The impact of surgical safety checklists on theatre departments : a critical review of the literature

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Table 1 - Summary of included studies

Authors and date	Summary of methods	Summary of main findings
Askarian et al (2011)	Pre/post interventional cohort study of patients. Pre-intervention 3 months: 144 patients. Post intervention 3 months: 150 patients.	• Rate for 'any complication' rate reduced from 22.9% to 10% (P=0.03). • After intervention, 5 items on checklist in total compliance (pulse oximetry, risk of >500ml blood loss, patient-specific concerns, essential imaging displayed, and issues with equipment).
Avansino et al (2011)	Prospective audit for compliance carried out over a 12-month period. 190 staff participants, 129 (67%) responded (included surgeons, anaesthetists and nurse anaesthetists, and theatre staff).	• Statistically significant increase in total monthly compliance over a 12-month period after implementation (1,318 of 1,493 [88%] vs 1,414 of 1,463 [97%] P<0.001). • Significant difference in overall positive agreement with statements when respondents stratified by role. Surgeons more positive agreement than anaesthesia providers, and both greater positive agreement than OR staff (P=0.001).
Aveling et al (2013)	Ethnographic case studies. Semi-structured interviews - 39 staff interviewed (anaesthetists, surgeons, theatre staff, management and administrative staff) – purposive sampling so that sample was diverse. Non-standardised observations and informal discussions, collection of relevant documentation. Thematic analysis of data.	• Many staff value checklist. • Some resentment was present in all settings. • Compliance was considerably higher in the UK settings. • Hierarchical relationships were a major barrier to implementation in all settings.
Bergs et al (2013)	Systematic review and meta-analysis. 7 papers identified for review, 1 of which was excluded for meta-analysis as it was a reanalysis of a sub-cohort reported in another study.	• Meta-analysis demonstrated a significant effect of the checklist on any complication (RR 0.59, 95 per cent c.i. 0.47 to 0.74), mortality (RR0.77, 0.6 to 0.98), and surgical site infection (RR 0.57, 0.41 to 0.79). • Pooled analysis showed significant improvements in postoperative complications following introduction of the checklist.
Böhmer et al (2012)	Staff survey carried out pre implementation and at 3 months, 18 months and 24 months post implementation. Included anaesthetists, anaesthetic nurses and surgeons - 99	• Verification of written consent for surgery (P<0.01), surgical site marking (P<0.01) and time management (P<0.05) were rated more positively over time by

	respondents.	anaesthetists and nurses. • Items relating to communication were rated less positively at 18 and 24 months than at 3 months. • Surgeons rated being better informed about the patients (P<0.05), the planned operation (P<0.01) and assignment of tasks (P<0.01) progressively more positively over the time.
Fourcade et al (2012)	Random sample of 80 patients per centre to determine compliance rate -1440 surgical procedures, leading to 1299 checklists handed in and 28,578 item analysed for compliance. Collective and semi-structured individual interviews used to develop questionnaire sent to all 18 centres. Voluntary staff interviewed collectively (16 – 4 surgeons, 3 anaesthetists, 2 nurses, 6 senior nurses and 1 quality manager). 8 other key theatre staff interviewed individually. Direct observation of checklist use in 2 centres - 1 identified as having low (52%) and 1 high (84%) proportion of complete checklists.	• Mean compliance rate was 90.2% (range 0-100). • Mean completeness rate was 61% (range 0-84). • Eleven barriers to effective checklist implementation identified. • Most common barrier (16 centres) was duplication with existing processes. • Next most common barrier (10 centres) was lack of communication between surgeon and anaesthetist at the end of the procedure.
Gagliardi et al (2014)	Qualitative interviews - 51 staff (29 nurses, 13 surgeons, 9 anaesthetists). Thematic analysis of responses.	• Checklist was inconsistently reviewed and often inaccurately documented as complete. • Adherence to checklist influenced by multiple issues.
Gillespie et al (2014)	Systematic review and meta-analysis. 7 studies representing 37,399 patients included in meta-analysis, all cohort studies.	• Use of checklist led to a reduction in any complication, wound infection and blood loss. • There were no significant reductions in mortality, pneumonia or unplanned return to theatre.
Haugen et al (2012)	Prospective controlled intervention study using pre and post intervention staff surveys using intervention and control groups. Pre and post intervention data collected during two 4 week periods. Intervention group (orthopaedic, thoracic and neurosurgery) – 349/575 respondents. Control group (ear, nose and throat, maxillofacial, plastic, endocrine, urology, gastrointestinal, obstetric and gynaecological	• Checklist compliance ranged from 77% to 85%. • Significant positive changes in the checklist intervention group for the culture factors ‘frequency of events reported’ and ‘adequate staffing’. • Overall the intervention group reported significantly more positive culture scores, including at baseline.

	surgery) – 292/569 respondents.	
Lepänluoma et al (2013)	Restrospective analysis of patient records for length of hospital stay, reported adverse events, and readmissions (pre-intervention: 83 patients, post-intervention: 67 patients) compared with staff questionnaire study on communication and attitudes from previous work (Takala et al. 2011). Consistency of theatre documentation and patient records also assessed.	• Communication between the surgeon and the anaesthetist was enhanced. • Unplanned readmissions fell from 25% to 10 % after checklist implementation (P=0.02). • Wound complications decreased from 19% to 8% (P=0.04).
Lyons & Popejoy (2014)	Meta-analysis of 4 outcomes (teamwork and communication, morbidity, mortality, and compliance with safety measures. 19 studies included.	• Effect size of checklist use on teamwork and communication was 1.180 (P=0.003), morbidity was 0.123 (P=0.003), mortality was 0.088 (P=0.001) and on compliance with safety measure was 0.268 (P<0.001).
O'Connor et al (2013)	Semi-structured interviews of 14 theatre staff (6 surgeons, 4 anaesthetists, and 4 theatre nurses) leading to development of a 27 item questionnaire. 107 respondents (42.6% response rate) to questionnaire (41 surgeons, 33 anaesthetists, and 33 theatre nurses).	• Overall attitudes towards effect of the checklist on safety and teamwork were positive. • Nurses were significantly more sensitive to barriers to the use of the checklist than surgeons or anaesthetists.
Papaconstantinou et al (2013a)	Pre/post implementation staff surveys (1 month before, 1 year after only those who responded in the pre group were included in the post group). Pre-implementation: 469, post-implementation: 355 (lower due to natural attrition). Overall response rate 53%, 64% for post group vs 45% for pre group (P<0.01).	• Overall improvement in awareness of patient safety and quality of patient care. • Significant improvement in perceptions of value and participation in the time out process, in surgical team communication, and establishment and clarity of patient care needs. • Indication that barriers in communication still exist. • 65% of respondents perceived checklist improved patient safety and care. • Strong negative perception of theatre efficiency.
Papaconstaninou et al (2013b)	Retrospective review of operations 1 year pre and 1 year post implementation of checklist - 35,570 operations: pre-implementation: 17,204, post-implementation: 18,366.	• No significant difference between groups for operating time (P=0.93), operation time (P=0.66), first starts on time (P=0.15), and same day cancellations (P=0.57). • The mean theatre disposable cost was significantly lower ($70/operation) for the post group (P<0.01).
Patel et al (2014)	Systematic review. 16 studies included.	• Checklists have been shown to significantly improve

		patient safety. • This reduction has been shown to correlate with increased checklist compliance.
Pickering et al (2013)	Direct observation of 294 surgical procedures across 5 NHS sites.	• Time out was attempted in 87.4% of operations and sign out in 8.8%. • Surgical specialty did not affect time out or sign out attempt frequency (P=0.453). • Time out attempt frequency, information communicated, all team present, and active participation varied between hospitals (P<0.001).
Russ et al (2013)	Systematic review. 20 studies included.	• Evidence suggests that checklists improve the perceived quality of teamwork and communication and reduce observable errors relating to poor team skills. • Evidence suggests that when used sub-optimally checklists may have a negative impact on the function of the team.
Russ et al (2015a)	Prospective longitudinal interview study. Used semi-structured interview schedule conducted over the phone - 119 staff across professional groups (37 surgeons, 31 anaesthetists, 23 nurses, 18 operating department practitioners, 10 radiographers). Thematic analysis of data.	• Identified a large variation in how the checklist was initially implemented, both between and within hospitals. • Identification of 11 themes representing barriers to checklist implementation, and 9 themes representing facilitators.
Sewell et al (2011)	Prospective audit of patients pre and post intervention (pre-intervention: 480, post-intervention:485. Staff survey (100 staff).	• Checklist use significantly increased from 7.9% to 96.9% (RR 12.2; 95% CI 9.0-16.6). • Checklist use was not associated with a significant reduction in early complication and mortality. • 77% of staff thought the checklist improved team communication.
Takala et al (2011)	Prospective staff (surgeons, anaesthetists and circulating nurses) survey pre/post checklist implementation (pre-implementation:901, post-implementation:847).	• Identity of patient confirmed more frequently, and team members' awareness of roles improved. • Nurses and anaesthetists thought communication improved post implementation. • Anaesthetists and surgeons discussed critical events

		preoperatively more frequently. • Fewer communication failures (43 vs 17, P<0.05) reported with the checklist.
Urbach et al (2014)	Pre/post implementation survey study of procedures, 3 months each period (pre-implementation:109,341, post-implementation: 106,370).	• No hospital had a significant change in operative mortality after checklist introduction. • Significant but small and clinically unimportant decrease in adjusted length of stay. • No significant improvement in adjusted risk of an emergency department visit within 30 days after discharge, or of readmission. • Risk of most complications did not differ significantly. • Only complication where risk significantly decreased was unplanned return to theatre.
Yuan et al (2012)	Pre/post interventional study of consecutive adult (≥16 years of age) patients. Pre-implementation:232, post-implementation:249.	• Checklist associated with significant (P<0.05) improvements in overall surgical process and outcomes. • Checklist significantly associated with reduction of surgical site infections and reduced surgical complications.