**Supplemental Digital Content 1**

**Search Strategy**

Databases used: MEDLINE database via Pubmed, Scopus, Web of Science, ERIC, CINAHL, PsycINFO (ProQuest) and Education Research Complete

Pubmed Search: ((general surgery[MeSH Terms]) OR (surgical procedures, operative[MeSH Terms]) OR (video-assisted surgery[MeSH Terms]) OR (surgery, computer-assisted[MeSH Terms]) OR (minimally invasive surgical procedures[MeSH Terms]) OR (surgeons[MeSH Terms]) OR (surgery department, hospital[MeSH Terms]) OR (surgeon[Title]) OR (surgical[Title]) OR (preoperative[Title]) OR (perioperative[Title]) OR (postoperative[Title])) AND ((professional practice gaps[MeSH Terms]) OR (diffusion of innovation[MeSH Terms]) OR (patient reported outcome measures[MeSH Terms]) OR (dissemination[Title]) OR (adoption[Title]) OR (implementation[Title]) OR (behavior change[Title]) OR (feedback[Title]) OR (benchmarked[Title]) OR (mentoring[MeSH Terms]) OR (coaching[Title]) OR (opinion leaders[Title])) Sort by: Best Match Filters: Publication date from 2012/01/01 to 2012/12/31; Humans

The other databases had a variation of controlled language and keywords similar to those listed above with minor modifications based on proprietary thesauruses.

## Supplementary Table - Characteristics of Selected Surgical Practice Change Articles

| Author, publication year, region | Study setting, design, and topic | Barriers | Facilitators | Neutral factors |
|---|---|---|---|---|
| Abdelsattar, 2017<br>USA | • Regional/national<br>• Retrospective cohort<br>• Variation in adoption of video-assisted thoracoscopic lobectomy and outcomes | • Limited personnel and expertise<br>• Surgeons' personal preference contrasting with change | - | - |
| Abrishami, 2014<br>Europe | • Regional/national<br>• Qualitative<br>• Adoption dynamics for da Vinci robot | - | • Representation as innovative<br>• Surgeon benefits (e.g., improved ergonomics, achieving scientific excellence)<br>• Outperforming competition<br>• Accessibility and reduced financial risks<br>• Prioritization of patients' choices and the public's expectations | - |
| Aiken, 2013<br>Europe | • Regional/national<br>• Survey<br>• Usage of antibiotic prophylaxis in elective inguinal hernia repair with mesh | - | • Guidelines<br>• Belief that practice was more effective | - |
| Alam, 2015<br>Europe | • Hospital(s), nonspecific*<br>• Retrospective cohort<br>• Diffusion of laparoscopic bariatric surgery | - | • Specific population characteristics (e.g., higher socioeconomic status) | - |
| Ament, 2017<br>Europe | • Academic and community hospitals<br>• Qualitative<br>• Sustainability of Enhanced Recovery after Surgery (program for colonic surgery and short stay program from breast cancer surgery) | - | • Opportunities for hospital-specific adaptation of program<br>• Cost-effectiveness<br>• Low staff turnover<br>• Effective communication<br>• Patient satisfaction, inter-facility networking, program audits with external policies and incentives | - |
| Ament, 2014<br>Europe | • Hospital(s), nonspecific*<br>• Qualitative<br>• Hospital-specific strategies to maintain or improve Enhanced Recovery after colon and breast cancer surgery | - | • Internal audit and feedback of outcomes<br>• Administrative reminders<br>• Educational meetings<br>• Physical environment conducive to implementation<br>• Effective care process coordination<br>• Task delegation and defined staff roles | - |
| Apramian, 2015<br>Canada | • Academic center(s)<br>• Qualitative<br>• Decision-making and influence by others regarding adopting variations on surgical procedures | • Complexity of conducting surgical clinical trials (e.g., resources, required skillset) | • Seeking professional improvement<br>• Easily reproducible<br>• Positive impact on surgeon quality of life<br>• Followed principles of surgery (accepted rules of conduct)<br>• Story sharing<br>• Trust or logic is demonstrated<br>• Spreading variation or the logic behind it | • Reputational risk<br>• Logistics<br>• Career trajectory |
| Arakawa, 2016<br>Asia | • Academic and community hospitals<br>• Survey<br>• Implementation of a cooperative program between regional cardiology and cardiac surgery facilities for post-acute management of myocardial infarction | • Poorly developed communication methods<br>• No perceived necessity or organizational merit<br>• Increased duties of doctors | • Specific hospital characteristics (e.g., larger hospitals)<br>• Specialists for specific conditions (e.g., stroke)<br>• Larger volume of cardiology care (e.g., cardiac surgery and coronary artery bypass graft) | • Prescriptions for patient education program-formulated exercise |

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| Arts-de Jong, 2015<br>Europe | • Academic and community hospitals<br>• Qualitative<br>• Factors influencing the choice of risk-reducing salpingo-oophorectomy or risk-reducing salpingectomy with delayed oophorectomy | • Perceived negative outcomes or increased risk<br>• Specific patient characteristics (e.g., family influence, health history)<br>• Complexity of decision-making or ease of deferral<br>• Limited knowledge and uncertainty of benefits<br>• Increased costs and limited hospital capacity<br>• Lack of cooperation between hospitals | • Perceived positive outcomes and benefits<br>• Sufficient evidence<br>• Cooperation in multidisciplinary teams | - |
| Bailin, 2017<br>USA | • Academic center(s)<br>• Observational cohort<br>• Predictors of urinary tract infection treatment in patients undergoing total hip or knee arthroplasties | • Presentation of specific patient clinical conditions | • Existing evidence<br>• Presentation of past and current study results | - |
| Barbash, 2014<br>USA | • Regional/national<br>• Retrospective cohort<br>• Relationship between robot acquisition and volume of radical prostatectomies | - | • Competition between hospitals<br>• Specific hospital and population characteristics (e.g., large or teaching hospitals, more surgical specialists)<br>• Specific patient characteristics (e.g., private insurance) | - |
| Bekelis, 2017<br>USA | • Regional/national<br>• Retrospective cohort<br>• Exnovation and de-adoption of carotid revascularization | • Higher shares of revenue for the practice | • Tenured, experienced surgical staff | - |
| Bekelis, 2014<br>USA | • Regional/national<br>• Retrospective cohort<br>• Association of intensity of neurosurgical care with diffusion of cerebral aneurysm coiling | • Specific hospital characteristics (e.g., large hospital size, urban) | • Specific patient characteristics (e.g., higher income)<br>• More trained surgeons<br>• Competition between providers, physician characteristics<br>• Increased volume of neurosurgical care | - |
| Bergholm, 2014<br>Europe | • Hospital(s), nonspecific*<br>• Qualitative<br>• New methods and technology used after dental surgery training program | • Problems with equipment<br>• Inexperienced/untrained personnel<br>• Limited time to provide treatment and information to patients<br>• Disappointment at unfulfilled expectations<br>• Insufficient scientific evidence<br>• Worries about safety and costs | • Interest in learning and taking initiative<br>• Ample preparation<br>• Social support/professional network<br>• Perception of patient benefit<br>• Desire to utilize expensive and extensive training<br>• Guilt for not using equipment<br>• Desire to be an early adopter | - |
| Bousleiman, 2015<br>USA | • Hospital(s), nonspecific*<br>• Survey<br>• Adoption trends of evidence-based obstetrics interventions and associated factors | • Difficulty in drug delivery, cost, insurance coverage | • Knowledge of evidence-based practice<br>• Satisfaction with evidence<br>• Capability of implementing a change | - |
| Boveda, 2018<br>Europe | • Academic and community hospitals<br>• Mixed methods<br>• Use of leadless pacemakers | • Limited device availability, high device cost<br>• Lack of reimbursement<br>• Lack of eligible patients | • New device superior to traditional pacemakers in certain scenarios | - |
| Boveda, 2016<br>Europe | • Regional/national<br>• Survey<br>• Use of subcutaneous implantable cardiac defibrillator | • Lack of availability of devices and high device cost<br>• Lack of reimbursement<br>• Lack of eligible patients | • Specific patient characteristics (e.g., health history, age, risk, vascularity)<br>• Access to newest device/technology<br>• Perception of reduced patient risk | • Training<br>• Complexity of procedure<br>• Patients' choice |

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| Author, publication year, region | Study setting, design, and topic | Barriers | Facilitators | Neutral factors |
|---|---|---|---|---|
| | | • Skepticism about device efficacy | | |
| Brindle, 2018<br>USA | • Hospital(s), nonspecific*<br>• Qualitative<br>• Factors that impact implementation of surgical debriefing | • Loss of leadership support<br>• Poor communication<br>• Cultural challenges<br>• Lack of meaningful feedback, perceived value, and resources | • Leadership engagement and experience<br>• Institutional mandates<br>• Creation of culture of safety (e.g., empowerment, opportunities for feedback) | - |
| Brown, 2016<br>Australia | • Regional/national<br>• Survey<br>• Knowledge, attitudes, beliefs about guidelines for adjuvant radiotherapy after radical prostatectomy (2012) | • Need for individualized care<br>• Perceived lack of evidence in trial data<br>• Concerns about side effects, overtreatment | • Shared-decision making<br>• Multidisciplinary expertise<br>• Awareness of guidelines<br>• Positive attitudes toward practice | Regulatory requirements |
| Brown, 2016<br>Australia | • Regional/national<br>• Follow-up survey<br>• Change in perceptions following 2012 assessment of knowledge, attitudes, beliefs about adjuvant radiotherapy after radical prostatectomy (2015) | • Continued need for individualized care<br>• Continued perceived lack of evidence in trial data<br>• Increased concerns about side effects<br>• Fear of criticism from peers | - | - |
| Bunta, 2016<br>USA | • Regional/national<br>• Observational cohort<br>• Effectiveness of fracture prevention program targeting osteoporosis and bone mineral density test recommendations | | • Systematic program design<br>• Physician and patient education<br>• Collaboration and mentorship<br>• Robust scientific dissemination<br>• Evaluations of site compliance with recommendations | - |
| Callea, 2017<br>Europe | • Regional/national<br>• Retrospective cohort<br>• Diffusion of transcatheter aortic valve implantation | • Reimbursement through capitation<br>• Publication of regional recommendations<br>• Financial plan in place to manage expenditures and deficits | • Specific hospital characteristics (e.g., experience, medium to high volume, internal providers contributed to guidelines)<br>• Reimbursement | - |
| Chang, 2014<br>USA | • Regional/national<br>• Retrospective cohort<br>• Impact of robot-assisted radical prostatectomy adoption on practice patterns and cost | - | • Specific hospital characteristics (e.g., teaching or urban, geographic region, high-volume surgeons) | • Specific patient characteristics (e.g., age, race, insurance status) |
| Cheung, 2017<br>USA | • Regional/national<br>• Retrospective cohort<br>• Adoption pattern and decision-making of robot-assisted technology for partial nephrectomies | - | • High-volume surgeons<br>• Familiarity with robotic platform<br>• Shown to be effective and consistent by early adopters | - |
| Chopra, 2016<br>Europe | • Hospital(s), nonspecific*<br>• Survey<br>• Implementation of custom software for surgical handover | • Unfamiliar with user interface, not user-friendly<br>• Incorrect information entered<br>• Perceived patient safety risks from misinformation | • Increased efficiency and patient safety<br>• Lower provider burden | - |
| Choy, 2013<br>Canada | • Academic center(s)<br>• Qualitative<br>• Adoption of laparoscopic surgery at a hospital in a low-middle income country | • Organizational structure for funding<br>• Hierarchical nature of the local surgical culture<br>• Need to acquire new expertise and skills associated with practice change | - | - |
| Compagni, 2014<br>Europe | • Regional/national<br>• Mixed methods<br>• Spread of robotic surgery and early adopters' role in diffusion | • Perception of practice as difficult or time consuming<br>• Intraoperative complications<br>• Lack of evidence of utility and patient benefit | • Surgeon characteristics (e.g., openness to innovation, desire to be early adopter, increase standing in organization) | - |

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|---|---|---|---|---|
| | | • Financial constraints | • Alignment with organizational culture and reputation<br>• Feasibility of adoption in specific fields (e.g., urology)<br>• Education and training opportunities<br>• Evidence of reproducibility of results and feasibility and safety of procedure<br>• Recruitment of surgeons with experience<br>• Pressure from patients and media | |
| Cook, 2017<br>Africa | • Hospital(s), nonspecific*<br>• Qualitative<br>• Factors affecting post-abortion care and the use of manual vacuum aspiration | • Unreliable supply of resources, staff shortage<br>• Poor care quality and inconsistent training<br>• Senior staff preference for old techniques<br>• Lack of patient feedback and performance measures<br>• Unclear roles and responsibilities<br>• Poor teamwork and power dynamics/differentials<br>• Differing opinions/goals on prioritization<br>• Cultural differences | • Effective training<br>• Availability of ongoing educational opportunities<br>• Positive feelings associated with helping vulnerable population<br>• Cheaper and more efficient<br>• Positive patient outcomes | - |
| Costa ML, 2016<br>Europe | • Regional/national<br>• Retrospective cohort<br>• Effect of a clinical trial (Distal Radius Acute Fracture Fixation Trial) on clinical practice | - | • Presentation and publication of randomized trial results in peer-reviewed journals | - |
| Cundy, 2014<br>Europe | • Global<br>• Mixed methods<br>• Attitudes of early adopter pediatric surgeons toward robot technologies | • Cost of disposable equipment and maintenance of the robot<br>• Instrument size | • Perceived benefit and utility of instruments | - |
| de Groot, 2018<br>Europe | • Academic and community hospitals<br>• Prospective randomized trial<br>• Spread of Enhanced Recovery after Surgery innovation from colorectal to gynecologic teams | - | - | • Influence from a different surgical team within the same hospital |
| de Groot, 2014<br>Europe | • Academic center(s)<br>• Observational cohort<br>• Spontaneous diffusion of Enhanced Recovery after Surgery program in gynecologic oncology surgery | • Lack of utilization of research<br>• Inconsistent/non-standard patient conditions that impact standard procedures<br>• Deep-rooted concern for inflicting patient harm | • Active and organized implementation<br>• Multidisciplinary sharing of best practices<br>• Ease of implementation<br>• Positive patient outcomes | - |
| Dharampal, 2016<br>Canada | • Academic center(s)<br>• Qualitative<br>• Attitudes impacting adoption and compliance of surgical safety checklist | • Evidence not equally supportive across all hospital environments<br>• Practice not functioning in the capacity intended<br>• Perceived provider burden, competing duties, change in time management<br>• Different perspectives based on outcome of the procedure | • Similarity to current practices<br>• Improvements in patient safety<br>• Feasibility<br>• Perceived efficiency | • Hospital setting |
| Farges, 2014<br>Europe | • Regional/national<br>• Retrospective cohort | • Specific hospital and patient characteristics (e.g., female operated | • Specific hospital and patient characteristics (e.g., male patient in a | - |

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|---|---|---|---|---|
| | • Adoption and practice of laparoscopic liver resections and open resections | on in university hospital with large annual caseload) | private hospital with small annual caseload) | |
| Farias-Kovac, 2014<br>USA | • Academic and community hospitals<br>• Retrospective cohort<br>• Impact of capitation on use of primary total hip and knee arthroplasty premium implants | - | • Pricing system with increased physician autonomy<br>• Patient satisfaction<br>• Improved outcomes | • Procedure type |
| Gallego, 2013<br>Australia | • Regional/national<br>• Survey<br>• Factors that influence uptake and diffusion of new health technologies | • Lack of financial resources<br>• Existing clinician or media bias | • Specific hospital characteristics (e.g., public hospital, regulatory approval accessible for private hospitals)<br>• Desire for better patient outcomes and safety<br>• Availability of evidence<br>• Cost-effective | • Peer influence<br>• Political considerations<br>• Patient demand and preferences<br>• Workforce capacity |
| Gams, 2017<br>USA | • Academic and community hospitals<br>• Mixed methods<br>• Barriers to implementation of delayed cord clamping as standard practice | • Unknown criteria for patient selection<br>• Unfamiliarity of procedure and benefits<br>• Hospital policy contradicts the procedure | • Creation of hospital-based guidelines<br>• Institution of mandatory delivery room brief/debrief<br>• Mandatory online education | - |
| Gershengorn, 2013<br>USA | • Hospital(s), nonspecific*<br>• Retrospective cohort<br>• Factors associated with slower removal of technology related to pulmonary artery catheter use | - | • Specific hospital characteristics (e.g., academic)<br>• Surgical intensive care units<br>• Surgeon leadership | - |
| Gillissen, 2014<br>Europe | • Academic and community hospitals<br>• Retrospective cohort<br>• Sustainability of the Enhanced Recovery after Surgery program after implementation | - | • Hospital mandate | - |
| Giusti, 2016<br>Europe | • Hospital(s), nonspecific*<br>• Mixed methods<br>• Attitudes regarding surgical antibiotic prophylaxis | • Provider preferences conflict with recommendations<br>• Patient choice deviates from guidelines<br>• Poor knowledge of hospital data on quality and incidence<br>• Overcrowded hospital environment | • Guidelines shared and communicated appropriately<br>• Trust in group that developed policies<br>• Protection against litigation<br>• Confidence in care team | • Clinical judgment of patient condition<br>• Specific surgeon characteristics (e.g., practice, background, and experience)<br>• Responsiveness to patients' needs<br>• Adherence to norms and ethics<br>• Ability to manage anxiety and stress |
| Gold, 2014<br>USA | • Academic and community hospitals<br>• Qualitative<br>• Adoption and non-adoption of accelerated partial breast radiotherapy | • Disagreement between providers about procedure<br>• Risk associated with early adoption<br>• Lack of willingness or enthusiasm to learn something new<br>• Lack of resources, cost | • Encouragement and enthusiasm from colleagues<br>• Patient demand<br>• Device company interaction<br>• Perceived patient benefit<br>• Professional benefit to early adoption<br>• Financial incentives<br>• Threats to referral base<br>• Randomized clinical trial evidence | - |
| Goutte, 2016<br>Europe | • Regional/national<br>• Retrospective cohort<br>• Use and outcomes of hepatobiliary laparoscopic and open left lateral sectionectomy | - | • Specific hospital characteristics (e.g., university, higher volume) | - |
| Gramlich, 2017<br>Canada | • Hospital(s), nonspecific*<br>• Mixed methods | • Culture of the working environment | • Education regarding patient benefit | - |

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|---|---|---|---|---|
| | • Barriers and facilitators to Enhanced Recovery after Surgery program implementation | • Resistance to change, long-held practices | • Site-specific and intervention-specific customizations<br>• Intervention audits<br>• Multidisciplinary site teams | |
| Haider, 2015<br>USA | • Academic and community hospitals<br>• Survey<br>• Battlefield innovations and impact on civilian trauma practice | • Lack of adequate evidence to support translation of military practices to civilian environment | • Prior military experience<br>• Specific hospital characteristics (e.g., level 1 trauma centers) | - |
| Hart, 2017<br>USA | • Regional/national<br>• Survey<br>• Utilization of and opinions regarding safety and efficacy of lumbar total disk replacement | • Difficulty finding candidates<br>• Concerns with long-term complications<br>• Out-of-pocket costs for patient | • Satisfaction with clinical results<br>• FDA trial involvement | - |
| Herbert, 2017<br>Europe | • Academic center(s)<br>• Qualitative<br>• Facilitators and challenges of implementation of the Enhanced Recovery after Surgery program | • Resistance to change<br>• Perceived impact on personalized patient care<br>• Difficulty obtaining stakeholder buy-in<br>• Patient and staff burden<br>• Disjointed approach and conflicting cultures | • Alignment with evidence-based practice<br>• Leadership and collaboration<br>• Patient and staff education<br>• Access to resources<br>• Physical environment conducive to implementation<br>• Data collection and feedback<br>• Opportunities for hospital-specific adaption | - |
| Hibi, 2014<br>Asia | • Global<br>• Mixed methods<br>• Spread of lap liver resection | • Specific hospital characteristics (e.g., less experience and lower volume) | • Specific hospital characteristics (e.g., academic or community dependent on geographic location, higher volume) | - |
| Hirshoren, 2018<br>Asia | • Academic center(s)<br>• Retrospective cohort<br>• Surgical practice changes after the implementation of new American Thyroid Association guidelines | - | • Guidelines | - |
| Horwitz, 2013<br>USA | • Regional/national<br>• Retrospective cohort<br>• Relationship between cardiac service adoption and neighboring hospitals offering the service | • Nearby competing hospitals with more advanced interventions | • Nearby competing hospitals with similar interventions | - |
| Hsu, 2016<br>Asia | • Hospital(s), nonspecific*<br>• Mixed methods<br>• Intention to use a computer-assisted orthopedic navigation surgery system | - | • Perceived usefulness<br>• Facilitating environment<br>• Social support<br>• Opportunity to stand out as professional | - |
| Iacopino, 2018<br>Europe | • Hospital(s), nonspecific*<br>• Survey<br>• Social influences on perceptions about a new technology | • Dissimilarities in structure and social network<br>• Professional characteristics (e.g., same gender, tenure status, and same clinical ward) | • Connection with like-minded professionals<br>• Similarity in social capital characteristics and adoption behavior | - |
| Jaiprakash, 2017<br>Australia | • Regional/national<br>• Survey<br>• Perceptions about knee arthroscopy and willingness to adopt robotic technology | • Nervousness about introduction of technology | • Desire to shorten the learning curve<br>• Potential for improved efficiency<br>• Decreased rate of iatrogenic damage to cartilage<br>• Professional benefit (e.g., increase to working life, perform concurrent surgeries) | • Ability to treat more patients |
| Johnson, 2016<br>USA | • Regional/national<br>• Retrospective cohort | • Increase in cumulative surgery rate (i.e., decrease in available patient population) | • Increasing number of Medicare centers of excellence (i.e., indication of high-quality care) | - |

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|---|---|---|---|---|
| | • Factors affecting speed of diffusion of bariatric surgery | • Increase in specific patient characteristics (e.g., aged 50-59) | | |
| Lamartina, 2017<br>Europe | • Regional/national<br>• Prospective cohort<br>• Treatment of differentiated thyroid cancer patients and consistency with 2009 American Thyroid Association guidelines | - | - | • Guidelines<br>• Specific patient characteristics (e.g., disease stage, risk)<br>• Evidence of benefit |
| Lander, 2018<br>Canada | • Regional/national<br>• Mixed methods<br>• Factors that contributed to the adoption of opportunistic salpingectomies | - | • Social support and cohesion within the field<br>• Exposure to information regarding practice change<br>• Thought leader support | - |
| Leggott, 2016<br>USA | • Academic center(s)<br>• Mixed methods<br>• Rate and timing of change to peripheral nerve blocks for orthopedic procedures | • Adherence to group norms and prior experiences<br>• Resistance to change<br>• Lack of understanding of the technique | • Improved safety and efficiency<br>• Employment of formally trained provider | - |
| Leow, 2017<br>USA | • Regional/national<br>• Retrospective cohort<br>• Adoption of minimally invasive radical prostatectomy and outcomes | • Specific hospital characteristics (e.g., military hospitals) | • Specific hospital characteristics (e.g., civilian hospitals, fee for service model) | - |
| Ligier, 2015<br>Europe | • Regional/national<br>• Observational cohort<br>• Impact of the dissemination of the clinical practice guidelines on management of sarcomas | - | - | • Evidence-based guidelines on sarcoma management |
| Lu, 2015<br>Asia | • Regional/national<br>• Retrospective cohort<br>• Characteristics of hospitals providing percutaneous coronary intervention | • Specific hospital characteristics (e.g., community hospital, small hospital size) | • Specific hospital characteristics (e.g., tertiary referral center, large hospital size) | • Public or private ownership of hospital |
| Merkel, 2015<br>Europe | • Academic and community hospitals<br>• Qualitative<br>• Implementation and diffusion of transcatheter aortic valve implementation | • Doubt from colleagues<br>• Rigorous additional training and technical difficulty<br>• Lack of knowledge about implant<br>• Views of opinion leaders in cardiac surgery<br>• Lack of multidisciplinary collaboration | • Improved outcomes<br>• Positive patient feedback<br>• Views of opinion leaders in cardiology<br>• Competition among hospitals | - |
| Meyer, 2013<br>USA | • Regional/national<br>• Retrospective cohort<br>• Diffusion of sentinel lymph node biopsy | • Specific patient characteristics (e.g., race, older age, Medicaid status, and geographic region) | • Specific hospital characteristics (e.g., geographic region, larger size, quartiles, cancer center designation)<br>• Medical school or oncology network affiliation | - |
| Nezhat, 2017<br>USA | • Global<br>• Survey<br>• Practices and attitudes regarding power morcellation of presumed benign leiomyoma | • FDA warning and hospital policy against procedure<br>• Belief that the procedure negatively affects patient outcomes | • Senior staff influence<br>• More experience with procedure | - |
| Nguyen, 2017<br>USA | • Academic and community hospitals<br>• Mixed methods<br>• Surgical telementoring for laparoscopic sleeve gastrectomy | - | • No complications or adverse events<br>• Positive impression of the program<br>• Perceived utility and improvement in current practice | - |
| Nolan, 2017<br>USA | • Hospital(s), nonspecific*<br>• Survey<br>• Use and role of trauma time-out protocol in improving team dynamics and care | - | • Perception of increased efficiency<br>• Perception of improved understanding of patient condition and procedures | - |

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| Oberlin, 2017<br>USA | • Academic center(s)<br>• Retrospective cohort<br>• Utilization of multiparametric MRI for diagnosis and management of prostate cancer | - | • Need for a non-invasive and accurate screening tool | - |
| O'Brien, 2014<br>Canada | • Academic and community hospitals<br>• Qualitative<br>• Facilitators and barriers to the uptake of patient decision aids in breast cancer surgical consultations | • Low motivation to change communication routines<br>• Outcomes not compelling enough<br>• No perceived need for use, confident in skills<br>• Difficulties with information accessibility<br>• Outdated or incorrect information | • Familiarity with change<br>• Effective communication skills<br>• Ease of tailoring to individual patients<br>• Accessibility | - |
| Padia, 2014<br>USA | • Community hospital(s)<br>• Retrospective cohort<br>• Adherence to guidelines for pediatric tonsillectomy recommendations | - | - | • Guidelines<br>• Contrast to routine antibiotic practice |
| Parsons, 2014<br>USA | • Regional/national<br>• Retrospective cohort<br>• Patient safety indicators of minimally invasive radical prostatectomy and open radical prostatectomy during diffusion | • Specific patient characteristics (e.g., race, more comorbidities)<br>• Specific hospital characteristics (e.g., low-income area, non-teaching, rural) | • Specific patient characteristics (e.g., race, fewer comorbidities)<br>• Specific hospital characteristics (e.g., high-income area, teaching, urban) | • Specific patient characteristics (e.g., age, insurance) |
| Pollack, 2015<br>USA | • Regional/national<br>• Retrospective cohort<br>• Peer exposure associations with adoption of a new approach to brachytherapy | - | • Sharing patients with early adopter | - |
| Poon, 2013<br>USA | • Regional/national<br>• Retrospective cohort<br>• Surgeon and practice influence on trends in nephrectomy treatment options | • More experienced, recertifying surgeons | • Higher volume, initially certifying urologists | - |
| Rizan, 2017<br>Europe | • Academic center(s)<br>• Prospective cohort<br>• Uptake of local IV-oral antibiotic prescription practice change after education | - | - | • Educational intervention |
| Roberts, 2014<br>Canada | • Regional/national<br>• Survey<br>• Barriers to epilepsy surgery among neurologists | • Differing perceptions of surgical candidacy<br>• Lack of recognition of appropriate patient clinical condition<br>• Inaccurate knowledge about surgery indications<br>• Inadequate resources | • Positive beliefs about capabilities<br>• Higher volume of patients<br>• More recent training | - |
| Rongen, 2018<br>Europe | • Hospital(s), nonspecific*<br>• Retrospective cohort<br>• Meniscus surgeries performed after the implementation of a guideline | • Delay in dissemination, acceptance, and implementation of guidelines | • Guideline publication | - |
| Sacks, 2015<br>2 or more regions | • Academic center(s)<br>• Retrospective cohort<br>• Guideline dissemination influence on use of radioactive iodine treatment | - | • Stricter institutional guidelines | - |
| Sanei-Moghaddam, 2017<br>USA | • Academic center(s)<br>• Mixed methods<br>• Factors impacting the utilization of hysterectomy clinical pathways | • Perceived to be inappropriate or waste of time<br>• Difficulty remembering to use the pathway<br>• Unfavorable incentive structure | • Alignment with current guidelines<br>• Ease of use | - |

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| | | • Bureaucracy associated with change | | |
| Sartelli, 2017<br>2 or more regions | • Global<br>• Survey<br>• Structure and resources of antimicrobial stewardship teams in surgical departments | - | • Tailored to local clinical practice<br>• Collaboration between healthcare professionals | - |
| Savin, 2016<br>2 or more regions | • Global<br>• Survey<br>• Use of reverse total shoulder arthroplasty in acute complex proximal humerus fractures | • Experience and familiarity with older treatments | • Evidence<br>• Working at academic center<br>• More recent training/fellowship | - |
| Schootman, 2016<br>USA | • Regional/national<br>• Observational cohort<br>• Acquisition of robotic systems and characteristics of patients receiving robot assisted surgery | • Specific hospital characteristics (e.g., rural) | • Specific hospital characteristics (e.g., teaching hospitals, high volume, advanced imaging or oncology services) | • Implementation of electronic medical record<br>• Distance to nearest hospital offering robot assisted surgery<br>• Specific patient characteristics (e.g., race, sex, insurance type, median income) |
| Schroeck, 2014<br>USA | • Regional/national<br>• Retrospective cohort<br>• Technological capacity association with prostate cancer quality of care | • Specific patient population (e.g., race, higher stage, comorbidities) | • Specific patient characteristics (e.g., older, lower socioeconomic status)<br>• Increased technological capacity | - |
| Schroeck, 2013<br>USA | • Regional/national<br>• Retrospective cohort<br>• Technological capacity association with receipt of localized prostate cancer therapy | - | - | • Technological capacity |
| Schulman, 2017<br>USA | • Regional/national<br>• Retrospective cohort<br>• Re-excision rates after initial breast conserving surgery after guideline publication | - | • 100% of practice dedicated to breast surgery | - |
| Sears, 2017<br>USA | • Regional/national<br>• Survey<br>• Carpal tunnel release provider requests for electrodiagnostic studies and other diagnostics tests | - | • Provider specialty (e.g., neurosurgery) | • Membership in professional organization<br>• Size of practice<br>• Teaching facility status |
| Sethi, 2013<br>USA | • Regional/national<br>• Retrospective cohort<br>• Early adoption of endovascular aneurysm repair and outcomes of abdominal aortic aneurysm repairs | - | • More competition | - |
| Shigeta, 2017<br>Asia | • Regional/national<br>• Retrospective cohort<br>• Effect of practice guidelines for endometrial cancer on clinical practice and outcomes | - | • Guidelines | - |
| Shinn, 2014<br>USA | • Hospital(s), nonspecific*<br>• Mixed methods<br>• Effect of star physicians and star hospitals on the diffusion of laparoscopic gastric bypass surgery | - | • Star physicians (i.e., graduated or completed residency at a Top 30 hospital)<br>• Star hospitals (i.e., certified by the Council of Teaching Hospitals) | - |
| Simons, 2017<br>USA | • Regional/national<br>• Retrospective cohort<br>• Patterns of fenestrated endovascular aneurysm repair device adoption at physician/hospital level | - | - | • Training and knowledge of device |

**Hospital(s), nonspecific* indicates that the study did not state the type of hospital

## Supplementary Table - Characteristics of Selected Surgical Practice Change Articles

| Author, publication year, region | Study setting, design, and topic | Barriers | Facilitators | Neutral factors |
|---|---|---|---|---|
| Simunovic, 2013<br>Canada | • Hospital(s), nonspecific*<br>• Mixed methods<br>• Uptake of total mesorectal excision by rectal cancer surgeons | • Lack of perceived advantage over old techniques | • Perceived advantage for new surgical technique | • Specific surgeon characteristics (e.g. graduation year, weekly operating room hours, surgery volume, attendance of scientific conferences) |
| Sinha, 2015<br>Asia | • Regional/national<br>• Qualitative<br>• Perceptions and practices of registered health care providers vs. traditional care providers | • Cultural differences among providers<br>• Lack of local evidence<br>• Systematic burden, shortage of skilled professionals | • Perceived patient benefits regarding prevention | - |
| Sivarajan, 2015<br>USA | • Regional/national<br>• Retrospective cohort<br>• Acquisition of the surgical robot and impact on partial nephrectomy | - | • Acquisition of robot | - |
| Slusher, 2014<br>USA | • Academic center(s)<br>• Observational cohort<br>• Adherence to guidelines for standard treatment of perforated appendicitis and outcomes | - | • Education<br>• Policy change<br>• Multidisciplinary approach | - |
| Spellman, 2013<br>USA | • Academic and community hospitals<br>• Qualitative<br>• Perceptions of factors related to the transition and integration of decision aid into routine medical care | • Perception of practice as time intensive and challenging<br>• Patient choice contradicts practice<br>• Disagreement between providers<br>• Poor provider-to-patient communication skills | • Perception of patient benefits regarding decision-making and risk communication | - |
| Sullivan, 2017<br>Canada | • Hospital(s), nonspecific*<br>• Mixed methods<br>• Barriers and facilitators to the utilization of research evidence in pediatric surgical practice | • Shortage of properly trained personnel, outdated equipment, and a lack of funding<br>• Time constraints/competing tasks<br>• Poor quality of evidence<br>• Lack of confidence in personal skill in implementing practices<br>• Implementation not a priority in clinical practice<br>• Peer pressure<br>• Small patient population | • More experience<br>• Working with groups dedicated to implementation or junior staff<br>• Working at research institution, active researcher<br>• Access to evidence<br>• Professional obligation to best practices | • Personal expectation and intention to implement<br>• Existing confidence and comfort in implementation<br>• Prior beliefs that positive outcomes and best practices are associated with implementation<br>• Emotional influence<br>• Positive or negative reinforcement |
| Tan, 2015<br>USA | • Regional/national<br>• Retrospective cohort<br>• Relationship between an oncology network and the utilization of laparoscopy and partial nephrectomy | - | • Specific hospital characteristics (e.g., non-community hospitals, designated cancer center)<br>• Specific patient characteristics (e.g., age, gender, socioeconomic status, and comorbidities) | • Treatment within or by oncology network affiliated hospitals and physicians |
| Torbica, 2017<br>Europe | • Regional/national<br>• Retrospective cohort<br>• Factors that influence diffusion of medical technology | - | • Specific patient characteristics (e.g., age, higher education) | • Regional per capita GDP<br>• Number of implanting centers |
| Trevisonno, 2015<br>2 or more regions | • Regional/national<br>• Survey<br>• Practice patterns of laparoscopic inguinal hernia report, barriers to adoption, and educational needs | • Perceived minimal benefits<br>• Lack of training<br>• Increased resource requirements<br>• Increase in complications<br>• Conflicts with current practices | - | - |
| Trinh, 2015<br>Asia | • Community hospital(s)<br>• Survey<br>• Knowledge of, attitudes towards and experience of episiotomy use | • Poor outcomes<br>• Lack of training<br>• Existing attitudes and beliefs that the harms outweigh the benefits | • Specific patient characteristics (e.g., nulliparous versus multiparous)<br>• Belief that volume of procedures is already too high | - |

**Hospital(s), nonspecific* indicates that the study did not state the type of hospital

## Supplementary Table - Characteristics of Selected Surgical Practice Change Articles

| Author, publication year, region | Study setting, design, and topic | Barriers | Facilitators | Neutral factors |
|---|---|---|---|---|
| | | • Social pressure to conform to peers | • Knowledge and training regarding when to perform the procedure | |
| Urquhart, 2015<br>Canada | • Regional/national<br>• Qualitative<br>• System-level factors important to synoptic reporting tools | • Disorganized healthcare system structure and Information Technology infrastructure<br>• Differing policies and procedures across hospitals<br>• Resistance to working collaboratively | • Effective healthcare delivery system<br>• Organized Information Technology infrastructure<br>• Policy environment<br>• History of collaboration | - |
| Vertullo, 2017<br>2 or more regions | • Global<br>• Survey<br>• Attitudes toward change in total knee replacement | • Institutional or systemic limitations<br>• Belief that risks outweigh the benefits<br>• Learning curve | - | • Surgeon relationship with industry |
| Wang, 2015<br>USA | • Regional/national<br>• Survey<br>• Use of decision aids for prostate cancer treatment and barriers to adoption | • Perception that ability superseded the decision aid<br>• Concern about patient accessibility to information<br>• Doubt about improvement in decision-making | - | - |
| Wasterlain, 2017<br>USA | • Regional/national<br>• Survey<br>• Perspectives on cost containment strategies regarding the use of novel implants | - | • Evidence for clinical outcomes and cost-benefit analyses<br>• New technology<br>• Applying trial/monitoring periods | • Patient involvement |
| Woldrich, 2013<br>USA | • Regional/national<br>• Retrospective cohort<br>• Utilization of extirpative and ablative treatments for localized renal masses | • Specific patient clinical conditions (e.g. chronic kidney disease) | • Specific hospital characteristics (e.g., teaching or urban)<br>• Specific patient clinical conditions (e.g., diabetes, hypertension) | • Geographic region |
| Wright, 2016<br>USA | • Hospital(s), nonspecific*<br>• Retrospective cohort<br>• Use of robotic-assisted surgery | • Less market competition | • Specific patient characteristics (e.g., age)<br>• More market competition | • Hospital financial status |
| Yu, 2017<br>Asia | • Academic center(s)<br>• Survey<br>• Impact of changes to the surgical safety checklist | - | • Revisions based on feedback | - |
| Zhang, 2014<br>USA | • Regional/national<br>• Retrospective cohort<br>• Relationship between managed-care penetration and the dissemination of robotic prostatectomy | • Efforts to reduce utilization and spending | • Specific population characteristics (e.g., more racial diversity, education and wealth, population densities) | • Managed-care penetration |

**Hospital(s), nonspecific* indicates that the study did not state the type of hospital