group = 26 Post-protocol implementation group = 42	Comparison of the risk of postoperative infection: Decrease in risk for post-implementation group compared to pre-implementation group. *Statistically significant.*	Not reported

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Table 1 (*continued*)

Author, publication year, country, MMAT score	Surgical procedure/ patient compliant	Study design Comparator group	Implemented guideline	Sample and sample size	Outcome of implemented guideline	Compliance with guideline
[34] Chile 4/5	General surgery	Cohort study Yes – pre-vs post-checklist implementation	Association of Anaesthetists WHO surgical safety checklist	Patients Pre-checklist implementation group= 29,250 Post-checklist implementation group = 29,250	Mortality: Pre–checklist implementation group = 0.79% Post-checklist implementation group = 0.61% *Statistically significant.* LOS (mean, days): Pre-checklist implementation group = 3 days Post–checklist implementation group = 2 days *Statistically significant*	Not reported
[35] Netherlands 3/5	Administering low molecular weight heparin bridging during unilateral total hip or knee arthroplasty	Cross sectional study Yes – guideline implemented care group vs non-guideline implemented care group (control)	2012 American College of Chest Physicians (ACCP) guideline – to bridge high risk patients.	Patients Control group = 98 Guideline implemented care group= 13	Complications/ blood transfusion: Control group = 8.3% Guideline implemented care group = 54% *Statistically significant.* LOS (mean, days): Control group = 5.3 Guideline implemented care group = 14.2 *Statistically significant.*	Not reported
[36] USA 5/5	Perioperative chemotherapy	Cohort study Yes – intervention group receiving guideline recommender care vs control group	National Comprehensive Cancer Network, European Association of Urology and European Society for Medical Oncology guidelines that recommend perioperative chemotherapy in all pN2–3 M0 patients with squamous cell carcinoma of the penis (SCCP)	Patients PN2–3 M0 Patients with SCCP with chemotherapy administered = 140 PN2–3 M0 Patients with SCCP without chemotherapy administered (control) = 171	Administration of chemotherapy (CHT) was not associated with improved cancer specific mortality (CSM) outcomes in the overall cohort. No statistically significant differences were identified between CHT and no-CHT subgroups in the overall cohort.	45% of patients received chemotherapy (aligning to the guideline).
[37] USA 3/5	General surgery	Cohort study Yes – pre- vs. post-checklist implementation.	WHO - Surgical safety checklist	Staff Pre-implementation = 929 Post-implementation = 815	Staff agreed that they would feel safe as a patient in their operating room: Pre-implementation = 41.7% Post-implementation = 49.0% *Statistically significant.* 73.6% reported that checklists had averted problems or complications.	54.1% participants reported that their surgical teams always used checklists effectively. Strongly agree that team discussions (e.g., briefings or debriefings) are common: Pre-implementation = 20.11% Post-implementation = 29.64% *Statistically significant.* Physicians are open to suggestions: Pre-implementation = 17.80% Post-implementation = 23.94% *Statistically significant.* Potential errors or mistakes are pointed out without raised voices or condescending remarks: Pre-implementation = 15.86% Post-implementation = 22.89% *Statistically significant.*

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Table 1 (*continued*)

Author, publication year, country, MMAT score	Surgical procedure/ patient compliant	Study design Comparator group	Implemented guideline	Sample and sample size	Outcome of implemented guideline	Compliance with guideline
[38] Australia 5/5	Prevention of hypothermia in surgery patients	Qualitative study (semi-structured interviews) No comparison	Australian College of Perioperative Nurses (ACORN) guidance on prevention of perioperative hypothermia	Staff 12 participants	Not reported	Not reported
[39] Ireland 5/5	General surgery	Qualitative study (semi-structured interviews) No comparison	WHO surgical safety checklist	Staff Nurses = 10	Not reported	Not reported
[40] Denmark 4/5	Elective open-heart surgery	Cohort study Yes – pre- vs post-guideline implementation group	Danish Clinical Guideline on oral hygiene	Patients Control (Pre-guideline implementation) = 506 Post- guideline implementation group = 466	Antibiotic prescription on the 5th postoperative day: Control group = 12.6% Post- guideline implementation group = 7.7% *Statistically significant.*	The clinical guideline was considered to have been fully implemented as all patients referred for elective open-heart surgery were informed about the importance of systematic oral hygiene before admission to hospital. Of the patients in the intervention group, 405 (86.9%) reported that they had adhered to the oral hygiene recommendation.
[41] Canada 3/5	Gynaecologic oncology procedure	Cohort study Yes – pre- vs post-guideline recommended pathway implementation	Perioperative glycaemic management pathways based on ERAS and Diabetes Canada guidelines	Patients 878 patients whose outcomes were compared pre- vs post- pathway implementation	Screening for risk of postoperative hyperglycaemia: Pre-implementation = 78% Post-implementation = 90% *Statistically significant.* Cases of postoperative hyperglycaemia: Pre-implementation = 54% (at 24 hours) 37% (at 72 hours) Post-implementation = 42% (at 24 hours) 28% (at 72 hours) *Not statistically significant.* LOS (median, days): Pre-implementation = 3.0 Post-implementation = 2.5 *Statistically significant.*	Not reported
[42] India 1/5	General surgery	Mixed methods study No comparison	WHO Surgical Safety Checklist	Patients Total surgeries = 1778	Total of complications = 74 (4.1%) • Surgical site infection = 44 • Unplanned return to operating room = 5 • Pneumonia = 13 • Death = 3 • Other complications = 8	The proportion of patients who received prophylactic antibiotics was 100%.
[43] England 4/5	Open or laparoscopic colorectal surgery	Mixed methods study No comparison	Surgical warming care bundle based on the National Institute for Health and Care Excellence (NICE) Inadvertent perioperative hypothermia guideline	Patients = 124 HCPs = 21	At least 30% of patients were hypothermic on admission to the recovery unit.	Not reported Compliance with active warming in the operating room: 96% of hypothermic patients given a forced air warming blanket. Compliance with active warming in the recovery room: 47% of hypothermic patients given a forced air warming blanket.
[44] Japan 3/5	General surgery	Cross-sectional retrospective study Comparison between	Centers for Disease Control and Prevention (CDC) Hospital Infection Control	Staff from 83 hospitals Total = 4856	Not reported	Hospitals with high organizational culture scores were associated

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Table 1 (*continued*)

Author, publication year, country, MMAT score	Surgical procedure/ patient compliant	Study design Comparator group	Implemented guideline	Sample and sample size	Outcome of implemented guideline	Compliance with guideline
		compliance to guidelines and level of organisational culture	Practices The Japanese Association for Infectious Diseases. Guideline for Antibiotic Use			with higher adherence to both the CDC and Japanese guidelines.
[45] Turkey 3/5	Colorectal surgery	Cross-sectional study No comparison	ERAS protocol in colorectal surgery	HCPs Total = 110 Physician = 54 Nurse = 56	Not reported	HCPs who witnessed/ performed ERAS during their training = 35.5% Not heard of ERAS = 26.4% Do not know how to use in practice = 16.4% The evidence does not convince me to change practice = 22.7% I want to use ERAS but do not have the MDT support = 6.4% Would use ERAS if given adequate education and data = 68.2% Would use ERAS if had MDT support =70%
[46] USA 3/5	Open liver resection	Cohort study Yes – pre-vs post-ERAS implementation	ERAS	Patients Pre-ERAS = 42 Post-ERAS = 75	Pain: *No significant difference in pain score between pre- and post- ERAS implementation groups.* Morphine administered: *Significantly less morphine administered on post-operative day 1,2 and 3 in the post-ERAS implementation group compared to pre-ERAS implementation group.* Post-operative complications: Pre-ERAS = 10% Post-ERAS = 1% *Statistically significant.* LOS (median, days) Pre-ERAS = 6 Post-ERAS = 5 *Statistically significant.*	There was 70% compliance with all aspects of the ERAS pathway
[47] China 5/5	Colorectal surgery	Randomised controlled trial Yes – standard ERAS guidance care vs ERAS guidance with pre-operative rehabilitation considered too	Peri-operative rehabilitation recovery protocol based on and updated from ERAS guidance	Patients Standard-ERAS care group = 104 ERAS with pre-operative rehabilitation group = 109	Patients with normal recovery of GI function: Standard ERAS care group = 64.4% ERAS with pre-operative rehabilitation group = 78.9% *Statistically significant.*	The compliance rate for every element of the peri-operative rehabilitation recovery protocol in both groups ranged from 92% to 100%.
[48] France 4/5	Mini-invasive aortic valve replacement	Cohort study Yes – pre- vs post-ERAS program implementation	ERAS program	Patients Pre-ERAS group = 23 Post-ERAS group = 23	Average ICU pain scores: Pre-ERAS group = 2 Post-ERAS group = 1.4 *Statistically significant.* LOS (median, days): Pre-ERAS group = 10 Post-ERAS group = 7 *Statistically significant.*	Overall, adherence to the ERAS elements of the pathway was statistically more common in the MIAVR-ERAS group.

3.4. Types of guidelines that were or were not implemented

All guidelines that were referenced in the included articles can be found in Table 1. The most frequently referenced guidelines were the Enhanced Recovery after Surgery Society Consensus guidelines (n=13), and the WHO Surgical Safety Checklist (n=6). The ERAS guidelines were originally developed for colorectal surgery but there are now ERAS guidelines for 15 other surgical specialities. ERAS was designed to improve outcomes after surgery by facilitating quicker patient recovery. The guidelines are tailored around three stages: Stage 1, is focused on preoperative care, a patient's health is optimised through diet and physical exercise, risk assessments are carried out and starvation is

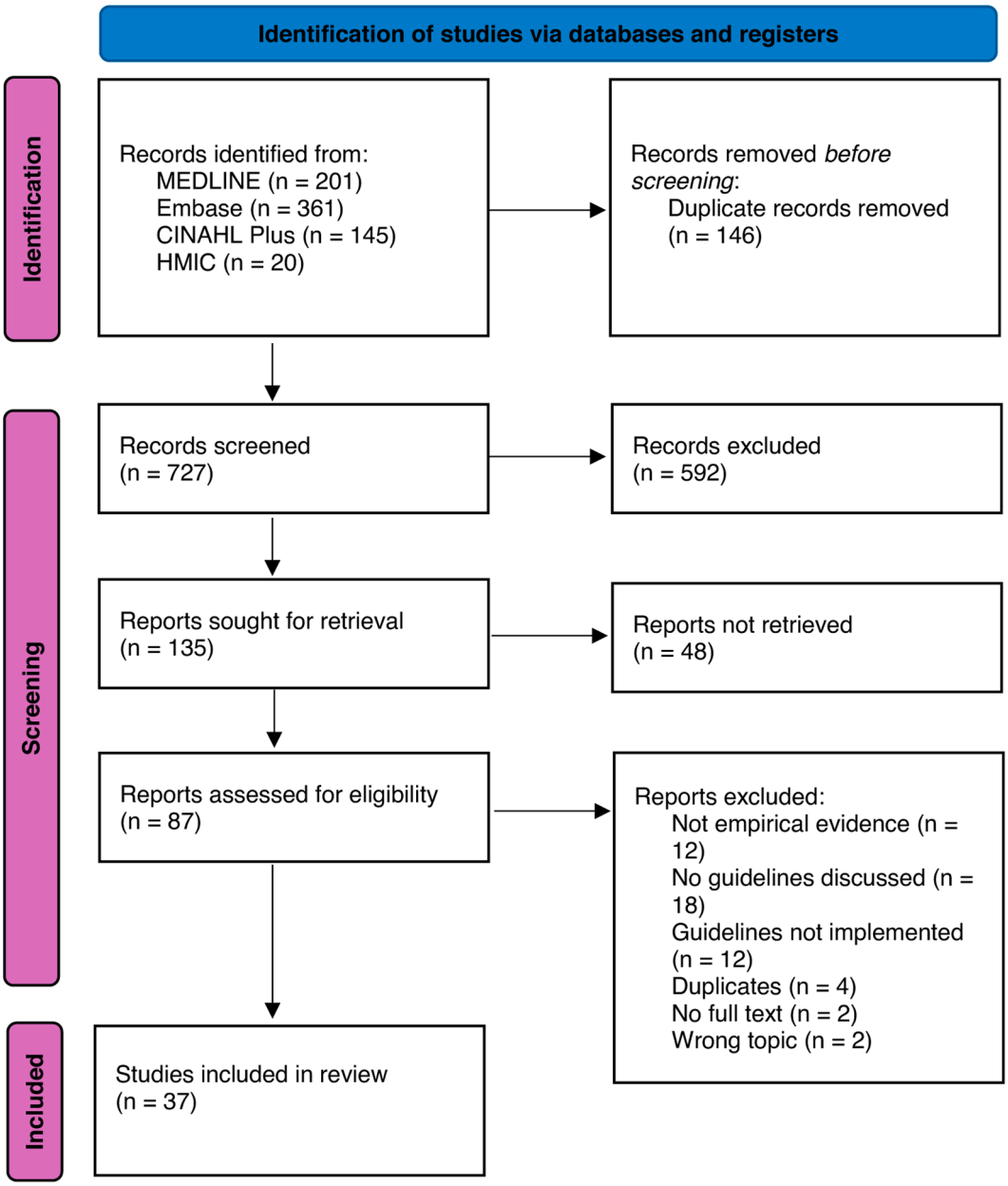

Fig. 1. PRISMA flow diagram.

reduced through carbohydrate loading drinks. At stage 2, surgery takes place (minimally invasive surgery is favourable). Stage 3 involves postoperative care, where there is a structured approach to pain relief, early mobilisation, and early nutrition[50] .

The WHO surgical safety checklist (SSC) was developed based on the WHO Guidelines for Safe Surgery 2009[51]. It consists of a 19-item checklist with three sections to be completed before the induction of anaesthesia, before skin incision and finally, before the patient leaves the operating room. The WHO SSC aims to decrease errors and adverse events and increase teamwork and communication in surgery[51].

Most of the studies assessed how HCPs implemented the guidelines and the impact on patient outcomes. The samples of patients varied in terms of their surgical procedures, demographic characteristics, and comorbidities. HCPs who were implementing guidelines included healthcare assistants, nurses, surgeons, and anaesthetists. Some studies collected outcome data from staff rather than relying on patient reported outcome measures. Most studies compared patient outcomes in groups that had implemented guidelines or protocols, and implementation strategies/interventions based on guidelines versus those where implementation had not occurred ($n = 27$).

Gabriel et al.[26] compared adherence to guidelines and patient outcomes following the publication of the Germans S3 Guidelines but did not compare pre- and post- implementation. Cui et al.[21] compared two age groups of patients, '65–79 years of age and '80 years and above' to identify the role age plays on patient outcomes when implementing ERAS protocols but did not compare pre- and post- implementation. Jeong and Kim[30] assessed to what percentage the components from ERAS protocol for gastric cancer were being implemented, but not the impact on patients, as did Costello et al.[20] with the American Society of Anaesthesiology's guidelines, and Ukawa et al.[44] with the CDC and Japanese Association for Infectious Disease guidelines. These publications therefore only demonstrate whether national guidelines are being implemented, and not their impact. Ceresoli et al.[52] compared outcomes in patients depending on their level of adherence to ERAS protocols. Others did not have a comparison element, instead they assessed patients or staff experiences with guidelines or strategies after

implementation had occurred[38,39,42,43,45]

3.5. Impact of implementing guidelines

The impact of guideline implementation could be grouped into three categories: 1) morbidity and mortality; 2) length of stay and readmission; 3) changes in practice.

1) Morbidity and mortality

Measures of morbidity improved significantly in 13 (35 %) of the studies as a result of implementing guidelines. The guidelines that led to these improvements were the:

- The enhanced recovery after surgery (ERAS guidelines, protocols, and pathways, for the following surgeries: colorectal[14], liver[31,46], colorectal[47], bladder[18] and cardiac[48].
- The 2014 revised Dutch colorectal cancer guideline[22].
- The Danish Clinical Guidelines on oral hygiene before thoracic surgery[40].
- The perioperative blood glucose monitoring and insulin infusion protocol[33].
- The American Society of PeriAnesthesia Nurses hypothermia guideline[32]
- The Dutch National Perioperative Safety Guidelines[24]
- The Multimodal Perioperative Pain Protocol[23]
- The WHO surgical safety checklist[15].

Gandaglia et al.[27], found that after implementing the EAU recommendation for reporting and grading complications, a significantly higher complication rate was identified compared to pre-implementation of the recommendation. Whilst this may seem negative, it meant that more complications were able to be detected that would have otherwise been missed. Whereas Leijtens et al.[35] demonstrated how some guidelines could lead to worse outcomes and found a higher complication rate in patients who had received a high-dose bridging therapy as per the American College of Chest Physicians (ACCP) guidelines compared to patients that did not receive the high-dose bridging therapy. High-dose bridging therapy refers to the replacement of long-term Vitamin K Antagonist (VKA) with short-acting Low-molecular-weight heparin (LMWH).

Mortality was reported to significantly improve in three publications as a result of implementing the 2014 revised Dutch colorectal cancer guideline[22], the WHO surgical safety checklist[34], and one of the recommendations from the Dutch National Perioperative Safety Guidelines[24]. Mortality was found to worsen significantly in one publication in the post implementation of the WHO surgical safety checklist, whilst authors cited that it was likely not due to the checklist, the finding could not be ignored[15].

2) Length of stay and readmission

Significant decrease in length of stay (LOS) was identified in 10 publications when the following guidelines were implemented:

- ERAS guidelines, protocols, and pathways[31]; (A. J.[46]);[14,18,48,52].
- WHO surgical safety checklist[34].
- Perioperative glycaemic management pathway (based on ERAS and Diabetes Canada guidelines)[41].
- 2014 revised Dutch colorectal cancer guideline[22].
- Dutch National Perioperative Safety Guidelines[24].

Alternatively, Leijtens et al.[35] found that implementing the ACCP recommendation for administering a bridging regimen, was associated with a significant increase LOS compared to patients who did not receive it.

A significant decrease in readmission was identified when the ERAS protocols in Edney et al.'s study were implemented[31], but the opposite was found in Chiang et al.'s study[18].

3) Changes in HCP practice and perceptions

Molina et al.[37] shared survey findings with HCPs before and after implementation of the WHO Surgical Safety checklist and found significant improvements in the perspective that HCPs would feel safe as a patient in their operating room. However, there were still <50 % of HCPs that thought this, highlighting a concern for patient safety. Haugen et al.[28] implemented a National Patient Safety Program, that incorporated the WHO Surgical Safety Checklist, and found that following implementation of the program, there was a significant increase in the majority of the domains of the Hospital Survey on Patient Safety Culture (HCPs perceptions of their organisation's safety culture). Aviles et al.[13] highlighted improved team morale and increased emphasis on patient-centred outcomes as positive consequences from ERAS implementation.

Some of the publications reported changes in screening, prescribing and treatment decisions and plans, which could have been based on the patients' morbidity/pain, and clinician decision. Publications that raised this included the significant reduction in long term opioid use, as they were not being prescribed postoperatively as frequently following ERP implementation[31] (A.J.[46]), significant reduction in morphine milligram equivalents prescription following implementation of the Perioperative pain management protocol based on American Academy of Otolaryngology-Head and Neck Surgery[16], significant reduction in oxycodone milligram equivalents taken in the population of patients where the Multimodal Perioperative Pain Protocol was implemented[23]. A significant reduction in use of chemotherapy, and significant increase in surgery alone was also discussed following introduction of the revised Dutch colorectal cancer guideline[22]; Ruzycki et al.[41] reported that as a result of their perioperative glycaemic management pathway, significantly more patients were being screened for risk of postoperative hyperglycaemia; and Boaz et al.[15] and Pedersen et al.[40] demonstrated that fewer antibiotics were being administered in the patients where the WHO surgical safety checklist and the Danish Clinical Guideline on oral hygiene had been administered.

3.6. Factors acting as enablers and barriers to implementation of guidelines

A total of five (14 %) articles discussed factors that enabled the implementation of guidelines, with staff engagement being the most common enabler. Staff reported the following engagement approaches, such as: education and training via lessons and workshops, ongoing feedback to improve preventative practices, buy-in amongst staff to ensure all members of the multi-disciplinary team (MDT) within perioperative care are aware of the guideline recommended care[34,38,39,43]. Tanner also highlighted that conducting an audit to understand a site's contextual issues before implementing guidelines were helpful[43]. A positive organisational culture, such as collaboration, information sharing, good staff morale, professional growth, and job satisfaction, amongst others, in hospitals was also associated with higher adherence to both the Centers for Disease Control and Prevention (CDC) Hospital Infection Control Practices and the Japanese Association for Infectious Diseases Guideline for Antibiotic Use[44].

There were 14 (38 %) publications that discussed barriers during the implementation of guidelines. The common barriers included:

- Limited knowledge on the disease/condition or procedure the guidelines were targeted at[17,38].
- A misunderstanding or lack of awareness that local hospital policies based on guidelines, or the guidelines themselves exist[17,43,45].

- General resistance to the guidelines or implementation strategy[24,39,42]; (A. J.[46]).
- A lack of training on how to implement what is recommended by guidelines[17,45].
- A barrier shared by staff who felt like they were excluded from involvement in developing the initial stages of WHO checklist specific to their hospital, and felt it was 'thrown' on them without any background information[39].
- Staffing issues were also a prominent barrier in implementation, general understaffing in hospitals and staff rotations where new staff were not always kept updated with the guidelines[14,24,41].
- Issues with prioritising other activities in perioperative care rather than implementing the guidelines or implementation strategies were reported,[14,24,38] especially as implementing some of the implementation strategies of guidelines such as completing the WHO checklist creates a larger workload on an already burdened workforce[39].
- Issues of determining who should be responsible for implementing guidelines were reported as were issues getting relevant members of the MDT involved[20,24,38,43]. Özbay et al.[45] reported that there was a lack of support from surgeons, nurses, and anaesthetists.
- The availability of equipment or resources required for implementation was also flagged as a barrier[13,38,42,43,45]
- Detering et al.[22] raised a concern that, with modern advances in personalised treatment options, an increasing number of therapeutic options will not always fall within the guideline recommended care. This will make guideline development and evaluation of their impact even more challenging.
- The COVID-19 pandemic was reported in two publications as a barrier to implementation; due to the restrictions and changes to hospital settings, clinical practice, and care delivery[41,52].

3.7. Limitations of implementation studies cited by authors

The authors highlighted some of the limitations they faced when conducting their research on implementing guidelines. This included gathering information which was obtained retrospectively and may be inaccurate or underrepresent a patient's symptoms and cannot determine causality[13–16,18,34]. Another issue was being unable to control for confounding factors[23,24,33,47]. Linked to this, was issues with multiple VTE programs being implemented simultaneously, meaning authors could not conclude which program had contributed to the decreased VTE rates[18]. Another issue was that adherence to guidelines or clinician decisions may have been dependant on clinicians knowing they were being evaluated, they may not have adhered to the guidelines if they weren't being assessed[26,31,48] and that the Hawthorne effect[24] may have occurred in patient reporting.

Another limitation identified was the missed evaluation, compliance or completeness of guideline implementation[18,34], or when follow-up time for analyses was identified as short, perhaps missing the longer term impact of implementation[22,36,42]; (A. J.[46]). Munday et al.[38] and Molina et al.[37] indicated that their studies assessed beliefs and perceptions rather than practice by staff or patient outcomes. Small sample sizes[13,14,20,22,32,33,35,39] and selection bias[24,36,44] in patients and HCPs were common limitations reported in the articles.

3.8. Recommendations cited by authors for future guideline implementation

Recommendations made by the authors for future guideline implementation could be grouped into those that were specific to the disease area of interest, and those related to recommendations for implementation research more generally. The broader implementation recommendations included providing training to all members of a multidisciplinary team on the implementation of guidelines[20,30,45], conducting longer-term evaluation with larger sample sizes (and possibly randomised control trials[33]) of guideline implementation, assessing the effectiveness of guidelines and integrating guideline implementation in quality improvement initiatives[13,14,17,19,20,39,41]; Haugen et al.[28].[42] suggested the further promotion of national guidelines to encourage their widespread use, and Haugen et al.[28], flagged that awareness raising needs to take place across the MDT. Tanner et al.[43] recommended involving patients in the development of guidelines.

4. Discussion

The review identified 34 studies that implemented guidelines to improve perioperative patient safety. The guidelines varied, but the most common guideline was the ERAS, implemented across various surgical procedures, hospitals, and patient demographics. Most studies evaluated the impact of implementing the guidelines, often in terms of morbidity, mortality, readmission, and LOS.

Of the 25 publications that assessed morbidity, 14 indicated an improvement, whereas no improvement was found in 11 studies. ERAS was the most prominent guideline implemented, with 12 studies (32.4 %) reporting on ERAS. The impact of ERAS in terms of morbidity was split equally between improvement and no improvement. Three studies reported an improvement in mortality, but all three had implemented different guidelines. There was also a decrease in LOS in 8 studies and a decrease in readmission in 3 studies.

Barriers in implementation discussed by staff included under-resourced settings and limited time available. A common theme was that guidelines are often developed without considering the impact of implementing them on the ground. Guidelines should be developed in line with the SEIPS (System Engineering Initative for Patient Safety) framework that considers tasks, tools and technology, organisation, external environment, and the internal environment rather than just individual practices, SEIPS also encourages looking for interactions rather than linear, cause and effect relationships and can be used proactively and reactively due to its systems approach[53,54]. Finally, as staff are often under-resourced and, in some instances, staff move across hospital settings, patients will likely be treated by several members of staff, therefore it is important that all staff across the board are aware of guideline recommended care and are prepared to implement this[55].

We found limited evidence of the evaluation of the implementation and impact of guidelines in the articles included in this review. This represents a notable gap in the literature as we cannot fully understand changes carried out at local levels to implement national guidelines, the factors that might have acted as barriers and enablers in implementation and whether guidelines that might be actively promoted by professional bodies are producing the intended effects on clinical outcomes and patient satisfaction with care.

4.1. Strengths and limitations

This review was based on a comprehensive search of the available data, across four key, scientific databases, however, we limited the number of databases searched to ensure we were not duplicating articles. This makes it difficult to be sure other publications were not missed on other databases. International publications were also included as we did not limit our search to UK or NHS based guidelines, therefore the final figure of 37 publications included is a strength of this review. The reviewers worked together to ensure consistency and reduce bias, cross-checking 25 % of each other's decisions at the study selection stage and full text screening stage.

In terms of limitations, a large majority of publications where non-randomised studies as randomised controlled trials would not have been appropriate due to the emergency nature of some of the procedures. Some studies conducted matching to reduce the effects of confounders, but this does not ensure all confounding effects have been removed., This fact should be considered when interpreting the findings

of these studies. Similarly, across included publications, the mean age of participants was 50 years or over and advancing age has been associated with increased frequency of complications compared to younger counterparts[56,57], a factor that should be considered when interpreting patient morbidity post guideline implementation. Finally, studies generally only looked at one set of guidelines and compared the outcomes of implementation at pre and post implementation timepoints, making it difficult to identify benefits of implementation. The interaction between hospital guidelines and national guidelines, is also not explored in any of the literature covered in this review, limiting our understanding of how staff make decisions on which guidelines to use in their daily practice.

4.2. Recommendations

There is a gap in the literature on the impact of published national guidelines on patient safety, and more research should be conducted in this field. Future research should delve deeper into the wider impact of the guidelines on staff wellbeing and changes in daily practice. to provide a better understanding of how organisational factors can shape patient clinical outcomes such as morbidity, LOS, readmission, and mortality as well as patient satisfaction. Despite identifying a good number of publications which included exploration of high- and middle-income countries (HICs/MICs), there appears to be a distinct lack of evidence from low-income countries (LICs). LICs have higher rates of perioperative mortality and morbidity than HICs[58], they also often have additional patient safety challenges.

5. Conclusion

With regards to all three research questions, national guidelines within perioperative care are being implemented, the impact of these guidelines on patient safety was mainly measured through improved patient outcomes, the majority of publications found improvements in patient outcomes as a result of guideline implementation. However, we found gaps in the literature regarding the processes used to implement the guidelines, their variation across sites and the experiences of staff designing and implementing guidelines. Future research should consider assessing the impact of national guidelines on perioperative care as well as the factors that might be acting as barriers and enablers in their implementation.

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CRediT authorship contribution statement

Gráinne Brady: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation. **Sigrún Eyrúnardóttir Clark:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Duncan Wagstaff:** Writing – review & editing. **Cecilia Vindrola-Padros:** Writing – review & editing, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

(A) OVID MEDLINE

1. ("Patient safety" or patient or hygiene or prevention or infecti* or "unsafe care" or harm or "surgical procedure" or safety or safe or hospital* or surger* or "rapid recovery" or "operating room" or "operating theatre" or complication* or anaesthetic or anaesthesia or anesthetic or anesthesia).ti.
2. ("recommendation" or "guideline" or guidance or implement* or "national recommendations" or "task force" or "consensus development" or "health planning guideline" or "clinical guideline").ti
3. ("perioperative care" or "perioperative surgery" or "surgical preparation" or perioperative or preoperative or "pre-operative" or "post-operative complications" or "intraoperative care" or "postoperative care" or "intraoperative complications" or "peri-operative").ti.
4. 1 and 2 and 3
5. limit 4 to (humans and yr="2014 -Current")

EMBASE

1. ("Patient safety" or patient or hygiene or prevention or infecti* or "unsafe care" or harm or "surgical procedure" or safety or safe or hospital* or surger* or "rapid recovery" or "operating room" or "operating theatre" or complication* or anaesthetic or anaesthesia or anesthetic or anesthesia).ti.
2. ("recommendation" or "guideline" or guidance or implement* or "national recommendations" or "task force" or "consensus development" or "health planning guideline" or "clinical guideline").ti.
3. ("perioperative care" or "perioperative surgery" or "surgical preparation" or perioperative or preoperative or "pre-operative" or "post-operative complications" or "intraoperative care" or "postoperative care" or "intraoperative complications" or "peri-operative").ti.
4. and 2 and 3
5. limit 4 to (human and yr="2014 -Current")

CINAHL Plus

TI ("patient safety" or patient or hygiene or prevention or infecti* or "unsafe care" or harm or ""surgical procedure" or safety or safe or hospital* or surger* or "rapid recovery" or "operating room" or "operating theatre" or complication* or anaesthetic or anaesthesia or anesthetic or anesthesia) AND TI ("recommendation" or "guideline" or guidance or implement* or "national recommendations" or "task force" or "consensus development" or "health planning guideline" or "clinical guideline") AND TI ("perioperative care" or "perioperative surgery" or "surgical preparation" or perioperative or preoperative or "pre-operative" or "post-operative complications" or "intraoperative care" or "postoperative care" or "intraoperative complications" or "peri-operative")

HMIC Health Management Information Consortium

1 ("Patient safety" or patient or hygiene or prevention or infecti* or "unsafe care" or harm or "surgical procedure" or safety or safe or hospital* or surger* or "rapid recovery" or "operating room" or "operating theatre" or complication* or anaesthetic or anaesthesia or anesthetic or anesthesia).ti.
2 ("recommendation" or "guideline" or guidance or implement* or "national recommendations" or "task force" or "consensus development" or "health planning guideline" or "clinical guideline").ti.
3 ("perioperative care" or "perioperative surgery" or "surgical preparation" or perioperative or preoperative or "pre-operative" or "postoperative complications" or "intraoperative care" or "post-operative care" or "intraoperative complications" or "peri-operative").ti.
4 limit 3 to yr="2014 - 2024″

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