Appendix, Organized by Panel

Item Description	General Surgery Panel	Orthopedic Surgery Panel
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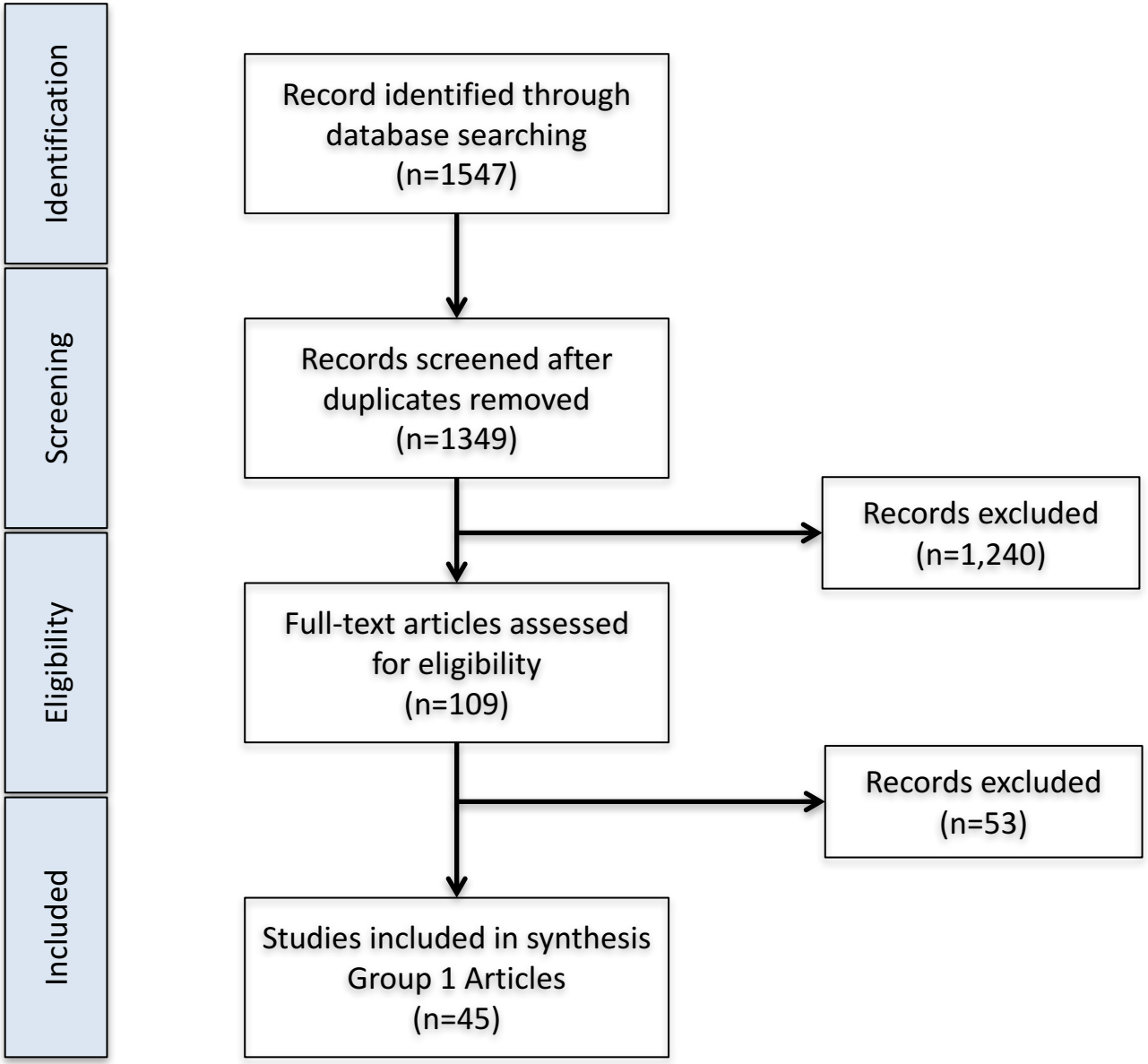
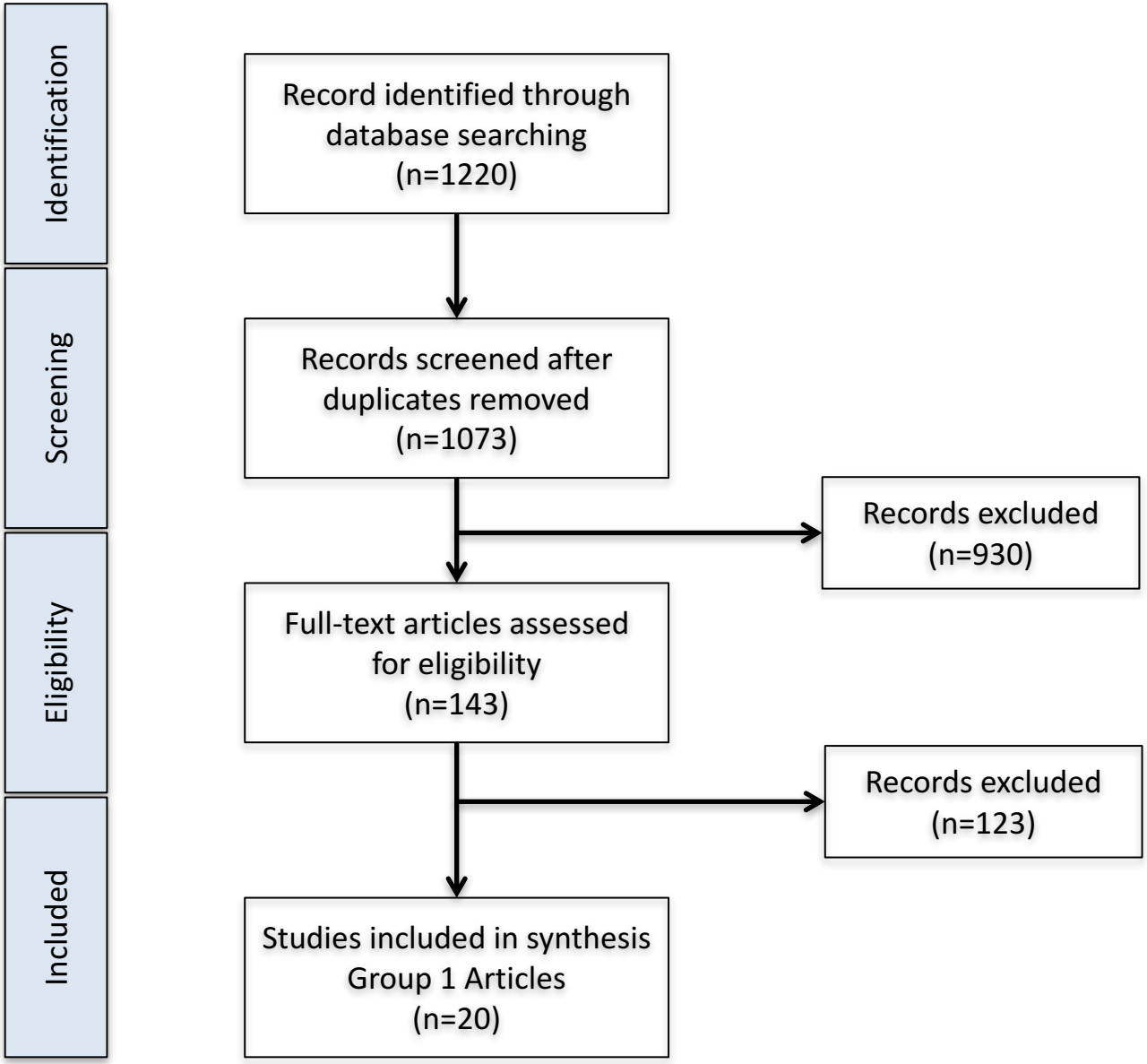
Appendix Figure 1. Literature Search for General Surgery Panel



Appendix Figure 2. Literature Search for Orthopedic Surgery Panel



Appendix Text 1: Literature Search for General Surgery Panel

Ovid Medline_2.06.2015

1. colorectal.mp. or exp Colorectal Surgery/
    a. N = 102048
2. exp bariatric surgery/ or exp cholecystectomy/ or exp appendectomy/ or exp colectomy/
    a. N = 62618
3. exp abdomen/su or exp colon/su or exp appendix/su or exp gallbladder/su or exp hernia/su or hernia.mp.
    a. N = 58026
4. ("bariatric surgery" or appendectomy or cholecystectomy or "hernia repair" or colectomy or (abdominal adj2 surg*)).mp.
    a. N = 85204
5. roux-en-y gastric bypass.mp. or exp Gastric Bypass/ or laparoscopic adjustable gastric banding.mp. or sleeve gastrectomy.mp. or biliopancreatic diversion with duodenal switch.mp. or mini-gastric bypass.mp. or intragastric balloon.mp. or endoluminal vertical gastroplasty.mp. or implantable gastric pacing.mp. or endoscopic gastrointestinal bypass devices.mp. or jejunoileal bypass.mp. or gastroplasties.mp. or exp Gastroplasty/
    a. N = 11329
6. 1 or 2 or 3 or 4 or 5
    a. N = 142883
7. hematuria.mp. or exp Hematuria/ or false passage.mp. or accidental removal.mp. or urine leakage.mp. or (urethral stricture.mp. or exp Urethral Stricture/) or catheter blockage.mp.
    a. N = 24560
8. exp urinary catheterization/ or exp urinary catheters/ or (urinary adj catheter$).mp. or (cauti or "catheter associated urinary tract infection$" or "hospital acquired urinary tract infection$").mp. or (exp catheter-related infections/ and urin$).mp.
    a. N = 14673
9. 7 or 8
    a. N = 38359
10. 6 and 9
    a. N = 619

Embase_2.12.2014

1. 'colorectal surgery' OR 'bariatric surgery' OR 'cholecystectomy' OR 'appendectomy' OR 'colectomy' OR 'abdomen surgery' OR 'colon surgery' OR 'appendix surgery' OR 'gallbladder surgery' OR 'hernia surgery' OR 'hernia repair' OR 'roux en y gastric bypass surgery' OR 'gastric bypass' OR 'laparoscopic gastric bypass' OR 'laparoscopic adjustable gastric banding' OR 'adjustable gastric banding' OR 'sleeve gastrectomy' OR 'bilipancreatic diversion' OR 'gastroplasty'OR gastroplasty
    a. N = 128,087
2. 'urinary catheter'/exp OR 'urinary catheter' OR 'urinary catheteri?ation' OR cauti OR 'catheter associated urinary tract infection$' OR 'hospital acquired urinary tract infection' OR ('catheter

related infection'/exp AND urin$) OR 'hematuria'/exp OR 'false passage' OR 'accidental removal' OR 'urine leakage'/exp OR 'urethral stricture' OR 'catheter blockage'
    a. N = 100,263
3. 1 and 2
    a. N = 717

Cochrane_2.12.2014

1. (colorectal surgery OR bariatric surgery OR cholecystectomy OR appendectomy OR colectomy surgery OR abdomen surgery OR colon surgery OR appendix surgery OR gallbladder surgery OR hernia surgery or hernia repair) OR (roux-en-y gastric bypass OR gastric bypass surgery OR laparoscopic gastric band or laparoscopic adjustable gastric banding or adjustable gastric banding OR sleeve gastrectomy OR bilipancreatic diversion OR gastroplasty)
    a. N = 196
2. (urinary catheter OR urinary catheteri?ation OR urinary tract infection$ OR cauti OR catheter associated urinary tract infection$ OR catheter-related infections OR hospital acquired urinary tract infection$) OR (hematuria OR false passage OR accidental removal OR urine leakage OR urethral stricture OR catheter blockage)
    a. N = 156
3. 1 AND 2
    a. N = 9

CINAHL_2.12.2015

1 - 20 of 16,659

1. colorectal surgery OR bariatric surgery OR cholecystectomy OR appendectomy OR colectomy surgery OR abdomen surgery OR colon surgery OR appendix surgery OR gallbladder surgery OR hernia surgery or hernia repair
    a. N = 16,659
2. roux-en-y gastric bypass OR gastric bypass surgery OR laparoscopic gastric band or laparoscopic adjustable gastric banding or adjustable gastric banding OR sleeve gastrectomy OR bilipancreatic diversion OR gastroplasty
    a. N = 1,518
3. 1 OR 2
    a. N = 17,645
4. urinary catheter OR urinary catheteri?ation OR urinary tract infection$ OR cauti OR catheter associated urinary tract infection$ OR catheter-related infections OR hospital acquired urinary tract infection$
    a. N =9,152
5. hematuria OR false passage OR accidental removal OR urine leakage OR urethral stricture OR catheter blockage
    a. N = 2,031
6. 4 OR 5
    a. N = 11,047

7. 3 and 6

Web of Science_2.12.2015

1. 'colorectal surgery' OR 'bariatric surgery' OR 'cholecystectomy' OR 'appendectomy' OR 'colectomy' OR 'abdomen surgery' OR 'colon surgery' OR 'appendix surgery' OR 'gallbladder surgery' OR 'hernia surgery' OR 'hernia repair' OR 'roux en y gastric bypass surgery' OR 'gastric bypass' OR 'laparoscopic gastric bypass' OR 'laparoscopic adjustable gastric banding' OR 'adjustable gastric banding' OR 'sleeve gastrectomy' OR 'bilipancreatic diversion' OR 'gastroplasty'OR gastroplasty Refined by: WEB OF SCIENCE CATEGORIES: (SURGERY)
    a. N = 57,373
2. (hematuria OR false passage OR accidental removal OR urine leakage OR urethral stricture OR catheter blockage) OR (urinary catheteri?ation OR urinary catheter OR catheter associated urinary tract infection$ or hospital acquired urinary tract infection$ catheter-related infections and urine$)
    a. N = 24,095
3. 1 AND 2 (Restrict to Surgery)
    a. N = 155

Appendix Text 2: Literature Search for Orthopedic Surgery Panel

Ovid Medline_3.16.2015

1. exp Osteoarthritis, Hip/ or exp Hip Prosthesis/ or exp Hip Joint/ or exp Arthroplasty, Replacement, Hip/ or hip arthroplasty.mp. or exp hip/su or exp Thrombophlebitis/ or exp Orthopedic Procedures/ or hip surgery.mp.
2. exp Arthroscopy/ or exp Knee Joint/ or exp Knee/ or knee surgery.mp. or exp Menisci, Tibial/ or exp Knee Injuries/ or exp anterior cruciate ligament/ or exp arthroplasty/ or exp fracture fixation/ or exp tendon transfer/
3. exp Anterior Cruciate Ligament/su [Surgery]
4. ((Hip or Knee or thigh or leg or femur or fibula or meniscus) adj3 (fracture or joint or ligament or arthroscopy) adj (repair or reconstructi* or replacement)).mp. or knee/su
5. exp Bacteremia/su [Surgery]
6. exp Sepsis/su [Surgery]
7. exp Prosthesis-Related Infections/su [Surgery]
8. joint infection.mp.
9. hardware infection.mp.
10. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
11. hematuria.mp. or exp Hematuria/ or false passage.mp. or accidental removal.mp. or urine leakage.mp. or (urethral stricture.mp. or exp Urethral Stricture/) or catheter blockage.mp. or (exp urinary catheterization/ or exp urinary catheters/ or (urinary adj catheter$).mp. or (cauti or "catheter associated urinary tract infection$" or "hospital acquired urinary tract infection$").mp. or (exp catheter-related infections/ and urin$).mp.)
12. 10 and 11
    a. N = 258

Embase_3.16.2015

1. 'osteoarthritis hip'/exp OR 'osteoarthritis hip' OR 'hip prostheses'/exp OR 'hip prostheses' OR 'hip joint'/exp OR 'hip joint' OR 'arthroplasty'/exp OR 'arthroplasty' OR 'hip replacement'/exp OR 'hip replacement' OR 'hip arthroplasties'/exp OR 'hip arthroplasties' OR 'hip surgery'/exp OR 'hip surgery' OR 'thrombophlebitis'/exp OR 'thrombophlebitis' OR 'orthopedic prostheses, orthoses and implants'/exp OR 'orthopedic prostheses, orthoses and implants'
2. 'arthroscopy' OR 'knee joint' OR 'knee surgery' OR 'menisci tibial' OR 'knee injuries' OR 'anterior cruciate knee ligament' OR 'fracture fixation' OR 'tendon transfer'
3. (hip OR knee OR thigh OR leg OR femur OR fibula OR menisucs) NEAR/3 (fracture OR joint OR ligament OR arthroscopy) NEAR/1 (repair OR 'reconstruction' OR replacment)
4. 'prosthesis related infections'
5. 'joint infection'
6. #1 OR #2 OR #3 OR #4 OR #5

7. ('catheter associated urinary tract' OR 'hospital acquired urinary tract') NEXT/1 infection* OR urinar* NEXT/1 catheter* OR ('catheter infection'/exp AND urin*:ab,ti) OR 'hematuria'/exp OR hematuria:ab,ti OR 'false passage':ab,ti OR 'accidental removal':ab,ti OR 'urine leakage':ab,ti OR 'catheter blockage':ab,ti OR 'urethra stricture'/exp OR 'urethral stricture':ab,ti
8. #6 AND #7
    a. N = 448

Cochrane_3.16.2015

1. "osteoarthritis" OR "hip prosthesis" OR "hip joint" OR "arthroplasty replacement" OR "hip arthroplasty" OR "hip surgery" or "thrombophlebitis" or "orthopedic procedures"
2. "arthroscopy" or "knee joint" or "Knee surgery" or "knee" OR "minisci" OR "tibial" OR "knee injuries" OR "anterior cruciate ligament" or "fracture fixation" Or "tendon transfer"
3. "prosthesis related infection" OR "joint infection" OR "hardware infection"
4. 1 OR 2 OR 3
5. urin* next catheter* or "urinary tract" next infection* or ("catheter associated urinary tract" or "hospital acquired urinary tract" or "catheter related") next infection* or hematuria or "false passage" or "accidental removal" or "urine leakage" or "urethral stricture" or "catheter blockage"
6. 4 AND 5
    a. N = 287

CINAHL_3.16.2015

1. osteoarthritis OR hip prosthesis OR hip joint OR arthroplasty replacement OR hip arthroplasty OR hip surgery OR thrombophlebitis or othropedic procedures OR arthroscopy or knee joint or knee surgery or knee or minisci or tibial or knee injuries or anterior cruciate ligament or fracture fixation or tendon transfer OR prosthesis related infection or joint infection or hardware infection
2. MH catheters, urinary OR MH urinary catheterization OR MH catheter-related infections+ OR TI urinary W1 catheter* OR AB urinary W1 catheter* OR TI (cauti OR ("catheter associated" OR "hospital acquired") W1 ("urinary tract infection" OR "urinary tract infections")) OR AB (cauti OR ("catheter associated" OR "hospital acquired") W1 ("urinary tract infection" OR "urinary tract infections")) OR MH hematuria OR TI hematuria OR AB hematuria OR TI ("false passage" OR "accidental removal" OR "urine leakage" OR "catheter blockage" OR "urethral stricture") OR AB ("false passage" OR "accidental removal" OR "urine leakage" OR "catheter blockage" OR "urethral stricture") OR MH urethral stricture
3. 1 AND 2
    a. N = 86

Web of Science_3.16.2015

1. (osteoarthritis OR hip prosthesis OR hip joint OR arthroplasty replacement OR hip arthroplasty OR hip surgery OR thrombophlebitis OR orthropedic procedures OR arthroscopy OR knee joint OR knee surgery OR knee OR Minisci OR tibial OR knee injuries OR anterior cruciate ligament OR fracture fixation OR tendon transfer OR prosthesis related infection OR joint infection or hardware infection)
2. TOPIC: (("urinary catheter" OR "urinary catheters" OR "urinary catheterization" OR cauti OR "catheter associated urinary tract infection" OR "catheter associated urinary tract infections" OR "hospital acquired urinary tract infections" OR "hospital acquired urinary tract infection" OR "catheter related infection" OR "catheter related infections" OR hematuria OR "false passage" OR "accidental removal" OR "urine leakage" OR "catheter blockage" OR "urethral stricture"))
3. 1 AND 2
    a. N = 141

Appendix Table 1. Summary of Group 1 Articles (Intervention Articles) for General Surgery Panel

Articles for your review include studies that assess the rates of infectious and non-infectious outcomes (including retention) relating to various urinary management strategies for patients receiving non-emergent abdominal surgery. This group of articles contains the results of controlled trials comparing patients' outcomes that had received different types of urinary management strategies (such as Foley removal on post-op day 1 compared to Foley removal when epidural is removed) in addition to observational studies assessing the rates of infections and non-infectious outcomes for cohorts of patients who received specific urinary management strategies (such as all patients having Foley removed on post-op day 1). An overview of the articles is presented below.

The total number of Interventional articles is: 45

The 45 interventional articles were clustered into 5 categories according to type of surgery performed. The surgical categories used for grouping were colorectal, bariatric, cholecystectomy, hernia and other general surgery procedures. Articles were ordered by the year they were published. Articles in the same surgical group published in the same year were further ordered alphabetically by the first author's last name.

Following the organization of the articles as described above the articles were then given an article number from 1 to 45. As you will see below, specific sets of articles can be quickly referenced based on type of operation and type of study and type of outcomes by referring to the article number in the provided table.

- *Intervention Articles*
  - Colorectal Surgery (N=25)
    - Article Numbers: 1-25
  - Bariatric (N=2)
    - Article Numbers: 26-28
  - Cholecystectomy (N=5)
    - Article Numbers: 29-34
  - Hernia Surgeries (N=8)
    - Article Numbers: 35-43
  - Other General Surgery Procedures (N=2)
    - Article Numbers: 44-45

  *Note: Literature search did not result appendectomy studies meeting criteria

- *Type of Outcomes*
  - Non-Infectious Only
    - Article Numbers: 10, 15, 16, 18, 22, 28, 29, 32, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43
  - Infectious Only
    - Article Numbers: 3, 13, 17, 25, 26, 33,
  - Non-Infectious and Infectious
    - Article Numbers: 1, 2, 4, 7, 8, 9, 14, 21, 27, 30, 31, 44

- *Type of Study*
  - Prospective Randomized Study
    - Article Numbers: 1, 3, 6, 9, 11, 12, 14, 15, 17, 18, 25, 31, 35, 36, 37, 38, 40, 41
  - Prospective Uncontrolled Study
    - Article Numbers: 2, 10, 13, 20, 24, 26, 27, 29, 30, 32, 33, 34
  - Retrospective Medical Record Review
    - Article Numbers: 5, 8, 16, 19, 21, 39, 42, 43
  - Retrospective Case Control
    - Article Numbers: 4, 23
  - Retrospective Cohort Study
    - Article Numbers: 7, 22
  - Cross Sectional Study
    - 28

Colorectal Surgery				
Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
1. Benoist S, Panis Y, Denet C, Mauvais F, Mariani P, Valleur P. Optimal duration of urinary drainage after rectal resection: a randomized controlled trial. Surgery 1999;125:135-41.	**Prospective Randomized Study** Rectal Resection *The aim of this controlled trial was to compare 1 versus 5 days of transurethral catheterization after rectal resection, with special reference to urinary tract infection and bladder retention.*	n= 126 patients in total (64 women and 62 men) n=64 in 1-day group n=62 in 5-day group Exclusion criteria: (1) Catheter pulled out (2) Postoperative complications requiring prolonged monitoring of urine output (3) Postoperative complications requiring early reoperation	Patients were randomly assigned to one of two groups *I: 1-day group: 1 day of transurethral catheterization after rectal resection* C: 5-day group: patients undergoing 5 days' catheterization	• *This controlled study showed that after rectal resection 1 day of urinary drainage can be recommended for most patients. Five-day drainage should be reserved for patients with low rectal carcinoma.* • Acute urinary retention occurred in 16 patients (25%) in the 1-day group versus 6 (10%) in the 5-day group ($p < .05$). • Urinary tract infection was observed in 13 of 64 patients (20%) in the 1-day group versus 26 of 62 (42%) in the 5-day group ($p < .01$). • Pelvic abscess was observed in 1 of 64 patients (1%) in the 1-day group versus 1 of 62 (2%) in the 5-day group.
2. Basse L, Werner M, Kehlet H. Is urinary drainage necessary during continuous epidural analgesia after colonic resection? Regional Anesthesia and Pain Medicine 2000;25:498-501.	**Prospective uncontrolled study** Elective colon resection (all open technique) The aim of this study was *to study the postoperative voiding function of patients who underwent elective colon resections with well-defined continuous 48- hour, low-dose, thoracic bupivacaine/morphine epidural analgesia and routine removal of the urinary drainage appliance after 24 hours.*	n= 100 total; 45 men and 55 women, with a median age of 72 years (range, 33 to 94). Exclusion criteria: Patients operated for acute/ subacute conditions, low-anterior resection, patients operated for inflammatory bowel disease, and patients undergoing operation during a 6- to 8-week summer period, when the research team was not available	*I: Planned 2-day hospital stay,* ***urinary catheter removal on the*** ***first postoperative morning****, and epidural catheter removal on the second postoperative morning. Follow-up in the outpatient clinic was on days 8 and 30.* C: No Control	• *The low incidence of urinary retention (9%) and urinary infection (4%) suggests that routine bladder catheterization beyond postoperative day 1 may not be necessary in patients with ongoing continuous low-dose thoracic epidural analgesia.* • 96 patients had a transurethral bladder catheter, while 4 patients received suprapubic drainage because of a urethral stricture in 1 patient and a deviation from the protocol by the surgeon in 3 patients. Postoperatively, 9 (9%) patients needed recatheterization; 8 of these had a single clean intermittent catherization, while 1 patient needed a second recatheterization, which was continued after discharge on day 3 with removal on day 8 in the outpatient clinic. • This patient had a urinary infection on day 10 and, despite antibiotic treatment, developed urosepsis and was readmitted. 3 other patients had uncomplicated urinary infection; 1 patient required hospitalization for 1 day, while 2 patients were treated in primary care by a general practitioner.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
3. Nakagoe T, Sawai T, Tsuji T, Ayabe H. Use of minilaparotomy in the treatment of colonic cancer. *British Journal of Surgery* 2001;88:831-6.	**Prospective cases compared to historical controls** Resection for colonic cancer via minilaparotomy with the use of a peri-operative urinary catheter *The aims of this study were to assess the feasibility and safety of using a minilaparotomy technique (length of incision less than 7 cm) in curative resection of patients with colonic cancer, and to compare various outcomes with those of conventional resection through a laparotomy incision.*	n= 84 patients scheduled to undergo complete resection for colonic cancer using the minilaparotomy approach Exclusion criteria: Patients who refused, those with a tumor larger than 6 cm in size or infiltrating adjacent organs, patients who had intestinal obstruction or perforation, those with synchronous cancers or familial adenomatous polyposis, and patients who had metastases to the liver, para-aortic lymph nodes or other distant organs	*I: 84 patients who underwent complete resection for colonic cancer using the minilaparotomy approach between January 1997 and December 1999.* C: 69 patients with colonic cancer who had undergone colonic resection by conventional laparotomy between January 1994 and December 1996.	• *The minilaparotomy approach was successful in 72 of the 84 patients. There was no difference in length of hospital stay between the intervention and control groups. A minilaparotomy approach to the curative resection of colonic cancer is an attractive alternative to conventional laparotomy in selected patients.* • No retention outcomes reported. • Time until urinary catheter removal was significantly shorter in the minilaparotomy group than the conventional therapy group.
4. de Moya MA, Zacharias N, Osbourne A, et al. Colovesical fistula repair: is early Foley catheter removal safe*? J Surg Res* 2009;156:274-7.	**Retrospective case/control chart review** Sigmoidectomy and takedown of the fistula *The aim of this study was to examine the approach to Foley catheter management after repair of colovesical fistulas (CVF) secondary to diverticulitis and assess whether early postoperative Foley catheter removal after simple bladder repair is associated with increased complications.*	N=37 patients underwent simple bladder repair N=13 with early Foley removal (≤ 7 days) N=24 with late Foley removal (> 7 days) Exclusion criteria: incomplete medical records	I: early Foley removal (≤ 7 days) after bladder repair secondary to diverticulitis. C: Late Foley removal (>7 days) after bladder repair secondary to diverticulitis.	• *In total, six bladder-related complications were recorded in the late Foley catheter removal group. Early Foley removal is not associated with increased complications in patients with CVF secondary to diverticulitis with simple bladder repair and is safe.* • One patient (4%) in the late Foley catheter removal group developed urinary retention, while none developed in the early Foley catheter removal group. • Five patients (21%) in the late Foley catheter removal group developed urinary tract infections, compared to one (8%) in the early Foley catheter removal group.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results : Retention/Infectious/Other Outcomes
5. Baird G, Maxson P, Wrobleski D, Luna BS. Fast-track colorectal surgery program reduces hospital length of stay. Clinical Nurse Specialist: The Journal for Advanced Nursing Practice 2010;24:202-8..	**Retrospective Medical Record Review** Laparoscopic colorectal sugery *The primary aim was to determine if there was a significant difference in length of stay and 30-day readmission rates between the 2 groups. The secondary aim was to examine whether patients on the fast-track program were able to successfully tolerate early diet, early ambulation, and minimal use of drains.*	n= 200 adult patients total n= 100 fast track group n= 100 non-fast track group Exclusion criteria: None listed	*I: In Fast Track program: included early diet, early mobilization and minimal use of drains including the following protocol for urinary catheters:* *- Removal of urinary catheter at noon the day after surgery (labeled as post-day 2) unless patient had low anterior resection, abdominal perineal resection or ileal pouch anal anastomosis.* *- Removal of urinary catheter at 6:00pm 2 days after surgery for patients who had low anterior resection, abdominal perineal resection or ileal pouch anal anastomosis.* C: Traditional Recovery Program – Detail not given regarding catheter use	• *Overall, patients undergoing laparoscopic colorectal surgery on a fast-track program discharged 1 day sooner than patients on traditional recovery programs. Patients successfully followed the fast-track program.* • No urinary retention outcomes reported. • No infectious outcomes reported. • A statistical significant difference of 1 day was found between patients receiving traditional care and patients on the fast-track program. The mean length of stay for patients on the fast-track program was 4.66 (SD, 3.11) days compared with 5.87 (SD, 3.14) days for traditional patients. 89% of (n=89) of patients in the fast track group had their Foley catheter removed at the time indicated on the order set. 11% of the fast track group had to have their Foley re-inserted while 15% of the traditional group had to have their Foley re-inserted. Statistically significant differences were not found between the 2 groups for reinsertions of urinary catheters.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
6. Mahajna A, Masarwee A, Bishara B, Krausz MM. Laparoscopy and nullfast tracknull rehabilitation in colorectal surgery - Does it improve the patients' outcome (our initial results). Techniques in Coloproctology 2010;14:91 **<u>Abstract Only</u>**	**Prospective Study** Assess the benefits of laparscopic colorectal resection with fast-track care.	Fifty seven patients undergoing elective laparoscopic colorectal surgery.	*Treatment according to the fast-track rehabilitation program.*	• *Our initial results suggest that multimodal rehabilitation may improve further on the excellent results of laparoscopic colorectal resection and decrease the postoperative hospital stay. Larger comparative studies may help to establish this approach.* • No Retention Outcomes Reported. • No Infectious Outcomes Reported. • All patients were mobilized and orally fed at the 1st postoperative day. For the entire group, urinary catheter was removed at the 1.7 + 0.8 POD, and the drainage was removed at the 1.6 + 0.8 POD There was no intra-abdominal abscess, anastomotic leakage or mortality and the morbidity rate was low. The median length of hospital stay was four days (range 3–7).

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
7. Patel GN, Rammos CK, Patel JV, Estes NC. Further reduction of hospital stay for laparoscopic colon resection by modifications of the fast-track care plan. *Am J Surg* 2010;199:391-4; discussion 4-5.	**Retrospective cohort study** Elective laparoscopic colectomy *The aim of this study was to determine the outcome of one surgeon's modifications to fast-track care in a linear study of all patients undergoing elective laparoscopic colon resection managed by his modified fast-track care plan.*	N=48 patients who underwent laparoscopic colon resection by 1 surgeon Exclusion criteria: 5 patients who had emergency surgeries for diverticulitis or had combined surgeries that limited use of the modified fast-track care plan	*I: Patients undergoing elective laparoscopic colectomy using a fast-track care plan. The plan included no use of urinary catheters for right and transverse colon resections and immediate removal of catheters after low anterior colon resections.* C: No Control	• *The modified fast-track plan achieved significant improvement in length of stay for laparoscopic colectomy compared with previous results.* • There was no occurrence of urinary retention. • There was no occurrence of urinary tract infection.
8. Scatizzi M, Kroning KC, Boddi V, De Prizio M, Feroci F. Fast-track surgery after laparoscopic colorectal surgery: Is it feasible in a general surgery unit? Surgery 2010;147:219-26.	**Retrospective Analysis** Laparoscopic colorectal surgery *The aim of the ''fast-track surgery'' program is to decrease the perioperative stress response to surgical trauma and thus to a decrease in complication rates after elective surgery.*	n= 101 patients in total (43 women and 58 men) Exclusion criteria: None listed	*I: Patients who were cared for using a detailed fast-track surgery protocol that had been prepared and given to patients, physicians and nurses, with the aim to create a standard treatment.* C: No Control	• *Based on 6 comparative single-center studies, the fast-track program was found to reduce length of hospital stay, and was deemed safe for major abdominal surgeries. Present study shows that enhanced recovery or fast-track program can also be implemented safely in a general surgery unit.* • The bladder catheter was removed on median postoperative day 2 (range, 1-5). Urinary retention occurred in 5 patients: 3 were treated with ''in-and-out'' catheterization, while 2 had maintained urinary catheter (4 days). • One patient developed an aggressive urinary tract infection. • Median hospital stay was 4 days (range, 3-15; mean, 4.7 days). Postoperatively, 9 patients suffered from local complications, including 2 patients with anastomotic leakages causing an intra-abdominal abscess and local peritonitis. 2 patients were re-admitted within 30 days of surgery.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
9. Zmora O, Madbouly K, Tulchinsky H, Hussein A, Khaikin M. Urinary bladder catheter drainage following pelvic surgery - Is it necessary for that long? Diseases of the Colon and Rectum 2010;53:321-6..	**Prospective Randomized Controlled Trial** Patients Undergoing Pelvic Surgery *The aim of this study was to prospectively evaluate the utility of urinary bladder drainage after pelvic colorectal surgery.*	n= 118 patients in total (50 women and 68 men) Male patients with severe prostatic symptoms were excluded from the study Exclusion criteria: None listed	*Group A = Foley catheter removed on postop day 1 N= 41* *Group B = Foley catheter removed on postop day 3 N = 38* *Group C = Foley catheter removed on postop day 5 N=39* C: No Control	• *Routine prolonged urinary bladder catheterization after pelvic surgery may not be required, and the Foley catheter may be safely removed on postoperative day 1. Larger studies are needed t to confirm the findings of this study.* • Overall, urinary retention after removal of the Foley catheter occurred in 12 (10%) of the patients: 6 (14.6%) in group A, 2 (5.3%) in group B, and 4 (10.5%) in group C (p = .39). Eight patients who required reinsertion subsequently had the Foley catheter removed without requiring any further therapy. Four patients (1 in group A and 3 in group C) were discharged home with the catheter in situ. • Symptomatic urinary tract infection was diagnosed in 5 patients in group A, 3 in group B, and 9 in group C, but this difference did not reach statistical significance. There was a slight trend toward a higher rate of urinary tract infection, asymptomatic bacteriuria, surgical site infection, and an overall complication rate in group C. • There were no significant differences in anastomotic leak and intra-abdominal abscess rates among the 3 groups. There was a trend toward longer hospital stay in patients who developed urinary retention requiring catheter reinsertion (14 vs 9.7; p = .13), but this difference did not reach statistical significance.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
10. Cremona F, Pace U, Belli A, De Franciscis S, Mastromarino R, Romano G. Clinical benefit of fast-track protocol in frail elderly patients with colorectal cancer. Colorectal Disease 2011;13:58. **Abstract Only**	**Prospective Controlled Trial** Colorectal Surgical Procedures *The aim of this study is to analyze our preliminary experience with a fast track protocol for 'frail elderly' patients undergoing elective colorectal surgery for cancer.*	n= 10 (Patients older than 75 with high co-morbidity) Exclusion criteria: None Listed	*Nasogastric tube and bladder catheter were removed at the end of surgery. Mobilization and liquid diet were allowed and encouraged starting from post-operative day 1. Non opioid analgesia was used for pain control.* C: No Control	• *In our preliminary experience fast track protocol allows frail elderly patients with high co-morbidity undergoing colorectal surgery to benefit from a rapid recovery and early discharge. This approach seems to be feasible and safe.* • 2 patients needed temporary bladder catheter. • No infectious outcomes reported. • Median hospital stay was 4.5 days (range 4–5). Analgesic therapy was stopped on post-operative day 2 in all cases.
11. Mahajna A, Wissam A, Bishara B, Krausz MM. Laparoscopy and fast-track rehabilitation in colorectal surgery-does it improve patient outcome. Techniques in Coloproctology 2011;15:12 **Abstract Only**	**Prospective Randomized Controlled Trial** Elective Laparoscopic colorectal surgery *The objective of this study is to assess the benefits of laparoscopic colorectal resection with fast-track care.*	n= 57 patients in total Exclusion criteria: None Listed	*Use of a fast track rehabilitation protocol utilizing early mobilization and oral nutrition to accelerate postoperative recovery* C: No Control	• *Our initial results suggest that multimodal rehabilitation may improve further on the excellent results of laparoscopic colorectal resection and shorten postoperative hospital stay. Larger comparative studies may help to establish the benefits of this approach.* • No urinary retention outcomes reported. • No infectious outcomes reported. • All patients were mobilized and orally fed on the 1st postoperative day. The urinary catheter was removed on the 1.7 + 0.9 postoperative day and the drainage was removed on the 1.8 + 0.9 postoperative day. There was no intra-abdominal abscess.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
12. Mahajna A, Serkovich K, Assalia A, Bishara B, Krausz MM, Kluger Y. Laparoscopy and 'fast track' rehabilitation in colorectal surgery-does it improve the patients' outcome. Surgical Endoscopy and Other Interventional Techniques 2012;26:S92. **Abstract Only**	**Prospective Randomized Controlled Trial** Patients undergoing laparoscopic colorectal surgery *The objective of this study is to assess the benefits of laparoscopic colorectal resection with fast-track care.*	n= 66 patients in total Exclusion criteria: None Listed	*Multimodal protocol utilizing an early mobilization and oral nutrition to accelerate postoperative recovery after elective laparoscopic colorectal surgery.* C: No Control	• *Our initial results suggest that multimodal rehabilitation may improve further on the excellent results of laparoscopic colorectal resection and decrease the postoperative hospital stay. Larger comparative studies may help to establish this approach.* • No urinary retention outcomes reported. • No Infectious outcomes reported. • All patients were mobilized and orally fed at the 1st postoperative day. Urinary catheter was removed at the 1.7 + 0.9 postoperative day, and the drainage was removed at the 1.8 + 0.9 postoperative day. There was no intra-abdominal abscess, anastomotique leakage or mortality and the morbidity rate was low. The median length of hospital stay was four days (range 3-7).
13. Bona S, Molteni M, Spinelli A, Sacchi M, Monzani R, Montorsi M. Fast-track protocol in laparoscopic colorectal surgery: Preliminary experience of a pilot study. Surgical Endoscopy and Other Interventional Techniques 2012;26:S29. **Abstract Only**	**Prospective Evaluation** Laparoscopic colorectal resection *Study aim was prospective evaluation of a Fast-track protocol that includes abolition of bowel preparation and of pre-and postoperative fasting, TIVA anesthetic technique, perioperative opioids-free epidural analgesia, limited use of drains, early removal of bladder catheter and mobilization.*	n= 47 patients in total The average age was 63. Median American Society of Anesthesiologists physical status score was 2. Mean BMI was 27. Exclusion criteria: None Listed	*I: Use of the fast track protocol including early removal of bladder catheter* C: No Control	• *Preliminary results confirm that a strict application of a 'Fast-track' protocol in laparoscopic colorectal surgery results in a rapid postoperative recovery by shortening the length of stay. This result was obtained with full patient satisfaction. Larger and comparative studies are needed before a definite introduction of these protocols.* • No retention outcomes reported. • In 4 cases, there has been a surgical site infection requiring outpatient medications. • Thirty-nine patients underwent preoperative placement of epidural catheter. In the first post-operative day about 90% spent at least 8 hours out of bed. Compliance with the items of the protocol was greater than 85%. Median hospital stay was 3 days. Readmission rate within 30 days was 4%.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
14. Hubner M, Schafer M, Demartines N, et al. Impact of Restrictive Intravenous Fluid Replacement and Combined Epidural Analgesia on Perioperative Volume Balance and Renal Function Within a Fast Track Program. J Surg Res 2012;173:68-74.	**Prospective Randomized Controlled Trial** Patients undergoing open elective colon resection *We aimed to assess whether additional fluid restriction had a negative impact on preservation of hemodynamics and renal function in patients having an effective epidural analgesia.*	n= 156 patients in total 78 were in the 'fast track' group 78 were in the standard of care group Exclusion criteria: None listed	*I: 'Fast Track': Patients received fluid restrictions and epidural analgesia* C: Standard Care: received a fixed restricted fluid regime according to institutional guidelines that were based on established recommendations	• *Fluid restriction and epidural analgesia in fast track programs are not associated with clinically relevant hemodynamic instability or renal dysfunction.* • Only one of 82 patients having an epidural analgesia without a bladder catheter had urinary retention. • There was one urinary infection in the remaining 38 patients having their bladder catheter disconnected only after removal of the epidural analgesia. • 61/76 'fast track' patients and 59/75 standard care patients had an effective epidural analgesia. Overall, 'fast track' patients had fewer postoperative complications (6 versus 20 patients; p=0.002). Overall, 'fast track' patients had a shorter median hospital stay (5d [2-30] versus 9 d [6-30]; p< 0.0001) compared with the standard care group.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
15. Lee SM, Jang JH, Kim DW, Heo S, Jeong SY, Park KJ, Kang S. Comparison of early mobilization and diet rehabilitation program with conventional care after laparoscopic low anterior resection: A prospective randomized controlled trial. Surgical Endoscopy and Other Interventional Techniques 2012;26:S190.	**Randomized Controlled Trial** Laparoscopic low anterior resection with defunctioning temporary ileostomy *The aim of this study was to evaluate the efficacy of a rehabilitation program after laparoscopic low anterior resection in a randomized controlled trial*	n=98 total Inclusion criteria: Adult patients receiving the specific surgery between July 2007 and September 2011 Exclusion criteria: None Listed	Patients were randomly assigned to 1 of 2 rehabilitation program groups *I Group 1: early mobilization and diet, n=52* *C : Group 2: conventional care, n=46*	• *There is no evidence to support that a rehabilitation program with early mobilization and diet is beneficial after laparoscopic low anterior resection.* • There was no difference in complication rates between the rehabilitation program group and conventional care group, but more complications were noted in the rehabilitation program group (42%vs. 24%; p = 0.051), which was related to high post-operative ileus (25%vs. 13%, p = 0.135) and acute urinary retention (17.3%vs. 4.3%, p = 0.056). • No infection outcomes reported. • Recovery time was not different in both groups (rehabilitation program group, 7.2 (5–8.3) days vs. conventional care group, 7.1 (5–8) days, p = 0.791). There was no difference in post-operative hospital stay between the two groups (rehabilitation, 8.7 (7–10.75) days vs. conventional, 8.3 (7–10) days; p = 0.436).

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
16. Smart NJ, White P, Allison AS, Ockrim JB, Kennedy RH, Francis NK. Deviation and failure of enhanced recovery after surgery following laparoscopic colorectal surgery: early prediction model. Colorectal Disease 2012;14:e727-34.	**Retrospective Review** Patients Undergoing elective laparoscopic colorectal resection *"Enhanced Recovery after Surgery" programmes are well established, but deviation from the postoperative elements may result in delayed discharge. Early identification of such patients may allow remedial action to be taken. The aims of this study were to investigate factors associated with delayed discharge and to produce a predictive scoring system for Enhanced Recovery after Surgery failure.*	n= 385 patient records were reviewed (196 Women, 189 Men) Exclusion criteria: None listed	*I: Use of "Enhanced Recovery after Surgery" programmes* C: No Control	• *Enhanced recovery failure and delayed discharge after laparoscopic colorectal surgery can be predicted by the early deviation from postoperative factors of an "Enhanced Recovery after Surgery" programme.* • Re-insertion of urinary catheter was strongly associated with delayed discharge. 10.1% of patients required re-catheterization. • No Infectious outcomes reported. • Median length of stay was 6 days.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
17. Thompson EG, Gower ST, Beilby DS, et al. Enhanced recovery after surgery program for elective abdominal surgery at three Victorian hospitals.[Erratum appears in *Anaesth Intensive Car.* 2012 Jul;40(4):719]. *Anaesth Intensive Care* 2012;40:450-9.	**Prospective Before-After Intervention Study** Abdominal surgery (colorectal, gastric, small bowel, hepatobiliary, oesophageal, Other). 70% were open surgeries. *The aim of this study was to evaluate the anaesthesia care of an enhanced recovery after surgery program for patients having abdominal surgical in Victorian hospitals.*	N=323 total enrolled patients N=154 pre- enhanced recovery after surgery N=169 post- enhanced recovery after surgery Exclusion criteria: Patients undergoing vascular, inguinal hernia, gynaecological or urological surgery	*I: Enhanced recovery after surgery bundle was multifaceted. They measured compliance with these 14 items: 1) no bowel prep; 2) preop oral nutritional supplementation; 3) no drain tubes; 4) no nasogastric tubes; 5) local anaesthesia technique; 6) timely antibiotics; 7) IV fluids ≤ 5 ml/h; 8) avoid hypothermia; 9) Society of Ambulatory Anesthesia postoperative nausea and vomiting practice guideline antiemetics; 10) thromboprophylaxis;* ***11) removal of indwelling urinary catheter (if used) the morning after surgery (unless epidural in situ);*** *12) early oral analgesia; 13) early mobilization; and 14) early postop oral nutritional supplementation.* C: The control group was a prospective cohort representing pre-existing practice for elective abdominal surgical patients (n=154)	• *From a total of 14 enhanced recovery after surgery -recommended items, there were significantly more implemented in the post- enhanced recovery after surgery period (median 8 vs. 9; p<0.001). There were however persistent low rates of IV fluid restriction (25%) and early removal of urinary catheter (31%) in the post- enhanced recovery after surgery period.* • No retention outcomes reported. • The incidence of urinary tract infection increased from 3.2% pre- enhanced recovery after surgery to 7.1% post enhanced recovery after surgery (p=0.12). • Removal of the urinary catheter the morning after surgery had low uptake, with only 31% removed in the post- enhanced recovery after surgery patients vs. 25% in the pre-enhanced recovery after surgery group. ERSA patients had less pain and faster recovery parameters, and this was associated with a reduced hospital stay, geometric mean (SD) 5.7 (2.5) vs. 7.4 (2.1) days, p=0.006. There were no significant differences in the rates of complications after surgery, including rates of hospital re-admission.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
18. Baek SJ, Kim SH, Kim SY, Shin JW, Kwak JM, Kim J. The safety of a "fast-track" program after laparoscopic colorectal surgery is comparable in older patients as in younger patients. Surg Endosc 2013;27:1225-32.	**Prospective Randomized Controlled Trial** Patients Undergoing laparoscopic colorectal surgery *The present study was designed to assess the safety of application of a fast-track program after laparoscopic colorectal surgery in elderly patients.*	n= 337 patients in total 87 patients were 70 years or older and were considered in the "old group" (OG) 250 patients were younger than 70 and considered in the "young group" (YG) Exclusion criteria: None listed	*Included patients were cared for using an enhance recovery program protocol* C: No Control	• *Fast-track after laparoscopic colorectal surgery can be safely applied in carefully selected elderly patients older than age 70 years. Physicians should keep in mind complications that may present after discharge and should actively educate patients about them.* • 2 patients in the OG and 6 patients in the YG could not have the urinary catheter successfully removed during the postoperative hospital stay due to urinary retention. • No Infectious outcomes reported.
19. Foster JD, Smart NJ, White P, et al. An early prediction model for deviation and failure of enhanced recovery after surgery following laparoscopic colorectal surgery. Surgical Endoscopy and Other Interventional Techniques 2013;27:S98.S6. **<u>Abstract Only</u>**	**Retrospective review of case notes** Patients undergoing elective laparoscopic colorectal resection *Enhanced Recovery After Surgery programmes are well established, but deviation from the postoperative elements may result in delayed discharge. Early identification of patients deviating from the postoperative pathway may enable remedial action to be taken. The aims of this study were to investigate factors associated with delayed discharge and to produce a predictive scoring system for Enhanced Recovery After Surgery failure.*	n= 385 patients were reviewed Exclusion criteria: None Listed	*I: The intervention applied was the "Enhanced Recovery After Surgery Programme". There was a detailed analysis of patients who deviated from the protocol.* C: No Control	• *Enhanced recovery failure and delayed discharge after laparoscopic colorectal surgery can be predicted by the early deviation from postoperative factors of an "Enhanced Recovery After Surgery Programme."* • No retention outcomes reported. • No Infectious outcomes reported. • Prolonged length of stay was associated with an operation time greater than 5 hours. Deviation from the protocol at the end of the first post-operative day was strongly associated with re-insertion of urinary catheter and a delayed discharge.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
20. Hardt J, Schwarzbach M, Hasenberg T, Post S, Kienle P, Ronellenfitsch U. The effect of a clinical pathway for enhanced recovery of rectal resections on perioperative quality of care. International Journal of Colorectal Disease 2013;28:1019-26.	**Prospective Non-Randomized Controlled Trial** Patients undergoing rectal resections *The authors aimed to assess whether additional fluid restriction had a negative impact on preservation of hemodynamics and renal function in patients having an effective epidural analgesia.*	n= 103 patients in total 36 patients were in the clinical pathyways group 67 patients were treated prior to the implementation of the clinical pathways Exclusion criteria: None Listed	*I: Patients who received care following the clinical pathway plan of care.* C: Patients who received the standard of care before implementation of the clinical pathway program.	• *After implementation of clinical pathways for rectal resections, one parameter of process quality improved and length of stay decreased.* • No retention outcomes reported. • No Infectious outcomes reported. • About 90% of patients in both groups received an epidural catheter. The stipulated goal of removing Foley catheters the same day of epidural catheter removal was met only in a small minority of patients. This failure was very pronounced in the clinical pathways group where Foley catheters remained in situ for 2 or more days after removal of the epidural catheter in almost half of the patients. The reasons why a supposedly easy task, removing a catheter which is usually perceived as bothersome by patients, was achieved so infrequently remain unclear. Possible explanations are that staff had fears of urinary retention after catheter removal or of a higher workload if patients required nursing assistance to urinate. Pelvic surgery and epidural analgesia are in fact both known risk factors for postoperative bladder dysfunction. There were no statistically significant differences regarding Foley catheter removal. This study found a significantly shorter hospital stay in patients treated with clinical pathways.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
21. Kolozsvari NO, Capretti G, Kaneva P, et al. Impact of an enhanced recovery program on short-term outcomes after scheduled laparoscopic colon resection. *Surg Endosc* 2013;27:133-8.	**Retrospective case/control chart review** Laparoscopic colon resection *The aim of this study was to determine whether the use of an enhanced recovery program improved short-term outcomes after laparoscopic colon resection in one hospital.*	N=136 patients in the enhanced recovery program after laparoscopic colon resection N=161 patients undergoing traditional care after laparoscopic colon resection Exclusion criteria: None listed	*I: Enrollment in the enhanced recovery program, which included early removal of the urinary catheter.* C: Traditional care	• *In patients undergoing scheduled laparoscopic colectomy in a university-based clinical teaching unit, an enhanced recovery program can further reduce length of stay and postoperative ER visits without increasing readmission rates.* • There was no significant difference in urinary retention between groups (4% in enhanced recovery program vs. 2% in traditional care, p=0.34). • There was no significant difference in urinary tract infection rates between groups (3% enhanced recovery program vs. 4% in traditional care, p=0.76). • Patients in the enhanced recovery program had earlier removal of their urinary catheter compared to traditional care (p<0.001). There was no significant difference in complication rates between the groups, including intra-abdominal abscess (1.5% vs. 2%, p=1) and readmissions (8% vs. 7%, p=0.73). More patients in the enhanced recovery program were discharged by post-op day 3 than in traditional care (47% vs. 26%, p<0.001).

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
22. Stubbs BM, Badcock KJM, Hyams C, Rizal FE, Warren S, Francis D. A prospective study of early removal of the urethral catheter after colorectal surgery in patients having epidural analgesia as part of the enhanced recovery after surgery programme. Colorectal Disease 2013;15:733-6.	**Prospective cohort study** Elective colorectal resection (laparoscopic and open technique) The aim of this study was *to investigate retention rates in those who had the urethral catheter removed prior to the removal of epidural analgesia compared to those who had their catheter removed after the epidural had stopped and whether pelvic surgery was associated with an increased risk of urinary retention.*	n= 209 total n= 118 in trial without catheter (TWOC) before the epidural was stopped (early TWOC) group n= 91 individuals had the catheter removed after the epidural was removed (late TWOC) group Exclusion criteria: Alternative forms of postoperative analgesia besides epidural, such as a transversus abdominis plane (TAP) block or a peripherally sited patient-controlled analgesic device.	*I: trial without catheter before the epidural was stopped (early TWOC))on average within 24 hours postoperatively* C: Catheters removed after the epidural was removed (late TWOC) on average 3 days postoperatively	• *Early TWOC with epidural analgesia running significantly increases the risk of urinary retention; however, it was still successful in 88% of patients.* • In the early TWOC group, 86% had the catheter removed within 24 h of surgery at a mean ± SD interval of 29 ±17.4 h. In the latter group the interval was 85 ± 66.1 h. 16 patients developed urinary retention. There was a statistically significant difference between the early (n = 14; 11.9%) and late (n = 2; 0.9%) TWOC groups in the need for recatheterization *(p = 0.009).* There was no significant difference in the incidence of retention for catheter removal within 24 or 48 h after surgery *(χ^2, p= 0.24 and χ^2, p= 0.77* respectively*).* The mode of surgery (i.e. laparoscopic or open) did not affect the risk of retention in either group *(early TWOC, p= 0.811; late TWOC, p= 0.912).* There was no statistically significant increased risk of developing retention if patients underwent pelvic dissection compared with no pelvic dissection *(p= 0.63).* The mode of surgery (i.e. laparoscopic or open) did not affect the risk of retention in either group (early TWOC, P = 0.811; late TWOC, *p = 0.912*). Retention rates for laparoscopic and open surgery were 12.3% and 10.8%, respectively, in the early TWOC group and 2.4% and 2.0%, respectively, in the late TWOC groups. • No infection outcomes reported.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
23. Agrafiotis AC, Corbeau M, Buggenhout A, Katsanos G, Ickx B, Van de Stadt J. Enhanced recovery after elective colorectal resection outside a strict fast-track protocol. A single centre experience. International Journal of Colorectal Disease. Jan 2014;29(1):99-104.	**Retrospective Analysis** Colorectal Resection *In order to optimise, in every aspect, the postoperative recovery of each patient undergoing an elective colorectal resection inside our institution, we set up a "soft" enhanced recovery programme.*	N=92 patients receiving elective colonic resection Exclusion Criteria: Patients excluded from this study were those with a total mesorectal excision and coloanal anastomosis, a discharge stoma, more than one anastomosis, and all patients who had emergency surgery.	*I: Patients assigned to fast track protocol aimed at patients' discharge on the second postoperative day* C: No Control	• *There are substantial possibilities of optimizing the recovery process after an elective colorectal resection, outside a strict fast-track protocol.* • No retention outcomes reported. • No Infectious outcomes reported. • When the urinary catheter was not removed or oral feeding not resumed on postoperative day 1, the patients were discharged later (p <0.001). When all the required measures of our protocol were correctly implemented, the median discharge day was postoperative 3.
24. Khoury W, Dakwar A, Sivkovits K, Mahajna A. Fast-track Rehabilitation Accelerates Recovery After Laparoscopic Colorectal Surgery. J Soc Laparoendosc Surg 2014;18.	**Prospective Study of Patients** Patients who underwent laparoscopic colorectal resections *The aim of this study is to provide data supporting the use of Fast Track rehabilitation care plans in laparoscopic colorectal surgery, to present our protocol, and to share the experience with it.*	n= 71 patients in total (30 women , 41 men) Exclusion criteria: None Listed	*I: Fast Track: Patients who underwent laparoscopic colorectal resections in accordance with the guidelines of fast track rehabilitation protocol* C: No Control	• *FT rehabilitation results in favorable postoperative outcomes. Our data provides evidence and suggests that FT protocols should be implemented as a reliable method of preparation and recovery for laparoscopic colorectal surgery.* • No retention outcomes reported. • No infectious outcomes reported. • Urinary catheter removal occurred on postoperative day 1.7 +/- 0.9. 1 patient had intra-abdominal abscess.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
25. Nagle D, Curran T, Anez-Bustillo L, Poylin V. Reducing urinary tract infections in colon and rectal surgery. *Dis Colon Rectum* 2014;57:91-7.	**Prospective cohort study** Colon or rectal resection *The aim of this study was to investigate the effect of standardized indwelling urinary catheter management on urinary tract infection.*	N=811 total N=476 Intervention 1 N=120 Intervention 2 N=215 Control Exclusion criteria: Patients who had evidence of a pre-existing urinary tract infection. Patients with enterovesical, colovesical, or colon or rectal vaginal fisulae were considered to have a pre-existing urinary tract infection	*I1: Implementation of daily electronic order prompt requiring justification for an indwelling urinary catheter for >24 hours.* *I2: Intervention 1, plus sterile intraoperative placement of a urinary catheter after the antiseptic preparation and draping of the patient.* C: Patients in control group did not undergo a standardized indwelling urinary catheter management program, but did undergo daily reassessment of the need for the indwelling urinary catheter	• *The implementation of 2 low-cost practice interventions was associated with a statistically significant decrease in urinary tract infection in patients undergoing colorectal surgery at an academic tertiary care center.* • No retention outcomes reported. • Urinary tract infection rate decreased significantly with the implementation of each intervention (control, 6.9%; group 1, 2.7%; group 2, 0.8%; p = 0.004). The lone urinary tract infection in group 2 involved ureteral reconstruction and stent placement at the time of surgery. • Mean duration of the indwelling urinary catheter was 2.2 days in the intervention 2 group. Data was not available to compare to the intervention 1 or control groups. Predictors of development of a urinary tract infection included superficial surgical site infection. Overall morbidity was decreased in Intervention 2 (24%) when compared to Intervention 1 (35%) and the Control Group (37%)(p=0.05). Mean length of stay decreased with each additional intervention, but was not significantly different between the 3 groups (6.7 days Control; 6.2 days Intervention 1; 5.3 days Intervention 2; p=0.11). There was also no significant difference in mortality between groups (2% Control, 3% Intervention 1, 0% Intervention 2; p=0.07).

Bariatric				
Reference	**Study Type** Operation *Aims*	Patients	*Intervention/* Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
26. Capella, JF, Capella, RF. Is routine invasive monitoring indicated in surgery for the morbidly obese? Obesity Surgery 1996;6(1):50-3.	**Prospective cohort** Primary vertical banded gastroplasty-gastric bypasses *The aim of this study was to identify factors potentially associated with the need for invasive monitoring in morbidly obese individuals undergoing primary gastric bypass procedures who required central or other forms of invasive monitoring for their management.*	n= 521 total Inclusion criteria were: Adult patients undergoing the specific form of gastric bypass, who required central, arterial or urinary catheters for monitoring purposes Exclusion criteria: None Listed	Factors: Age, sex, preoperative BMI, length of procedure, if there were technical complications during the operation, preoperative co-morbidities: • Hypertension, diabetes mellitus, heart disease, asthma or bronchitis, hypoventilation syndrome, obstructive lung disease, restrictive lung disease, and sleep apnea.	• *The findings show that morbid obesity itself is not an indication for invasive monitoring. The majority of morbidly obese individuals can be safely managed through primary gastric bypass procedures without invasive monitoring.* • No Retention Outcomes Reported. • Post-op pneumonia (1 patient with urinary and arterial catheter) • The five patients requiring post-operative invasive monitoring had significantly longer operations as compared to the study population ($p < 0.001$). These were the only patients with technical complications. Post-operative intra-peritoneal bleeding, inadvertent Ewald tube stapling, pulmonary embolism, post-operative anastomotic bleeding, wound dehiscence.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention/* Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
27. Campos GM, Ciovica R, Rogers SJ, Posselt AM, Vittinghoff E, Takata M, Cello JP. Spectrum and risk factors of complications after gastric bypass. Archives of Surgery 2007;142(10):969-75.	**Prospective Cohort** Open or laparoscopic gastric bypass surgery *The aim was to study the spectrum of risk factors for complications after gastric bypass*	n=404 total Inclusion criteria: Adult, morbidly obese patients who underwent gastric bypass surgery between January 2003 and December 2006 Exclusion criteria: None Listed	*I: Patients having either open (n=72) or laparoscopic (n=332) gastric bypass surgery were screened for risk factors and compared* C: No Control	• *Complications occurred in 18.3% of patients, but 95% were treated without leading to lasting disability. Presence of diabetes, early surgeon experience, and an open approach were found to be risk factors of complications in this population.* • Urinary retention occurred in 3 patients, 2 of which had open surgery. • Wound infection occurred in 13 patients in the laparoscopic group. • Extended stay (n=4), Foley catheter removed cystoscopy (n=1).
28. Schouten R, Van Dijke JCM, Van't Hof G, Feskens, PBGM. Prevalence and risk factors for urinary incontinence and bladder retention in gastric bypass surgery: A cross-sectional study. Obesity Surgery 2013;23(6):760-3.	**Cross Sectional Study of Pre- and Postoperative Patients** Standard laparoscopic Roux-en-Y gastric bypass surgery. *The aim of this study was to determine if morbid obesity leads to a high prevalence of peri-operative incontinence and bladder retention after bariatric surgery, due to routine use of bladder catheterization during the surgery.*	n=60 total; all female Inclusion criteria: Adult, morbidly obese female, primary RYGB patients at a single institution. Exclusion criteria: None Listed	*Patients with and without post-operative urinary incontinence were screened for risk factors and compared* C: No Control	• *There was no difference between the patients with and without post-operative with the listed risk factors. Due to the low prevalence of post-operative incontinence, there was no need for catheterization for bladder retention. Therefore, there were no pre-operative risk factors identified for developing urinary incontinence complication.* • Patients without incontinence had mean bladder retention of 59 ml pre-operative, and 200 ml residual volume post-operative. Patients with incontinence had mean bladder retention of 26 ml pre-operative, and 175 ml residual volume post-operative. • No Infectious outcome reported. • Pre-operative urinary incontinence was reported by 25 patients (43%), based on survey. After surgery, 9 patients (15%) were incontinent for urine, 4 of which had known incontinence.

Cholecystectomy				
Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
29. Mowschenson PM, Weinstein ME. Why catheterize the bladder for laparoscopic cholecystectomy? *J Laparoendosc Surg* 1992;2:215-7.	**Prospective cohort study** cholecystectomy *Determine the frequency of urinary retention after laparoscopic cholecystectomy surgery without perioperative bladder catheterization.*	n= 50 Exclusion criteria: None Listed	*I: 50 consecutive laparoscopic cholecystectomies were performed without perioperative bladder catheterization. All patients were requested to void shortly before arrival in the operating room. Patients were catheterized postoperatively if they were unable to void.* C: No Control	• *Routine bladder catheterization for laparoscopic cholecystectomy is unnecessary, and its elimination will reduce costs, urethral trauma, and nosocomial urinary tract infections.* • Only 3 of the 50 patients required bladder catheterization post-surgery. The catheters were removed within 12 hours for 2 of the patients, and 36 hours for 1 70-year-old male with choric prostatic symptoms. • No Infectious outcomes reported.
30. Majeed AW, Plura M, Priest S, Johnson AG. Is it necessary to catheterize the bladder before laparoscopy? Surgical Laparoscopy & Endoscopy 1998;8(2):157-8.	**Prospective Cohort** Laparoscopic cholecystectomy *The aim of this study was to assess if catheter drainage of the urinary bladder should be done before insertion of a Veress needle for laparoscopic surgery to prevent damage to the bladder*	n=50 Patients were catheterized aseptically with a 12-F soft rubber catheter after induction of anesthesia Exclusion criteria: None listed	*I: Measuring the amount of urine in a patients bladder before and after undergoing laparoscopic cholecystectomy and assessing the risk of catheterization.* C: No Control	• *If the urinary bladder is examined after the patient has been anesthetized, routine catheterization is not necessary before insertion of a Veress needle or infraumbilical trocar to insufflate the peritoneum for laparoscopic surgery. There was no correlation between the age of the patient and residual volume in the bladder.* • 3 patients (all male) had a residual volume of >200 ml, none of which developed post-op urinary retention. • 3 males did develop post-op urinary retention. • Urinary infection was excluded in these patients by culturing catheter specimens.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
31. Liu SKM, Rassai H, Krasner C, Braun J, Matolo NM. Urinary catheter in laparoscopic cholecystectomy: Is it necessary? *Surgical Laparoscopy and Endoscopy* 1999;9:184-6.	**Randomized control trial** Elective laparoscopic cholecystectomy *The aim of this prospective study was to evaluate the necessity or urinary catheterization in elective laparoscopic cholecystectomy.*	N=261 patients who underwent non-emergent laparoscopic cholecystectomies from April 1996-April 1998 N=134 without Foley N=127 with Foley Exclusion criteria: 6 patients who declined and 4 patients who had chronic indwelling Foley catheters	*I: Patients did not receive preoperative urinary bladder catheterization (without Foley).* C: Patients did receive preoperative urinary bladder catheterization (with Foley)	• *The authors concluded that urinary catheterization can be omitted safely in elective laparoscopic cholecystectomy. Although not statistically significant, there were more urinary tract complications in the "with Foley" group than in the "without Foley" group (four vs one, respectively).* • Two patients developed urinary retention (one intervention and one control). • Three patients (all in the control group) developed urinary tract infection. • There was no significant difference between the two groups with respect to length of operation and perioperative complications. There was no visceral injury or operative mortality in this study.
32. Kulacoglu H, Dener C, Kama NA. Urinary retention after elective cholecystectomy. *Am J Surg* 2001;182:226-9.	**Prospective cohort study** Laparoscopic cholecystectomy or open cholecystectomy *The aim of this study was to determine the postoperative urinary retention rate after cholecystectomy and to investigate the differences between open and laparoscopic techniques.*	N=140 total patients (121 female, 19 male) undergoing surgery for chronic cholelithiasis N=107 laparoscopic cholecystectomy N=33 open cholecystectomy Exclusion criteria: Previous catheterization history, chronic renal disorders, urinary tract obstruction, pericholecystic abscess, emphysema of the gallbladder, concomitant common bile duct exploration, additional intraabdominal interventions, drugs affecting micturition	*I: Either laparoscopic or open cholecystectomy for chronic cholelithiasis without perioperative bladder catheterization* C: No Control	• *Urinary retention is a rare complication after elective cholecystectomy. Helping measures are very effective and should be tried before inserting a urethral catheter.* • The overall post-op urinary retention rate was 0.7% and there was no difference in the rate between surgery types. 10 out of 140 patients were not able to pass urine spontaneously post-surgery. 9 of the 10 were able to void with helping measures within 12 hours of surgery. Only 1 patient required a post-op urethral catheter insertion. • No Infectious outcomes reported. • The post-operative difficulty in micturition rate was 7.1% and there was a significant difference between type of surgery: 4.7% laparoscopic vs. 15.2% open cholecystectomy (P=0.04). Only perioperative IV fluid volume and meperidine had significant effects on post-operative difficulty in micturition. Mean IV fluid volume was 2,020 mL for those with post-operative difficulty in micturition and 1,401 mL for those with no post-operative urinary problems (P=0.03). 8 of 70 patients who were given 50 to 100 mg meperidine developed post-operative difficulty in micturition, but only 2 of 70 who did not receive meperidine for postoperative analgesia (P=0.03).

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
33. Kotake S, Satoh W. Changes in lower urinary tract symptoms before and after using an indwelling urethral catheter. Japan Journal of Nursing Science 2004;1(2):99-106.	**Prospective Cohort** Laparoscopic cholecystectomy *The purpose of this study was to clarify changes in lower urinary tract symptoms before and after the use of indwelling urethral catheters*	n=39 Inclusion criteria: Inpatients who needed to use an indwelling urethral catheter for treatment and who do no have any chief complaints about urinary tract symptoms Exclusion criteria: Patients with cerebrovascular disease, spinal cord disorders, kidney and urinary tract disorders (bladder cancer), post-laparotomy, and diabetes mellitus	*I: A questionnaire was completed by each patient enrolled, upon which their lower urinary tract symptoms and characteristics were compared* C: No Control	• *There is no evidence to support the causes of worsening symptoms of lower urinary tract symptoms. It is necessary to investigate the long-term effects following the use of the indwelling urethral catheter.* • No retention outcomes reported. • On admission, 84.6% (n=36) of subjects had lower urinary tract symptoms. 71.8% (n=28) of subjects still had lower urinary tract symptoms after use of the catheter. • Quality of life because of urinary symptoms was poor in patients with lower urinary tract symptoms. After the removal of catheters 6 subjects exhibited intensified lower urinary tract symptoms inpatients with LUTS, and the QOL because of LUTS was low in patients. Moreover, there were six patients whose symptoms of LUTS deteriorated after the use of a catheter.
34. Petrosic N, Cepic I, Pirjavec A, et al. Outcome Evaluation of 10,317 Laparoscopic Cholecystectomies: A 17-Year Experience at Single Center. Hepato-Gastroenterology. 2013;60(128):1873-6.	**Prospective Cohort** Laparoscopic Cholecystectomy *This study is an analysis of the large series of laparoscopic cholecystectomies and compare our results with those reported in the literature concerning complications*	N = 10,317 Exclusion criteria: None Listed	*I: Patients undergoing laparoscopic cholecystectomy* C: No Control	• *Our results on large number of patients are similar to other series in the newer literature but the rate of complications should be decreased. The incidence of complications decreases with growing laparoscopic experience.* • Urine retention occurred in 8 patients. • No infection outcomes reported.

Hernia Surgeries				
Reference	**Study Type** Operation *Aims*	Patients	*Intervention/* Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
35. Urbach KF, Lee WR, Sheely LL, Lang FL, Sharp RP. Spinal or General Anesthesia for Inguinal Hernia Repair? A Comparison of Certain Complications in a Controlled Series. Jama 1964;190:25-9.	**Randomized control trial** Inguinal hernia repair	n= 514 patients in total n=236 had spinal anesthesia administered N= 278 had general anesthesia administered Exclusion criteria: None listed	*I: Patients given spinal anesthesia* C: Patients given general anesthesia	• *The article concluded that the choice of anesthesia for inguinal hernia repair may largely be left to the personal preferences of patient, surgeon, and anesthetist without great risk of increasing postoperative complications.* • No patient in this study required catheterization more than once and all were voiding spontaneously after the first 24 hours following operation. Approximately 30% of the patients had not voided 12 hours postoperatively and 4% need catheterization. The incidence of retention was strikingly similar in the spinal and general anesthesia groups. Urinary retention was considered to be present in any patient who had not voided at the end of 12 hours postoperatively. • No infectious outcomes reported.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
36. Ryan JA, Jr., Adye BA, Jolly PC, Mulroy MF, 2nd. Outpatient inguinal herniorrhaphy with both regional and local anesthesia. American Journal of Surgery 1984;148:313-6.	**Randomized control trial** Inguinal herniorrhapeis *This report will summarize the experience at Virginia Mason Hospital with outpatient inguinal herniorrhaphy using regional anesthesia with short-acting anesthetic agents in combination with local infiltration of a long-acting agent and will retrospectively compare the results with those in a matched set of inpatients undergoing hernia repair with regional anesthesia using a long-acting anesthetic agent.*	n= 53 patients in total Exclusion criteria: None Listed	I: Inguinal herniorrhaphy using regional anesthesia with short acting anesthetic agents in combination with local infiltration of a long-acting agent C: Inpatients undergoing hernia repair with regional anesthesia using a long acting agent	• *There was a significantly greater incidence of urinary retention in the hospitalized patients who received long-acting regional anesthetic agents. We suggest anesthesia for inguinal herniorrhaphy is most satisfactorily provided by the combination of a short-acting regional anesthetic agent and a long-acting local one.* • Urinary retention developed in 16 patients (30%). Of these 16 patients, 15 required catheterization and 1 was able to void only after being given bethanecol. The incidence of urinary retention after long-acting regional anesthesia in the inpatients was significantly higher (30%) than that after short acting regional anesthesia. • No infectious outcomes reported.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention/* Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
37. Ferzli G, Sayad P, Huie F, Hallak A, Usal H. Endoscopic extraperitoneal herniorrhaphy - A 5-year experience. Surg Endosc-Ultrason Interv Tech 1998;12:1311-3.	**Randomized control trial** Groin hernias *This report reviews our experience with 512 groin hernias treated by a laparoscopic extraperitoneal approach over the past 5 years. We detail the modifications that have been made to this procedure and compare our morbidity an recurrence rates with other laparoscopic and open herniorrhaphy techniques.*	n= 512 groin hernias All Male Exclusion Criteria: None Listed	*I: Patients undergoing groin hernia surgery by laparoscopic extra peritoneal approach* C: No Control	• *The endoscopic extraperitoneal approach to groin hernia repair has a recurrence rate comparable with open and other laparoscopic techniques. Operative time has decreased considerably with experience. Familiarity with the technique has eliminated the need for balloon dissectors, cauteries, suction irrigation, Foley catheters, and stapling of the mesh. These advances, along with shortening of the operative time and employment of reusable trocars, have permitted a significant decrease in the cost of the procedure. This study provides the longest follow-up reported with this technique. In experienced hands, the TEP repair produces results that are comparable with the open, tension-free re-pair and represents a reasonable alternative.* • 8 cases of urinary retention were reported. • No infectious outcomes reported.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention/* Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
38. Pavlin DJ, Pavlin EG, Gunn HC, Taraday JK, Koerschgen ME. Voiding in patients managed with or without ultrasound monitoring of bladder volume after outpatient surgery. Anesthesia and Analgesia 1999;89:90-7.	**Randomized control trial** Outpatient surgery (hernia; anal; pelvic gynecologic surgery) The aim of this study was *to test that ultrasound monitoring of bladder volume, compared with conventional management, would reduce the incidence of unnecessary bladder catheterization and lessen the probability of prolonged over distention.*	n= 334 total; patients were stratified in advance into 4 categories based on a presumptive risk of retention obtained from the literature. Hypothesized high-risk categories included: 1) spinal/epidural anesthesia; 2) hernia surgery; 3) anal surgery; and 4) vaginal/pelvic gynecologic surgery A low-risk category included patients undergoing general anesthesia, peripheral nerve blocks, or local anesthesia with sedation for low-risk surgery n= 161 patients managed with ultrasound bladder monitoring n= 173 controls without bladder monitoring Exclusion criteria: Patients undergoing urologic surgery	*I: patients monitored with ultrasound monitoring of bladder volume. Measurements were made preoperatively, immediately postoperatively, and hourly in phase 2 recovery from time of arrival until voiding or bladder catheterization was performed. Patients' bladders were catheterized if they were unable to void with a measured volume > 600 mL. Urinary retention was defined as inability to void at a volume of > 600 mL* C: patients did not receive ultrasound monitoring of bladder volume	• *The findings demonstrate that bladder ultrasound monitoring did not alter outcome in patients at low risk of retention, but it facilitated determining when to catheterize patients at high risk of retention (hernia/anal surgery, spinal/epidural anesthesia).* • In the control group, managed by conventional means without ultrasound monitoring, median times to void were greater after vaginal/pelvic surgery (p= 0.0005) and spinal/epidural anesthesia (p= 0.003) compared with the low-risk category. Median bladder volumes before voiding, which were only measured in the ultrasound group, were higher after spinal/epidural anesthesia (p< 0.0001) and lower after vaginal/pelvic surgery (p= 0.04) compared with those in the low-risk group. Using ultrasound to guide care had no significant effect on time to void, time to discharge, or incidence of retention in low-risk patients. In patients at high risk of retention managed by ultrasound (hernia/anal surgery and spinal/epidural anesthesia combined), there was a trend toward shortened times to void (138 ± 68 min for ultrasound versus 168 ± 99 min for control; p= 0.17) and to discharge (196 ± 73 vs 220 ± 96 min, respectively; p= 0.27). There was a statistically significant correlation between elapsed time (time from operating room entry to time of voiding) and bladder volume (R^2= 0.07, p= 0.002) but not between fluids administered and bladder volume. • No infectious outcomes reported.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention/* Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
39. Mazeh H, Beglaibter N, Grinbaum R, et al. Laparoscopic inguinal hernia repair on a general surgery ward: 5 years' experience. J Laparoendosc Adv Surg Tech 2008;18:373-6.	**Retrospective Review** Laparoscopic inguinal hernia *The aim of this study was to present the experience of a general surgery ward with laparoscopic inguinal hernia repair.*	n= 220 patients in total Exclusion criteria: None Listed	*I: Patients who received laparoscopic inguinal hernia repairs* C: No Control	• *The laparoscopic herniorrhaphy offers a safe and effective repair with acceptable complication and recurrence rates. Good results with the total extra peritoneal technique can be achieved by general laparoscopists and not only in highly specialized hernia centers. It is especially suited for bilateral repair and for recurrent hernias.* • Only 2 patients were readmitted within 7 days of the operation, both owing to urinary retention. The average time for return to complete and normal activity was 14.2 days (range, 1–90), and the postoperative analgesics usage at home after surgery was 1.5 days (range, 0–60). • No infectious outcomes reported.
40. Antonescu I, Baldini G, Watson D, et al. Impact of a bladder scan protocol on discharge efficiency within a care pathway for ambulatory inguinal herniorraphy. Surg Endosc 2013;27:4711-20.	**Randomized control trial** Inguinal herniorraphy *This study aimed to assess whether the implementation of a bladder scan-based voiding protocol reduces the time until discharge after ambulatory inguinal herniorraphy without increasing the rate of postoperative urinary retention.*	n= 124 patients in total Exclusion Criteria: If patients had conditions making postoperative urinary retention not an applicable problem (e.g., an ileal conduit), if they had undergone a concomitant procedure, or if they had been admitted overnight regardless of the reason	*I: 64 patients underwent hernia repair after implementation of the protocol* C: 60 patients underwent hernia repair prior to the implementation of the protocol .	• *After ambulatory inguinal herniorraphy, implementation of a bladder scan-based voiding protocol did not result in earlier discharge. The incidence of POSTOPERATIVE URINARY RETENTION was lower than reported in the literature.* • The proportion of patients voiding before discharge was higher after protocol implementation (73 vs. 89 %; p = 0.02). The protocol had no impact on median time to discharge (190 vs. 205 min; p = 0.60). Only one patient in each group presented to the emergency department with postoperative urinary retention (2 %). The volume voided was noted for 19 of the 57 patients who had voided spontaneously before discharge. These voided volumes ranged from 15 to 450 mL and was <150 mL in five cases. • No infectious outcomes reported. • The overall median PACU stay was 190 (155; 261) before and 205 (150; 273) minutes after implementation of the protocol. This 15-minute increase was not statistically significant (p = 0.60).

Reference	**Study Type** Operation *Aims*	Patients	*Intervention/* Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
41. O'Connell JE, Kearney DE, Kukaswadia S, Andrews EJ. Incidence of and risk factors for post-operative urinary retention in patients undergoing laparoscopic inguinal hernia repair. Colorectal Disease 2014;16:186. **Abstract Only**	**Prospective controlled trial** Laparoscopic Inguinal hernia Repair *The aim of this study was to examine the incidence of and risk factors for post-operative urinary retention in patients undergoing laparoscopic inguinal hernia repair.*	n= 71 patients in total 66 male, 5 female Exclusion criteria: None Listed	*I: Patients who underwent a laparoscopic inguinal hernia repair* C: No Control	• *Post-operative urinary retention is a common complication following laparoscopic inguinal hernia repair. In this study, existing BPH, and intra-operative fluid volume were independent risk factors for its development.* • Five (7%) patients, all male, developed post-operative urinary retention. • No infectious outcomes reported.
42. Sivasankaran MV, Pham T, Divino CM. Incidence and risk factors for urinary retention following laparoscopic inguinal hernia repair. American Journal of Surgery 2014;207:288-92.	**Retrospective chart review** Laparoscopic inguinal hernia repair *The objectives of this study were to determine the incidence of postoperative urinary retention and examine different risk factors that may be associated with the development of postoperative urinary retention in patients who have undergone laparoscopic inguinal hernia procedures.*	n=350 patients in total Exclusion criteria: None Listed	*I: Patients who underwent laparoscopic inguinal hernia repair* C: No Control	• *History of benign prostatic hyperplasia, age ≥60 years, and anesthesia time ≥2 hours were significant independent risk factors for urinary retention after laparoscopic inguinal hernia repair. On multivariate analysis, only history of group and age≥60 years showed significance. This is 1 of the largest studies to show that the development of* postoperative urinary retention *in laparoscopic inguinal hernia repair patients is a multifactorial process. Further studies should be conducted to corroborate our findings.* • Twenty-nine patients developed postoperative urinary retention, an incidence of 8.3%. Age≥60 years and history of benign prostatic hyperplasia showed significance on multivariate analysis, with odds ratios of 3.0 and 11.0 respectively (P = .05). Anesthesia time≥2 hours (odds ratio, .75) was a contributing perioperative risk factor but only as an independent risk factor (P = .05). • No infectious outcomes reported.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention/* Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
43. Hudak KE, Frelich MJ, Rettenmaier CR, et al. Surgery duration predicts urinary retention after inguinal herniorrhaphy: a single institution review. Surgical Endoscopy and Other Interventional Techniques 2015.	**Retrospective Review** Inguinal hernia Repair *The primary objective of this study was to determine the incidence of Postoperative urinary retention (POUR) after inguinal hernia repair. As a secondary goal, we sought to determine whether perioperative and patient factors predicted urinary retention.*	n= 192 patients in total Exclusion criteria: None Listed	*I: Patients who underwent inguinal hernia repair* C: No Control	• *Bilateral hernia repairs, BMI >= 35 kg/m2, and operative time are significant predictors of postoperative urinary retention. These factors are important to determine potential risk to patients and interventions such as strict fluid administration, use of catheters, and potential premedication.* • The overall postoperative urinary retention rate was 13 %, with 25 of 192 patients requiring a Foley catheter prior to discharge. Postoperative urinary retention was significantly associated with bilateral hernia repairs (p = 0.04), BMI >= 35 kg/m2 (p = 0.05) and longer operative times (p = 0.03). Based on odds ratio (OR) estimates, for every 10-min increase in operative time, an 11 % increase in the odds of urinary retention is expected (OR 1.11, CI 1.004–1.223; p = 0.04). For every 10-min increase in operative time, an 11 % increase in postoperative urinary retention is expected. • No infectious outcomes reported.

Other General Surgery Procedures				
Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
44. Greig JD, Mahadaven M, John TG, Garden OJ. Comparison of manual and ultrasonographic evaluation of bladder size in patients prior to laparoscopy. Surgical Endoscopy-Ultrasound and Interventional Techniques. 1996;10(4):432-3.	**Prospective Cohort** Patients undergoing elective or emergency laparoscopic procedures *The aim of the study was to assess bladder size in patients undergoing laparoscopy*	N= 90 Exclusion criteria: None Listed	*I: Assessed bladder size by manual examination and transcutaneous ultrasound* C: No Control	• *Preoperative voiding does not guarantee bladder emptying. Manual examination does not detect bladder enlargement reliably in the obese patient. Ultrasonography may improve patient selection for catheterization.* • Manual assessment failed to detect bladder enlargement in any patients (sensitivity: 0%) whereas ultrasound identified four patients (4.4%) at risk of bladder injury due to unsuspected enlargement. • Three of these patients were either overweight or obese and one patient had previous lower abdominal surgery. Of 12 patients (13%) catheterized, three had or developed urinary tract infections.

Reference	**Study Type** Operation *Aims*	Patients	*Intervention*/ Control Comparison	*Conclusions* Study Results: Retention/Infectious/Other Outcomes
45. Stephan F, Sax H, Wachsmuth M, Hoffmeyer P, Clergue F, Pittet D. Reduction of urinary tract infection and antibiotic use after surgery: a controlled, prospective, before-after intervention study. *Clin Infect Dis* 2006;42:1544-51.	**Prospective Before-After Intervention Study** Orthopedic or abdominal surgery *The aims of this study were to perform a multifaceted, multidisciplinary intervention study to decrease the incidence of nosocomial urinary tract infection in surgical patients and thereby improve quality of care and patient safety.*	N=1328 total enrolled patients over 3 phases Phase 1 pre-intervention = 249 Abdominal Surgery Controls and 280 Intervention Orthopedic Surgery patients Phase 2 post-intervention = 240 Abdominal Surgery Controls and 259 Intervention Orthopedic Surgery Patients. Phase 3 2-Year Follow-up = 300 Intervention Orthopedic Surgery Patients Exclusion criteria: Patients with long-term urinary catheterization	*I: Orthopedic surgery patients. The intervention was multifaceted and included locally developed guidelines, educational sessions, and posters.* *-Placement of urinary catheters in the operating room was restricted to patients who met the following criteria: (1) interventions with a foreseen duration of surgery 15 hours; (2) total hip replacement or related surgery, if the patient met 1 of the following conditions: age 175 years, an ASA class ≥3, obesity, or urinary incontinence; and (3) total knee replacement, if the patient met 1 of the following conditions: age >80 years, obesity, or urinary incontinence.* *-In the post-anesthesia care unit, the decision to insert a urinary catheter followed these criteria: (1) the decision required the clinical judgment of a physician; (2) there was no routine requirement for urination before discharge; (3) there was no routine determination of bladder volume by ultrasound and no decision for catheterization based on bladder volume measurement; and (4) a urinary catheter inserted because of long-duration surgery must be removed before discharge from the unit.* *-In the surgical wards, the urinary catheter was removed (1) on postoperative day 2 (i.e., the third day of catheterization) after total hip replacement or related surgery or (2) on post-operative day 1 after total knee replacement.* C: Abdominal surgery patients	• *The incidence of UTI following orthopedic surgery decreased by two-thirds following the intervention, and its benefit persisted after 2 years. The impact of such a prevention strategy could be very substantial both for patient safety and consumption of health care resources.* • No retention outcomes reported • In the intervention group 29 hospital-acquired urinary tract infections were observed in Phase 1 versus 10 infections in Phase 2, which is a 59% decrease in incidence (P=0.004). Adherence with the guidelines was 82%. In the Control Group the incidence of urinary tract infection was stable with 6 infections in Phase 1 and 3 in Phase 2. • In the intervention group, the number of urinary catheters placed in the OR decreased from 31% in Phase 1 to 24% in Phase 2 (P=0.052), to 16% in Phase 3 (P=0.01). A significantly higher proportion of patients had a urinary catheter for ≤3 days after the intervention (52% Phase 1 vs. 67% Phase 2; P=0.04), although this was not sustained into Phase 3 (43%, P=0.006). There was a shorter mean duration of catheterization post-intervention (5.0 days Phase 1 vs. 3.9 days Phase 2; P=0.02). Again, this was not sustained into Phase 33 (6.4 days; 0.05). The occurrence of other infectious and non-infectious complications was similar during both Phase 1 and Phase 2 in both the intervention and control groups.

Appendix Table 2.
Detailed Final Results for All Rated Clinical Scenarios for General Surgery Panel

Summary Results from Round 3 GENERAL SURGERY Panel Meeting

Scenarios for Considering Appropriateness of Urinary Catheter Use in Patients Undergoing Routine General Surgeries

KEY

1) The bolded numbers on top of each box indicate the frequency of each numbered response
2) The number in parenthesis at the end of each cell is the median response for that indication
3) Color Codes:

Green	Appropriate (median of 7-9)
Orange	Neutral (median of 4-6)
Red	Inappropriate (median of 1-3)
Yellow	Disagreement (at least 4 rated appropriate and 4 rated inappropriate)

Example:

a. Indication	**7**	**4**	**1**		**1**					(1)	***←frequency of each response***
	1	2	3	4	5	6	7	8	9		*←response options 1-9*

(median response)

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Important Reminders:

1. Please rate the appropriateness of a transurethral **Foley** catheter placement and duration of use in these clinical settings with respect to the need for the Foley catheter because the patient has undergone a specific, **ROUTINE** surgical procedure. We are **NOT** asking about the need for Foley catheter to manage or monitor **unexpected** intra-operative or post-operative conditions (such as needing hourly urine output to manage critical illness, managing urinary incontinence with respect to wounds, or a pre-existing need for indwelling urinary catheter).

2. These scenarios are requesting the appropriateness of using a Foley catheter, not any other type of urinary catheter. If there are scenarios where an indwelling urinary catheter is always needed other than a Foley catheter (such as suprapubic catheter), please note.

3. We are **NOT** asking you to rate the appropriateness of a Foley placement or duration of use with respect to the type of anesthesia. A separate panel is rating the appropriateness of Foley catheter placement and removal with respect to the need for spinal and epidural anesthesia and analgesia used for intra-operative and post-operative care.

4. Assume that the patient has **no other indication** for a urinary catheter other than what is provided in the scenario. If you feel there is more information that you need to make a decision, **please rate the scenario as it is** and write a note describing the type of information you'd need on the document (near the scenario in question, or in the space permitted in Section II).

5. Assume the patients would have **no difficulty** with catheter placement, meaning that a nurse could place an indwelling (Foley) or intermittent straight (ISC), or assess urine volumes using a bladder scanner unless otherwise stated.

6. **Urinary retention protocols** including symptom evaluation and bladder scanning *vary greatly by institution*: **assume you could obtain the desired frequency and schedule of bedside assessment by nursing and bladder scanning needed for the duration of time you would recommend for your patient**. *A later panel will be assessing appropriateness for details of urinary retention protocols such as frequency of symptom, exam and bladder scanner assessment, bladder volume criteria, and use of ISC or Foley for management of confirmed and persistent post-operative urinary retention.*

Section I: This section provides scenarios that query the appropriateness of **placing a Foley and duration of catheter use (if one was placed)** in order to provide patient care for the patient who has undergone ROUTINE general surgery procedures.

Instructions: Please circle your rating of the appropriateness of each urinary management strategy for each scenario on a scale of 1 to 9.

1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate.

A. General Considerations: Please rate the appropriateness of placing and timing of removing a Foley catheter with respect to the expected procedure time (**from time of anesthesia until end of surgical case in the operating room**) or expected procedure intravenous fluids

Clinical Scenarios	**Urinary Management Strategies**				
	Appropriateness of **placing a Foley routinely for OR use because** of this description:	Appropriateness of a 1st trial of void to **remove Foley catheter in this time frame** (if had been place for Surgery). In other words, what is the appropriateness of **WAITING** until the timeframe listed before removing the Foley if one had been placed?			
		Appropriateness of removal WITHOUT the use of a post-op bladder scanner protocol			
		First trial of void on **post-op day #0**	Waiting until **post-op day #1** for first trial of void	Waiting until **post-op day #2** for first trial of void	Waiting until **post-op day #3-4** for first trial of void	Waiting until **post-op day #5** or greater for first trial of void
A1. Procedure time						
a. Procedure time: < 1 hour	13 (1)	13 (9)	13 (1)	13 (1)	13 (1)	13 (1)
b. Procedure time: 1 to <2 hours	11 1 1 (1)	1 12 (9)	12 1 (1)	13 (1)	13 (1)	13 (1)
c. Procedure time: 2 to < 3 hours	1 2 1 1 4 2 2 (5)	1 2 1 9 (9)	5 2 1 1 1 3 (2)	12 1 (1)	13 (1)	13 (1)
d. Procedure time: 3 to < 4 hours	1 1 4 4 3 (8)	1 1 4 3 4 (7)	3 1 4 2 2 1 (5)	9 1 1 1 1 (1)	12 1 (1)	13 (1)
e. Procedure time: 4 to <5 hours	1 5 7 (9)	1 1 2 3 2 4 (5)	2 1 5 1 1 3 (5)	8 1 1 2 1 (1)	9 1 3 (1)	12 1 (1)
A2. Procedure intravenous fluids						
a. Procedure intravenous fluids given <1 Liter	13 (1)	1 12 (9)	13 (1)	13 (1)	13 (1)	13 (1)
b. Procedure intravenous fluids given 1 to <1.5 Liters	12 1 (1)	1 12 (9)	12 1 (1)	13 (1)	13 (1)	13 (1)
c. Procedure intravenous fluids given 1.5 to <2 Liters	8 1 1 3 (1)	1 1 11 (9)	12 1 (1)	12 1 (1)	13 (1)	13 (1)
d. Procedure intravenous fluids given 2 to <3 Liters	1 4 2 3 1 2 (6)	2 5 1 5 (7)	3 1 1 6 1 1 (5)	10 1 1 1 (1)	12 1 (1)	12 1 (1)
e. Procedure intravenous fluids given 3 to <4 Liters	2 4 7 (9)	4 3 2 4 (6)	1 4 1 2 3 2 (7)	4 1 1 5 1 1 (5)	9 2 1 1 (1)	12 1 (1)
f. Procedure intravenous fluids given 4 Liters or more	1 12 (9)	2 1 1 1 2 2 4 (6)	1 2 4 1 5 (7)	4 1 5 3 (5)	9 1 2 1 (1)	12 1 (1)

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

A. General Considerations: Please rate the appropriateness of placing and timing of removing a Foley catheter with respect to the expected procedure time (**from time of anesthesia until end of surgical case in the operating room**) or expected procedure intravenous fluids

Clinical Scenarios	Appropriateness of **removing** **Foley catheter in this time frame** (if had been place for Surgery). In other words, what is the appropriateness of **WAITING** until the timeframe listed before removing the Foley if one had been placed? **Appropriateness of removal if a post-op bladder scanner protocol was available to monitor for urinary retention or under recessitation**				
	First trial of void on **post-op day #0**	Waiting until **post-op day #1** for first trial of void	Waiting until **post-op day #2** for first trial of void	Waiting until **post-op day #3-4** for first trial of void	Waiting until **post-op day #5** or greater for first trial of void
A3. Procedure time					
a. Procedure time: < 1 hour	13 9 (9)	13 1 (1)	13 1 (1)	13 1 (1)	13 1 (1)
b. Procedure time: 1 to <2 hours	1 12 9 (9)	12 1 1 (1)	13 1 (1)	13 1 (1)	13 1 (1)
c. Procedure time: 2 to < 3 hours	1 12 9 (9)	6 2 1 1 3 (2)	12 1 1 (1)	13 1 (1)	13 1 (1)
d. Procedure time: 3 to < 4 hours	1 2 1 1 2 2 1 6 9 (8)	3 1 2 2 2 2 1 1 (5)	9 1 1 1 1 1 (1)	12 1 1 (1)	13 1 (1)
e. Procedure time: 4 to <5 hours	1 1 3 1 7 1 (9)	2 1 1 2 2 2 3 1 (6)	9 1 1 1 1 (1)	10 1 2 1 (1)	12 1 1 (1)
A4. Procedure intravenous fluids					
a. Procedure intravenous fluids given <1 Liter	1 12 9 (9)	13 1 (1)	13 1 (1)	13 1 (1)	13 1 (1)
b. Procedure intravenous fluids given 1 to <1.5 Liters	1 12 9 (9)	12 1 1 (1)	13 1 (1)	13 1 (1)	13 1 (1)
c. Procedure intravenous fluids given 1.5 to <2 Liters	1 1 11 9 (9)	12 1 1 (1)	12 1 1 (1)	13 1 (1)	13 1 (1)
d. Procedure intravenous fluids given 2 to <3 Liters	1 3 9 9 (9)	6 1 3 2 1 (3)	10 1 1 1 1 (1)	12 1 1 (1)	12 1 1 (1)
e. Procedure intravenous fluids given 3 to <4 Liters	2 2 2 1 6 9 (8)	2 2 1 2 1 3 2 (5)	6 1 1 2 1 1 1 (2)	9 2 1 1 1 (1)	12 1 1 (1)
f. Procedure intravenous fluids given 4 Liters or more	2 1 1 3 6 9 (7)	2 1 1 1 3 5 (7)	6 1 1 1 4 (3)	9 1 2 1 1 (1)	12 1 1 (1)

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

B. Colorectal Surgery: In this section we are asking you to rate the appropriateness of placing and timing of removal of Foley catheters for cases that are considered **ROUTINE** – meaning we are excluding patients who have required colorectal procedure because of an emergency such as sepsis, shock, or trauma. We are also excluding cases that require creation of a new urinary conduit due to involvement of the bladder or renal system. Colorectal surgery is performed for a variety of reasons including cancers of the gastrointestinal system, metastatic tumors (such as melanoma), Crohn's disease, colon polyp, colitis and diverticulitis.

Clinical Scenarios	**Urinary Management Strategies**					
	Appropriateness of **placing a Foley routinely for OR use because** of this description:	Appropriateness of **removing Foley catheter in this timeframe** (if had been place for Surgery). In other words, what is the appropriateness of **WAITING** until the timeframe listed before removing the Foley if one had been placed?				
		Appropriateness of removal WITHOUT the use of a post-op bladder scanner protocol				
		First trial of void on **post-op day #0**	Waiting until **post-op day #1** for first trial of void	Waiting until **post-op day #2** for first trial of void	Waiting until **post-op day #3-4** for first trial of void	Waiting until **post-op day #5** or greater for first trial of void
B1. Colorectal procedures performed using **"Open" technique** (as opposed to "Laparoscopic" technique)	An overview of colon and rectal resection including a description of the common types of surgical procedures performed can be located in the "Review" articles provided on the USB drive labeled "Overview of Colon Resection," and "Overview of surgery for the treatment of primary rectal adenocarcinoma."					
a. Open ileocecetomy (removal of part of ileum of small intestine, cecum part of colon, ileocecal valve and appendix)	1 2 3 4 5 6 7 8 9 **1 2 1 2 1 6** (8)	1 2 3 4 5 6 7 8 9 **2 2 1 1 7** (9)	1 2 3 4 5 6 7 8 9 **2 2 3 6** (8)	1 2 3 4 5 6 7 8 9 **10 1 2** (1)	1 2 3 4 5 6 7 8 9 **13** (1)	1 2 3 4 5 6 7 8 9 **13** (1)
b. Open right hemicolectomy	1 2 3 4 5 6 7 8 9 **1 2 3 1 6** (8)	1 2 3 4 5 6 7 8 9 **3 1 1 1 7** (9)	1 2 3 4 5 6 7 8 9 **1 2 1 3 6** (8)	1 2 3 4 5 6 7 8 9 **8 1 1 1 2** (1)	1 2 3 4 5 6 7 8 9 **13** (1)	1 2 3 4 5 6 7 8 9 **13** (1)
c. Open transverse colectomy	1 2 3 4 5 6 7 8 9 **1 1 1 2 1 7** (9)	1 2 3 4 5 6 7 8 9 **2 1 3 7** (9)	1 2 3 4 5 6 7 8 9 **1 1 2 2 7** (9)	1 2 3 4 5 6 7 8 9 **7 3 3** (1)	1 2 3 4 5 6 7 8 9 **12 1** (1)	1 2 3 4 5 6 7 8 9 **13** (1)
d. Open left hemicolectomy	1 2 3 4 5 6 7 8 9 **1 3 9** (9)	1 2 3 4 5 6 7 8 9 **3 1 1 4 4** (7)	1 2 3 4 5 6 7 8 9 **1 2 1 2 7** (9)	1 2 3 4 5 6 7 8 9 **7 1 3 1 1** (1)	1 2 3 4 5 6 7 8 9 **12 1** (1)	1 2 3 4 5 6 7 8 9 **13** (1)
e. Open sigmoidectomy	1 2 3 4 5 6 7 8 9 **1 1 11** (9)	1 2 3 4 5 6 7 8 9 **2 2 1 1 3 4** (7)	1 2 3 4 5 6 7 8 9 **1 2 3 7** (9)	1 2 3 4 5 6 7 8 9 **6 1 1 3 1 1** (2)	1 2 3 4 5 6 7 8 9 **12 1** (1)	1 2 3 4 5 6 7 8 9 **13** (1)
f. Open rectal resection involving upper one-third of rectum	1 2 3 4 5 6 7 8 9 **1 12** (9)	1 2 3 4 5 6 7 8 9 **6 2 1 3 1** (3)	1 2 3 4 5 6 7 8 9 **1 1 1 1 3 6** (8)	1 2 3 4 5 6 7 8 9 **3 1 1 5 1 1 1** (5)	1 2 3 4 5 6 7 8 9 **10 2 1** (1)	1 2 3 4 5 6 7 8 9 **13** (1)
g. Open subtotal colectomy (removes the entire intraperitoneal colon, not removing rectum)	1 2 3 4 5 6 7 8 9 **1 12** (9)	1 2 3 4 5 6 7 8 9 **5 2 3 1 1 1** (3)	1 2 3 4 5 6 7 8 9 **1 1 1 1 3 6** (8)	1 2 3 4 5 6 7 8 9 **3 1 2 3 3 1** (5)	1 2 3 4 5 6 7 8 9 **10 2 1** (1)	1 2 3 4 5 6 7 8 9 **12** (1)
h. Open low anterior resection (removes the sigmoid colon and rectum to margin free from cancer) used to treat invasive cancers of the upper to middle third of the rectum	1 2 3 4 5 6 7 8 9 **13** (9)	1 2 3 4 5 6 7 8 9 **10 1 1 1** (1)	1 2 3 4 5 6 7 8 9 **3 1 1 4 2 2** (5)	1 2 3 4 5 6 7 8 9 **3 1 2 2 2 3** (6)	1 2 3 4 5 6 7 8 9 **3 2 2 1 3 1 1** (3)	1 2 3 4 5 6 7 8 9 **11 1 1** (1)
i. Open abdominal perineal resection (removal of sigmoid colon, rectum, anus and construction of permanent colostomy) used to treat invasive cancers of the lower third of the rectum	1 2 3 4 5 6 7 8 9 **13** (9)	1 2 3 4 5 6 7 8 9 **10 1 1 1** (1)	1 2 3 4 5 6 7 8 9 **5 3 1 1 1 2** (3)	1 2 3 4 5 6 7 8 9 **1 1 3 3 1 2 2** (6)	1 2 3 4 5 6 7 8 9 **1 1 2 1 2 2 1 3** (5)	1 2 3 4 5 6 7 8 9 **10 2 1** (1)
j. Open total proctocolectomy with or without ileal pouch anal anastamosis	1 2 3 4 5 6 7 8 9 **13** (9)	1 2 3 4 5 6 7 8 9 **11 1 1** (1)	1 2 3 4 5 6 7 8 9 **5 4 1 1 2** (3)	1 2 3 4 5 6 7 8 9 **1 1 1 6 1 1 2** (5)	1 2 3 4 5 6 7 8 9 **1 1 2 1 2 3 3** (5)	1 2 3 4 5 6 7 8 9 **9 1 1 2** (1)

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

B. Colorectal Surgery: In this section we are asking you to rate the appropriateness of placing and timing of removal of Foley catheters for cases that are considered **ROUTINE** – meaning we are excluding patients who have required colorectal procedure because of an emergency such as sepsis, shock, or trauma. We are also excluding cases that require creation of a new urinary conduit due to involvement of the bladder or renal system. Colorectal surgery is performed for a variety of reasons including cancers of the gastrointestinal system, metastatic tumors (such as melanoma), Crohn's disease, colon polyp, colitis and diverticulitis.

Clinical Scenarios	Appropriateness of **removing Foley catheter in this timeframe** (if had been place for Surgery). In other words, what is the appropriateness of **WAITING** until the timeframe listed before removing the Foley if one had been placed? **Appropriateness of removal if a post-op bladder scanner protocol was available to monitor for urinary retention or under recessitation**				
	First trial of void on **post-op day #0**	Waiting until **post-op day #1** for first trial of void	Waiting until **post-op day #2** for first trial of void	Waiting until **post-op day #3-4** for first trial of void	Waiting until **post-op day #5** or greater for first trial of void
B2. **Colorectal procedures** performed using **"Open" technique** (as opposed to "Laparoscopic" technique)					
a. Open ileocecetomy (removal of part of ileum of small intestine, cecum part of colon, ileocecal valve and appendix)	2 1 6 8 (9)	2 2 7 (9)	10 1 2 (1)	13 (1)	13 (1)
b. Open right hemicolectomy	2 1 1 1 8 (9)	1 2 1 2 7 (9)	8 1 1 1 2 (1)	13 (1)	13 (1)
c. Open transverse colectomy	2 1 2 1 7 (9)	1 2 1 2 7 (9)	8 2 3 (1)	12 1 (1)	13 (1)
d. Open left hemicolectomy	2 1 2 1 7 (9)	1 2 1 2 7 (9)	8 3 1 1 (1)	12 1 (1)	13 (1)
e. Open sigmoidectomy	2 1 1 2 1 6 (8)	1 2 1 2 7 (9)	7 1 2 3 (1)	12 1 (1)	13 (1)
f. Open rectal resection involving upper one-third of rectum	5 1 3 1 1 2 (5)	1 1 1 1 2 7 (9)	4 1 2 2 3 1 (3)	10 2 1 (1)	13 (1)
g. Open subtotal colectomy (removes the entire intraperitoneal colon, not removing rectum)	5 1 2 1 2 2 (4)	1 1 1 1 2 7 (9)	6 1 1 2 2 1 (2)	10 2 1 (1)	13 (1)
h. Open low anterior resection (removes the sigmoid colon and rectum to margin free from cancer) used to treat invasive cancers of the upper to middle third of the rectum	10 1 1 1 (1)	1 1 2 3 2 4 (5)	2 1 1 2 2 2 3 (6)	7 1 1 2 1 1 (1)	11 1 1 (1)
i. Open abdominal perineal resection (removal of sigmoid colon, rectum, anus and construction of permanent colostomy) used to treat invasive cancers of the lower third of the rectum	10 1 1 1 (1)	3 1 3 1 1 1 3 (3)	2 2 2 3 4 (8)	4 1 1 1 1 2 3 (5)	11 1 1 (1)
j. Open total proctocolectomy with or without ileal pouch anal anastamosis	10 1 1 1 (1)	3 1 3 2 1 3 (3)	2 4 1 1 1 4 (6)	4 1 1 1 1 2 3 (5)	9 1 1 1 1 (1)

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

B. Colorectal Surgery:

Clinical Scenarios	Urinary Management Strategies				
	Appropriateness of **placing a Foley routinely for OR use because** of this description:	Appropriateness of **removing Foley catheter in this timeframe** (if had been place for Surgery). In other words, what is the appropriateness of **WAITING** until the timeframe listed before removing the Foley if one had been placed?			
		Appropriateness of removal WITHOUT the use of a post-op bladder scanner protocol			
		First trial of void on **post-op day #0**	Waiting until **post-op day #1** for first trial of void	Waiting until **post-op day #2** for first trial of void	Waiting until **post-op day #3-4** for first trial of void	Waiting until **post-op day #5** or greater for first trial of void
B3. Colorectal procedures performed using "**Laparoscopic" technique** (as opposed to "Open" technique)	An overview of colon and rectal resection including a description of the common types of surgical procedures performed can be located in the "Review" articles provided on the USB drive labeled "Overview of Colon Resection," and "Overview of surgery for the treatment of primary rectal adenocarcinoma."					
a. Laparoscopic ileocecetomy (removal of part of ileum of small intestine, cecum part of colon, ileocecal valve and appendix)	1 2 3 4 5 6 7 8 9 **1 2 1 1 1 7** (9)	1 2 3 4 5 6 7 8 9 **2 1 1 9** (9)	1 2 3 4 5 6 7 8 9 **2 2 3 6** (8)	1 2 3 4 5 6 7 8 9 **11 1 1** (1)	1 2 3 4 5 6 7 8 9 **13** (1)	1 2 3 4 5 6 7 8 9 **13** (1)
b. Laparoscopic right hemicolectomy	1 2 3 4 5 6 7 8 9 **1 2 1 7** (9)	1 2 3 4 5 6 7 8 9 **1 2 1 9** (9)	1 2 3 4 5 6 7 8 9 **1 2 1 3 6** (8)	1 2 3 4 5 6 7 8 9 **9 1 1 1 1** (1)	1 2 3 4 5 6 7 8 9 **13** (1)	1 2 3 4 5 6 7 8 9 **13** (1)
c. Laparoscopic transverse colectomy	1 2 3 4 5 6 7 8 9 **1 1 1 1 8** (9)	1 2 3 4 5 6 7 8 9 **1 3 9** (9)	1 2 3 4 5 6 7 8 9 **1 1 2 2 7** (9)	1 2 3 4 5 6 7 8 9 **9 2 2** (1)	1 2 3 4 5 6 7 8 9 **12 1** (1)	1 2 3 4 5 6 7 8 9 **13** (1)
d. Laparoscopic left hemicolectomy	1 2 3 4 5 6 7 8 9 **1 2 10** (9)	1 2 3 4 5 6 7 8 9 **1 1 1 4 6** (7)	1 2 3 4 5 6 7 8 9 **1 2 1 1 8** (9)	1 2 3 4 5 6 7 8 9 **9 2 1 1** (1)	1 2 3 4 5 6 7 8 9 **12 1** (1)	1 2 3 4 5 6 7 8 9 **13** (1)
e. Laparoscopic sigmoidectomy	1 2 3 4 5 6 7 8 9 **1 1 11** (9)	1 2 3 4 5 6 7 8 9 **2 1 1 3 6** (7)	1 2 3 4 5 6 7 8 9 **1 2 2 8** (9)	1 2 3 4 5 6 7 8 9 **9 2 1 1** (1)	1 2 3 4 5 6 7 8 9 **12 1** (1)	1 2 3 4 5 6 7 8 9 **13** (1)
f. Laparoscopic rectal resection involving upper one-third of rectum	1 2 3 4 5 6 7 8 9 **1 12** (9)	1 2 3 4 5 6 7 8 9 **4 2 1 2 1 3** (4)	1 2 3 4 5 6 7 8 9 **1 1 1 1 2 7** (9)	1 2 3 4 5 6 7 8 9 **5 1 1 3 1 1 1** (4)	1 2 3 4 5 6 7 8 9 **10 2 1** (1)	1 2 3 4 5 6 7 8 9 **13** (1)
g. Laparoscopic subtotal colectomy (removes the entire intraperitoneal colon, not removing rectum)	1 2 3 4 5 6 7 8 9 **1 12** (9)	1 2 3 4 5 6 7 8 9 **3 2 3 1 4** (4)	1 2 3 4 5 6 7 8 9 **1 1 1 1 3 6** (8)	1 2 3 4 5 6 7 8 9 **5 2 2 3 1** (4)	1 2 3 4 5 6 7 8 9 **10 2 1** (1)	1 2 3 4 5 6 7 8 9 **13** (1)
h. Laparoscopic low anterior resection (removes the sigmoid colon and rectum to margin free from cancer) used to treat invasive cancers of the upper to middle third of the rectum	1 2 3 4 5 6 7 8 9 **13** (9)	1 2 3 4 5 6 7 8 9 **10 1 1 1** (1)	1 2 3 4 5 6 7 8 9 **2 1 1 4 2 3** (5)	1 2 3 4 5 6 7 8 9 **3 1 3 1 1 1 3** (5)	1 2 3 4 5 6 7 8 9 **4 2 2 1 2 1 1** (3)	1 2 3 4 5 6 7 8 9 **11 1 1** (1)
i. Laparoscopic abdominal perineal resection (removal of sigmoid colon, rectum, anus and construction of permanent colostomy) used to treat invasive cancers of the lower third of the rectum	1 2 3 4 5 6 7 8 9 **13** (9)	1 2 3 4 5 6 7 8 9 **10 1 1 1** (1)	1 2 3 4 5 6 7 8 9 **4 3 1 1 1 3** (3)	1 2 3 4 5 6 7 8 9 **1 1 5 2 2 1 1** (5)	1 2 3 4 5 6 7 8 9 **2 1 2 1 1 2 1 3** (5)	1 2 3 4 5 6 7 8 9 **10 2 1** (1)
j. Laparoscopic total proctocolectomy with or without ileal pouch anal anastamosis	1 2 3 4 5 6 7 8 9 **13** (9)	1 2 3 4 5 6 7 8 9 **11 1 1** (1)	1 2 3 4 5 6 7 8 9 **4 4 1 1 3** (3)	1 2 3 4 5 6 7 8 9 **1 1 1 1 6 1 1 1** (5)	1 2 3 4 5 6 7 8 9 **2 1 2 1 1 3 3** (5)	1 2 3 4 5 6 7 8 9 **9 1 1 1 1** (1)

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

B. Colorectal Surgery:

Clinical Scenarios	Appropriateness of **removing Foley catheter in this timeframe** (if had been place for Surgery). In other words, what is the appropriateness of **WAITING** until the timeframe listed before removing the Foley if one had been placed? **Appropriateness of removal if a post-op bladder scanner protocol was available to monitor for urinary retention or under recessitation**				
	First trial of void on **post-op day #0**	Waiting until **post-op day #1** for first trial of void	Waiting until **post-op day #2** for first trial of void	Waiting until **post-op day #3-4** for first trial of void	Waiting until **post-op day #5** or greater for first trial of void
B4. Colorectal procedures performed using "**Laparoscopic" technique** (as opposed to "Open" technique)					
a. Laparoscopic ileocecetomy (removal of part of ileum of small intestine, cecum part of colon, ileocecal valve and appendix)	6:1, 8:2, 9:10 (9)	1:2, 4:2, 8:2, 9:7 (9)	1:11, 4:1, 5:1 (1)	1:13 (1)	1:13 (1)
b. Laparoscopic right hemicolectomy	6:1, 7:1, 8:1, 9:10 (9)	1:1, 4:2, 7:1, 8:3, 9:6 (8)	1:9, 2:1, 3:1, 4:1, 5:1 (1)	1:13 (1)	1:13 (1)
c. Laparoscopic transverse colectomy	6:1, 7:2, 8:1, 9:9 (9)	1:1, 4:2, 7:1, 8:2, 9:7 (9)	1:9, 3:2, 5:2 (1)	1:12, 2:1 (1)	1:13 (1)
d. Laparoscopic left hemicolectomy	2:1, 7:3, 8:1, 9:8 (9)	1:1, 4:2, 6:1, 8:2, 9:7 (9)	1:9, 5:2, 7:1, 8:1 (1)	1:12, 3:1 (1)	1:13 (1)
e. Laparoscopic sigmoidectomy	3:1, 5:1, 7:3, 8:1, 9:7 (9)	1:1, 4:2, 6:1, 8:1, 9:8 (9)	1:9, 5:1, 7:3 (1)	1:12, 3:1 (1)	1:13 (1)
f. Laparoscopic rectal resection involving upper one-third of rectum	1:3, 3:1, 5:2, 6:1, 7:1, 9:5 (6)	2:1, 3:1, 6:1, 7:1, 8:1, 9:8 (9)	1:6, 2:2, 5:1, 7:3, 8:1 (2)	1:10, 2:2, 8:1 (1)	1:13 (1)
g. Laparoscopic subtotal colectomy (removes the entire intraperitoneal colon, not removing rectum)	1:2, 3:1, 4:2, 5:1, 7:2, 9:5 (7)	1:1, 2:1, 6:1, 7:1, 8:2, 9:7 (9)	1:7, 2:1, 3:1, 5:1, 7:2, 8:1 (1)	1:10, 2:2, 4:1 (1)	1:13 (1)
h. Laparoscopic low anterior resection (removes the sigmoid colon and rectum to margin free from cancer) used to treat invasive cancers of the upper to middle third of the rectum	1:10, 5:1, 7:1, 9:1 (1)	2:1, 3:2, 5:3, 6:1, 7:1, 8:1, 9:5 (7)	1:2, 2:1, 4:1, 5:3, 6:1, 7:1, 8:1, 9:3 (5)	1:9, 2:1, 3:1, 8:1, 9:1 (1)	1:11, 3:1, 9:1 (1)
i. Laparoscopic abdominal perineal resection (removal of sigmoid colon, rectum, anus and construction of permanent colostomy) used to treat invasive cancers of the lower third of the rectum	1:10, 3:1, 4:1, 9:1 (1)	1:2, 2:1, 4:3, 6:1, 7:1, 9:4 (5)	2:2, 5:4, 6:1, 7:1, 8:2, 9:3 (6)	1:5, 2:1, 3:1, 7:1, 8:2, 9:3 (3)	1:11, 3:1, 9:1 (1)
j. Laparoscopic total proctocolectomy with or without ileal pouch anal anastamosis	1:10, 2:1, 3:1, 9:1 (1)	1:2, 2:1, 3:3, 5:2, 8:1, 9:4 (5)	2:2, 4:1, 5:4, 6:1, 7:2, 9:3 (5)	1:5, 2:1, 3:1, 7:1, 8:2, 9:3 (3)	1:9, 3:1, 7:1, 8:2, 9:2 (1)

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

C. Laparoscopic Procedures

Clinical Scenarios	Urinary Management Strategies		
	Appropriateness of **placing a Foley catheter routinely for OR use because** the laparoscopic surgery uses a suprapubic port:	Appropriateness of **using an ISC for OR use because** the laparoscopic surgery uses a suprapubic port:	Appropriateness of having a patient void with the option of using a bladder scanner if symptoms are present before surgery **WITHOUT placing a Foley** routinely for OR use because the laparoscopic surgery uses a suprapubic port:
C1.			
a. Laparoscopic surgery using a suprapubic port:	**4** **1** **3** **1** **1** **2** **1** (5) 1 2 3 4 5 6 7 8 9	**8** **1** **2** **1** **1** (1) 1 2 3 4 5 6 7 8 9	**2** **1** **1** **1** **8** (9) 1 2 3 4 5 6 7 8 9

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

D. Bariatric surgery procedures for the management of obesity: This section assesses the appropriateness of Foley catheter placement and duration of use for common, contemporary bariatric procedures performed as an initial procedure. This panel is not considering procedures that are considered revisions of prior bariatric procedures or rarely performed bariatric procedures.

Clinical Scenarios	**Urinary Management Strategies**					
	Appropriateness of **placing a Foley routinely for OR use because** of this description:	Appropriateness of **removing Foley catheter in this timeframe** (if had been place for Surgery). In other words, what is the appropriateness of **WAITING** until the timeframe listed before removing the Foley if one had been placed?				
		Appropriateness of removal WITHOUT the use of a post-op bladder scanner protocol				
		First trial of void on **post-op day #0**	Waiting until **post-op day #1** for first trial of void	Waiting until **post-op day #2** for first trial of void	Waiting until **post-op day #3-4** for first trial of void	Waiting until **post-op day #5** or greater for first trial of void
D1. Bariatric procedure described as the following:	An overview of bariatric procedures can be located in the “Review” article provided on the USB drive labeled "Bariatric surgical operations for the management of severe obesity: Descriptions."					
a. Laparoscopic Roux-en-Y gastric bypass (RYGB): in which a small (less than 30 mL) proximal gastric pouch is divided and separated from the distal stomach and anastomosed to a Roux limb of small bowel 75 to 150 cm in length	**4 2 1 2 4** (7) 1 2 3 4 5 6 7 8 9	**5 1 1 1 2 3** (5) 1 2 3 4 5 6 7 8 9	**1 2 2 1 7** (9) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9
b. Laparoscopic adjustable gastric banding	**9 2 1 1** (1) 1 2 3 4 5 6 7 8 9	**1 1 11** (9) 1 2 3 4 5 6 7 8 9	**9 4** (1) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9
c. Laparoscopic sleeve gastrectomy	**3 1 7 1 1** (5) 1 2 3 4 5 6 7 8 9	**1 1 1 2 8** (9) 1 2 3 4 5 6 7 8 9	**2 1 2 8** (9) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9
d. Laparoscopic biliopancreatic diversion with duodenal switch	**2 3 2 6** (8) 1 2 3 4 5 6 7 8 9	**3 1 2 2 1 4** (6) 1 2 3 4 5 6 7 8 9	**1 1 3 2 6** (8) 1 2 3 4 5 6 7 8 9	**11 1 1** (1) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

D. Bariatric surgery procedures for the management of obesity: This section assesses the appropriateness of Foley catheter placement and duration of use for common, contemporary bariatric procedures performed as an initial procedure. This panel is not considering procedures that are considered revisions of prior bariatric procedures or rarely performed bariatric procedures.

Clinical Scenarios	Appropriateness of **removing** **Foley catheter in this timeframe** (if had been place for Surgery). In other words, what is the appropriateness of **WAITING** until the timeframe listed before removing the Foley if one had been placed?				
	Appropriateness of removal if a post-op bladder scanner protocol was available to monitor for urinary retention or under recessitation				
	First trial of void on **post-op day #0**	Waiting until **post-op day #1** for first trial of void	Waiting until **post-op day #2** for first trial of void	Waiting until **post-op day #3-4** for first trial of void	Waiting until **post-op day #5** or greater for first trial of void
D2. Bariatric procedure described as the following:					
a. Laparoscopic Roux-en-Y gastric bypass (RYGB): in which a small (less than 30 mL) proximal gastric pouch is divided and separated from the distal stomach and anastomosed to a Roux limb of small bowel 75 to 150 cm in length	**2 1 2 1 2 5** (8) 1 2 3 4 5 6 7 8 9	**1 1 1 1 8** (9) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9
b. Laparoscopic adjustable gastric banding	**1 1 11** (9) 1 2 3 4 5 6 7 8 9	**9 4** (1) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9
c. Laparoscopic sleeve gastrectomy	**1 1 1 2 8** (9) 1 2 3 4 5 6 7 8 9	**2 1 1 1 8** (9) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9
d. Laparoscopic biliopancreatic diversion with duodenal switch	**3 1 1 1 1 6** (7) 1 2 3 4 5 6 7 8 9	**1 1 1 2 2 6** (8) 1 2 3 4 5 6 7 8 9	**11 1 1** (1) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9	**13** (1) 1 2 3 4 5 6 7 8 9

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

E. Cholecystectomy procedures for removal of the gallbladder: This section assesses the appropriateness of Foley catheter placement and duration of use for routine procedures performed for removal of the gallbladder in patients who are not critically ill. We are assessing only laparoscopic cholecystectomy because to our understanding, open cholecystectomy is now rarely performed, and when performed, is usually for anticipated technically difficult cases NOT considered routine.

Clinical Scenarios	**Urinary Management Strategies**					
	Appropriateness of **placing a Foley routinely for OR use because** of this description:	Appropriateness of **removing Foley catheter in this timeframe** (if had been place for Surgery). In other words, what is the appropriateness of **WAITING** until the timeframe listed before removing the Foley if one had been placed?				
		First trial of void on **post-op day #0**	Waiting until **post-op day #1** for first trial of void	Waiting until **post-op day #2** for first trial of void	Waiting until **post-op day #3-4** for first trial of void	Waiting until **post-op day #5** or greater for first trial of void
E1. Gallbladder procedure described as:	An overview of cholecystectomy procedures can be located in the "Review" articles provided on the USB drive labeled "Open cholecystectomy" and "Laparoscopic cholecystectomy."					
a. laparoscopic cholecystectomy WITHOUT the use of a post-op bladder scanner protocol	**12** **1** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (9)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)
b. Laparoscopic cholecystectomy if a post-op bladder scanner protocol was available to monitor for urinary retention or under recessitation	**12** **1** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (9)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

F. Procedures for removal of the appendix: This section assesses the appropriateness of Foley catheter placement and duration of use for routine procedures performed for removal of the appendix in patients who are not critically ill.

Clinical Scenarios	Urinary Management Strategies					
	Appropriateness of **placing a Foley routinely for OR use because** of this description:	Appropriateness of **removing Foley catheter in this timeframe** (if had been place for Surgery). In other words, what is the appropriateness of **WAITING** until the timeframe listed before removing the Foley if one had been placed?				
		Appropriateness of removal WITHOUT the use of a post-op bladder scanner protocol				
		First trial of void on **post-op day #0**	Waiting until **post-op day #1** for first trial of void	Waiting until **post-op day #2** for first trial of void	Waiting until **post-op day #3-4** for first trial of void	Waiting until **post-op day #5** or greater for first trial of void
F1. Appendix procedure described as:	An overview of appendectomy procedures can be located in the "Review" article provided on the USB drive labeled "Management of acute appendicitis in adults."					
a. Open appendectomy	**11** **1** **1** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (9)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)
b. Laparoscopic appendectomy without suprapubic port	**12** **1** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (9)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

F. Procedures for removal of the appendix: This section assesses the appropriateness of Foley catheter placement and duration of use for routine procedures performed for removal of the appendix in patients who are not critically ill.

Clinical Scenarios	Appropriateness of **removing** **Foley catheter in this timeframe** (if had been place for Surgery). In other words, what is the appropriateness of **WAITING** until the timeframe listed before removing the Foley if one had been placed?				
	Appropriateness of removal if a post-op bladder scanner protocol was available to monitor for urinary retention or under recessitation				
	First trial of void on **post-op day #0**	Waiting until **post-op day #1** for first trial of void	Waiting until **post-op day #2** for first trial of void	Waiting until **post-op day #3-4** for first trial of void	Waiting until **post-op day #5** or greater for first trial of void
F1. Appendix procedure described as:					
a. Open appendectomy	**13** 1 2 3 4 5 6 7 8 9 (9)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)
b. Laparoscopic appendectomy	**13** 1 2 3 4 5 6 7 8 9 (9)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

G. Procedures for repair of abdominal wall hernias: This section assesses the appropriateness of Foley catheter placement and duration of use for routine. We are asking about procedures performed for hernia repair in patients who are not critically ill. We are excluding procedures for STRANGULATION of the bowel or bladder, and we are only considering PRIMARY hernia repairs. Assume all laparoscopic procedures are performed with mesh, as to our understanding this is standard/routine.

Clinical Scenarios	**Urinary Management Strategies**					
	Appropriateness of **placing a Foley routinely for OR use because** of this description:	Appropriateness of **removing Foley catheter in this timeframe** (if had been place for Surgery). In other words, what is the appropriateness of **WAITING** until the timeframe listed before removing the Foley if one had been placed?				
		Appropriateness of removal WITHOUT the use of a post-op bladder scanner protocol				
		First trial of void on **post-op day #0**	Waiting until **post-op day #1** for first trial of void	Waiting until **post-op day #2** for first trial of void	Waiting until **post-op day #3-4** for first trial of void	Waiting until **post-op day #5** or greater for first trial of void
G1. Hernia repair using open procedure described as:	An overview of hernia repair procedures can be located in the "Review" articles labeled "Open surgical repair of inguinal and femoral hernia in adults," "Laparoscopic inguinal and femoral hernia repair in adults," "Incisional hernia," and "Overview of abdominal wall hernias in adults"					
a. Open reducible inguinal or femoral hernia repair	**1 3** 1 2 3 4 5 6 7 8 9 (1)	1 2 3 4 5 6 7 8 **9** (9)	**1 3** 1 2 3 4 5 6 7 8 9 (1)	**1 3** 1 2 3 4 5 6 7 8 9 (1)	**1 3** 1 2 3 4 5 6 7 8 9 (1)	**1 3** 1 2 3 4 5 6 7 8 9 (1)
b. Open reducible umbilical hernia repair	**1 3** 1 2 3 4 5 6 7 8 9 (1)	1 2 3 4 5 6 7 8 **9** (9)	**1 3** 1 2 3 4 5 6 7 8 9 (1)	**1 3** 1 2 3 4 5 6 7 8 9 (1)	**1 3** 1 2 3 4 5 6 7 8 9 (1)	**1 3** 1 2 3 4 5 6 7 8 9 (1)
c. Open reducible epigastric hernia repair	**1 3** 1 2 3 4 5 6 7 8 9 (1)	1 2 3 4 5 6 7 8 **9** (9)	**1 3** 1 2 3 4 5 6 7 8 9 (1)	**1 3** 1 2 3 4 5 6 7 8 9 (1)	**1 3** 1 2 3 4 5 6 7 8 9 (1)	**1 3** 1 2 3 4 5 6 7 8 9 (1)

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

G. Procedures for repair of abdominal wall hernias: This section assesses the appropriateness of Foley catheter placement and duration of use for routine. We are asking about procedures performed for hernia repair in patients who are not critically ill. We are excluding procedures for STRANGULATION of the bowel or bladder, and we are only considering PRIMARY hernia repairs. Assume all laparoscopic procedures are performed with mesh, as to our understanding this is standard/routine.

Clinical Scenarios	Appropriateness of **removing** **Foley catheter in this timeframe** (if had been place for Surgery). In other words, what is the appropriateness of **WAITING** until the timeframe listed before removing the Foley if one had been placed?				
	Appropriateness of removal if a post-op bladder scanner protocol was available to monitor for urinary retention or under recessitation				
	First trial of void on **post-op day #0 in the PACU**	Waiting until **post-op day #1** for first trial of void	Waiting until **post-op day #2** for first trial of void	Waiting until **post-op day #3-4** for first trial of void	Waiting until **post-op day #5** or greater for first trial of void
G2. Hernia repair using open procedure described as:					
a. Open reducible inguinal or femoral hernia repair	1 2 3 4 5 6 7 8 **13** 9 (9)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)
b. Open reducible umbilical hernia repair	1 2 3 4 5 6 7 8 **13** 9 (9)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)
c. Open reducible epigastric hernia repair	1 2 3 4 5 6 7 8 **13** 9 (9)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)	**13** 1 2 3 4 5 6 7 8 9 (1)

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

G. Procedures for repair of abdominal wall hernias: This section assesses the appropriateness of Foley catheter placement and duration of use for routine. We are asking about procedures performed for hernia repair in patients who are not critically ill. We are excluding procedures for STRANGULATION of the bowel or bladder, and we are only considering PRIMARY hernia repairs. Assume all laparoscopic procedures are performed with mesh, as to our understanding this is standard/routine.

Clinical Scenarios	**Urinary Management Strategies**					
	Appropriateness of **placing a Foley routinely for OR use because** of this description if a patient has voided prior to surgery	Appropriateness of **placing a Foley routinely for OR use because** of this description if a patient has not voided prior to surgery	Appropriateness of **removing Foley catheter in this timeframe** (if had been place for Surgery). In other words, what is the appropriateness of **WAITING** until the timeframe listed before removing the Foley if one had been placed?			
			Appropriateness of removal WITHOUT the use of a post-op bladder scanner protocol			
			First trial of void on **post-op day #0 in the PACU**	Waiting until **post-op day #1** for first trial of void	Waiting until **post-op day #2** for first trial of void	Waiting until **post-op day #3-4** for first trial of void	Waiting until **post-op day #5** or greater for first trial of void
G3. Hernia repair using laparoscopic procedure described as:	An overview of hernia repair procedures can be located in the "Review" articles labeled "Open surgical repair of inguinal and femoral hernia in adults," "Laparoscopic inguinal and femoral hernia repair in adults," "Incisional hernia," and "Overview of abdominal wall hernias in adults"						
a. Laparoscopic reducible inguinal or femoral hernia repair by Totally Extraperitoneal Approach (TEP)	**5 1 1 4 1 1** (4)	**1 1 11** (9)	**12** (9)	**Not Rated**	**Not Rated**	**Not Rated**	**Not Rated**
b. Laparoscopic reducible inguinal or femoral hernia repair by Transabdominal Preperitoneal (TAPP) approach	**6 1 2 1 1 1 1** (2)	**1 1 1 1 10** (9)	**12** (9)	**Not Rated**	**Not Rated**	**Not Rated**	**Not Rated**
c. Laparoscopic reducible umbilical hernia repair	**12 1** (1)	**11 1 1** (1)	**13** (9)	**11 1 1** (1)	**13** (1)	**13** (1)	**13** (1)
d. Laparoscopic reducible epigastric hernia repair	**13** (1)	**12 1** (1)	**13** (9)	**11 1 1** (1)	**13** (1)	**13** (1)	**13** (1)

Note: It was discussed that the TEP and TAPP procedures are all outpatient, therefore the catheter would automatically come out on post-op day #0 before the patient goes home. Therefore panelists were told they didn't have to rate those columns.

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

G. Procedures for repair of abdominal wall hernias: This section assesses the appropriateness of Foley catheter placement and duration of use for routine. We are asking about procedures performed for hernia repair in patients who are not critically ill. We are excluding procedures for STRANGULATION of the bowel or bladder, and we are only considering PRIMARY hernia repairs. Assume all laparoscopic procedures are performed with mesh, as to our understanding this is standard/routine.

Clinical Scenarios	Appropriateness of **removing** **Foley catheter in this timeframe** (if had been place for Surgery). In other words, what is the appropriateness of **WAITING** until the timeframe listed before removing the Foley if one had been placed?				
	Appropriateness of removal if a post-op bladder scanner protocol was available to monitor for urinary retention or under recessitation				
	First trial of void on **post-op day #0 in the PACU**	Waiting until **post-op day #1** for first trial of void	Waiting until **post-op day #2** for first trial of void	Waiting until **post-op day #3-4** for first trial of void	Waiting until **post-op day #5** or greater for first trial of void
G2. Hernia repair using laparoscopic procedure described as:					
a. Laparoscopic reducible inguinal or femoral hernia repair by Totally Extraperitoneal Approach (TEP)	**Not Rated**	**Not Rated**	**Not Rated**	**Not Rated**	**Not Rated**
b. Laparoscopic reducible inguinal or femoral hernia repair by Transabdominal Preperitoneal (TAPP) approach	**Not Rated**	**Not Rated**	**Not Rated**	**Not Rated**	**Not Rated**
c. Laparoscopic reducible umbilical hernia repair	**13** (9) 1 2 3 4 5 6 7 8 9	**11 1** (1) 1 2 3 4 5 6 7 8 9	**Not Rated**	**Not Rated**	**Not Rated**
d. Laparoscopic reducible epigastric hernia repair	**13** (9) 1 2 3 4 5 6 7 8 9	**11 1** (1) 1 2 3 4 5 6 7 8 9	**Not Rated**	**Not Rated**	**Not Rated**

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

References:

1. American Urological Association (AUA) Symptom Score. Available at http://www.urologyhealth.org/_media/_pdf/AUA%20Symptom%20Score.pdf
2. International Prostate Symptom Score. (IPSS). Available at http://www.urospec.com/uro/Forms/ipss.pdf

Appendix Table 3. Summary of Group 1 Articles (Intervention Studies) for Orthopedic Surgery Panel

This table summarizes studies yielded by the systematic literature review that assess the rates of infectious and non-infectious outcomes (including retention and urinary catheter use) for patients receiving hip and knee surgery.

- These studies share the results of studies that specifically assessed at least one outcome of interest (such as catheter use, urinary retention or urinary tract infection) in patients who received hip or knee surgery when a specific urinary catheter management strategy was employed (such as removing Foley catheters immediately after the surgical procedure or routine removal on post-operative day 1).

  We anticipate these Group 1 articles to be of highest relevance to panelists to inform guidance on the appropriateness of Foley catheter use in the setting of hip and knee surgeries.

An overview of the articles is presented below. Within Group 1, the articles are clustered according the type of lower extremity surgery studied (hip, knee, orthopedic surgery not otherwise specified). Articles were ordered by the year they were published. Articles in the same surgical group published in the same year were further ordered alphabetically by the first author's last name. Following the organization of the articles as described above the articles were then given an article number from 1 to 20. As you will see below, specific sets of articles can be quickly referenced based on type of operation and type of study and type of outcomes by referring to the article number in the provided table.

	Group 1 Articles
Surgery Type: Hip surgery	2, 4, 5, 8, 10, 11, 13, 14, 15, 16, 19, 20
Surgery Type: Knee surgery	2, 8, 9, 10, 13, 14, 15, 18,
Surgery Type: orthopedic, not otherwise specified	1, 3, 6, 7, 12, 17
Outcome type reported: Non-Infectious Outcomes such as urinary catheter use, urinary retention	1-20
Outcome type reported: Infectious Outcomes such as urinary tract infection	1-13, 19

Group 1 Articles		
Reference	Study Description Catheter Use/Important Exclusions in Patient Selections	Results & Conclusions Key Outcomes: Catheter use/Urinary Retention/Urinary Infections/Other Outcomes
1. Hozack WJ, Carpiniello V, Booth Jr RE. The effect of early bladder catheterization on the incidence of urinary complications after total joint replacement. Clinical Orthopaedics and Related Research. 1988(231):79-82.	**METHODS:** A prospective, randomized study was performed in 54 female total arthroplasty patients to determine whether straight catheterization in the recovery room might reduce the incidence of postoperative urinary infection, urinary retention, and urinary catheterization. Thirty-one patients were straight catheterized in the recovery room; 23 were not.	**RESULTS:** Overall, 13% of the patients developed a urinary tract infection postoperatively, 60% of the patients required at least one catheterization, and 13% of the patients required a Foley catheter. **CONCLUSIONS:** No beneficial effect of straight catheterization in the recovery room after arthroplasty was demonstrated.
2. Michelson JD, Lotke PA, Steinberg ME. Urinary-bladder management after total joint-replacement surgery. N Engl J Med. Aug 11 1988;319(6):321-326.	**AIMS:** We conducted a randomized study of 100 patients to examine the efficacy and risks of two methods of urinary-bladder management after total joint-replacement surgery. **METHODS:** Patients who had hip or knee replacement were randomly assigned either to Group I, in which indwelling catheters were placed during the operation and removed the next morning, or Group II, in which urinary retention was treated by intermittent catheterization as needed.	**RESULTS:** After the removal of the indwelling catheter, the patients in Group I had a lower incidence of urinary retention than those in Group II (27 vs. 52 percent; P less than 0.01). Bladder distention (volume above 700 ml) was more common in Group II (45 percent as compared with 7 percent in Group I; P less than 0.01) and was associated with an increased need for subsequent long-term catheterization. There was no significant difference between the groups in the rates of urinary tract infection (11 vs. 15 percent). We could not identify patients at high risk for retention or infection on the basis of preoperative urinary symptoms, previous urinary tract surgery, previous urinary tract infection or urinary retention, high-risk medical conditions, sex, type of anesthesia, or age (in the absence of prophylactic treatment). **CONCLUSIONS:** We conclude that the short-term use of an indwelling catheter after extended surgery, such as joint replacement, reduces the incidence of urinary retention and bladder overdistention, without increasing the rate of urinary tract infection.

Reference	Study Description Catheter Use/Important Exclusions in Patient Selections	Results & Conclusions Key Outcomes: Catheter use/Urinary Retention/Urinary Infections/Other Outcomes
3. Ritter MA, Faris PM, Keating EM. Urinary tract catheterization protocols following total joint arthroplasty. Orthopedics. Aug 1989;12(8):1085-1087	**METHODS:** Six hundred one consecutive total joint arthroplasty patients were divided into three groups using three different catheterization protocols. Each group was evaluated for preoperative and postoperative urinary tract infections, number of catheterizations, and number of subsequent urinary tract manipulations.	**RESULTS:** Group 1 (165 patients) were treated with "as needed" intermittent catheterization. One hundred six of these patients (64%) required a minimum of one catheterization with a total of 265 (mean 2.4 per patient) catheterizations. One post-operative urinary tract infection was recorded. Group 2 (295 patients) was treated with in-and-out catheterization on one occasion followed by anchoring of a closed drainage system if needed. One hundred eighty-one patients (61%) required catheterization, 124 (69%) of these patients required anchoring of a closed system. Two (0.69%) of these patients developed postoperative urinary tract infections. Group 3 (140 patients) were treated with intraoperative sterile anchoring of a closed drainage system which was maintained for 48 hours or less. Ten patients required in-and-out catheterizations (maximum one per patient) after system discontinuance. No urinary tract infections developed. **CONCLUSIONS:** Using Fisher's Exact test, no statistical difference in infection rates was found between the three groups. The group 3 protocol was felt to offer several patient conveniences.
4. Lampe HI, Sneller ZW, Rijnberg WJ. [Urination problems following total hip arthroplasty: insertion or not of an indwelling catheter?]. Ned Tijdschr Geneeskd. Apr 25 1992;136(17):827-831.	**OBJECTIVE**: To assess the frequency of urine retention and of urinary tract infection after total hip replacement in order to: to minimize morbidity due to urine retention and urinary tract infection after total hip replacement; to limit the discomfort to the patient; to decrease the work load of the nursing staff, if possible. **SETTING**: University Hospital Rotterdam. **DESIGN**: Prospective, randomized. **PATIENTS AND METHODS**: In 61 patients after 63 total hip replacements the use of an indwelling catheter for 48 hours (group 1) was compared with catheterisation on indication only (group 2).	**RESULTS**: Urine retention was less in group 1 than in group 2, 12/39 (31%) versus 15/24 (63%). In the subgroup males no difference was found between both groups. Urine retention was more frequent in elderly people. No other risk factors could be demonstrated. The number of patients with bacteriuria greater than 10(5) CFU/ml in group 1, 11/39 (28%) did not differ from group 2, 9/24 (38%). **CONCLUSIONS**: On the basis of these study results we recommend: In females: to use an indwelling catheter for 48 hours after total hip replacement; In males: to discuss this choice with the patient, because use of an indwelling catheter appears not to decrease the frequency of urine retention. The risk of discomfort caused by catheterisation and urine retention still exists. An indwelling catheter can, without increasing the risk of significant bacteriuria, eliminate this discomfort in the first 48 hours after operation.

Reference	Study Description Catheter Use/Important Exclusions in Patient Selections	Results & Conclusions Key Outcomes: Catheter use/Urinary Retention/Urinary Infections/Other Outcomes
5. Oishi CS, Williams VJ, Hanson PB, Schneider JE, Colwell CW, Jr., Walker RH. Perioperative bladder management after primary total hip arthroplasty. J Arthroplasty. Dec 1995;10(6):732-736.	**AIMS:** A retrospective review of 95 consecutive primary total hip arthroplasty patients was performed to assess the clinical outcome of two postoperative bladder management protocols. **METHODS:** The first 49 patients (group 1) were treated with a straight catheterization protocol. The next 46 patients (group 2) were treated with an indwelling catheterization protocol. There were no differences between the groups with respect to sex or age.	**RESULTS:** The patients in group 2 had significantly lower incidences of urinary retention (P < .0005) and bladder distention (P < .0005) than those in group 1. Preoperative systemic diseases and urologic symptoms did not correlate with the occurrence of postoperative urinary retention or bladder distention. There were no infections in group 1. In group 2, one patient (2%) had bacteriuria and one patient (2%) had a urinary tract infection (P > .1). **CONCLUSIONS:** This trend of increased contamination in the catheterization group may be related to a mean catheterization duration of 72 hours.
6. Knight RM, Pellegrini VD, Jr. Bladder management after total joint arthroplasty. J Arthroplasty. Dec 1996;11(8):882-888.	**AIMS:** This study was undertaken to determine the impact of an indwelling Foley catheter on bladder dysfunction and incidence of urinary tract infections after total joint arthroplasty. **METHODS:** A prospective randomized controlled trial was conducted assigning use of an indwelling Foley catheter (group 1) or intermittent catheterization (group 2) for 48 hours following operation. Postoperative cultures were obtained on days 2 and 5, and the number of intermittent catheterization events and void and catheterization volumes were recorded. Concurrent cost-effectiveness analysis was conducted. One hundred nineteen of 174 consecutive patients having elective primary total joint arthroplasty completed the study.	**RESULTS:** Five of 62 patients (8%) in group 1 and 7 of 57 patients (12%) in group 2 developed urinary tract infections (NS, P =.45). Twenty patients (35%) in group 2 and 12 (19%) in group 1 required straight catheterization for inability to void 48 hours after surgery (P = .05). Seventeen patients (35%) in group 2 and eight patients (16%) in group 1 required straight catheterization after epidural analgesia was discontinued (P = .024). Bladder management by indwelling Foley catheter saved more than 150 minutes of direct nursing contact per patient and $3,000 in total hospital costs. Indwelling Foley catheters reduced the frequency of postoperative urinary retention, were less labor intensive than intermittent straight catheterization, and were not associated with an increased risk of urinary infection. **CONCLUSIONS:** In the setting of epidural anesthesia and postoperative analgesia for total joint arthroplasty, management by indwelling catheter is a cost-effective strategy to facilitate postoperative return of normal bladder function.
7. Slappendel R, Weber EW. Non-invasive measurement of bladder volume as an indication for bladder catheterization after orthopaedic surgery and its effect on urinary tract infections. Eur J Anaesthesiol. Aug 1999;16(8):503-506.	**AIMS:** A non-invasive ultrasound imaging technique (BladderScan) was used prospectively in an attempt to reduce the need for catheterization of the urinary bladder and the incidence of urinary tract infections after orthopaedic surgery. **METHODS:** Over a 4-month period, in which 1920 patients were included, catheterization was performed if there was no spontaneous diuresis by 8 h after surgery.	**RESULTS:** A total of 31% of these patients were catheterized, and 18 patients developed urinary tract infections. In a subsequent 4-month period, there were 2196 patients, catheterization was performed only if the bladder volume was more than 800 mL 8 h after surgery. The rate of catheterization decreased to 16%, and five patients developed urinary tract infections. **CONCLUSIONS:** In our patients, measuring bladder volume reduced the need for a urinary catheter and the likelihood of urinary infection.

Reference	Study Description Catheter Use/Important Exclusions in Patient Selections	Results & Conclusions Key Outcomes: Catheter use/Urinary Retention/Urinary Infections/Other Outcomes
8. Wiley MJ, Tran TA. Perioperative urinary catheterisation in conjunction with epidural anaesthesia for hip and knee arthroplasty. Is it safe? Int J Surg Investig. 1999;1(2):157-160.	**AIMS:** The place of indwelling urinary catheterisation following epidural anaesthesia to prevent acute retention of urine after hip and knee arthroplasty is controversial. Even with the use of aseptic techniques and closed sterile drainage, bacteriuria has been reported in 10-27% of catheterised patients. **METHODS:** A prospective trial was carried out in 68 consecutive patients undergoing knee or hip joint arthroplasty with epidural anaesthesia to investigate the perioperative complications of short term urinary catheterisation. Following establishment of combined epidural and general anaesthesia, all patients underwent urinary catheterisation under aseptic technique by a member of the surgical team. Prophylactic antibiotics were given prior to insertion and continued for 24-48h postoperatively to minimise the risk of prosthetic infection.	**RESULTS:** The mean indwelling urinary catheter (IDC) period was 3.6 days (range 2-14). There were three (4.4%) urinary tract infections (UTIs) all of which resolved with appropriate antibiotics. Two were detected upon removal of the urinary catheter and one was detected on the seventh postoperative day when symptoms were detected. No patient required recatheterisation. There was no other infective morbidity or wound infection. **CONCLUSIONS**: Our findings suggest the use of indwelling urinary catheter for short periods combined with prophylactic antibiotics is safe in the perioperative phase of joint arthroplasty.
9. Iorio R, Healy WL, Patch DA, Appleby D. The role of bladder catheterization in total knee arthroplasty. Clin Orthop. Nov 2000(380):80-84.	**AIM**: The use of a urinary bladder catheter in the perioperative period for patients undergoing total knee arthroplasty is controversial. **METHODS**: In the current study, two bladder management protocols were studied. One group of patients had an indwelling catheter inserted into the bladder before total knee arthroplasty. The other group of patients was observed and treated for urinary retention as necessary. From 1993 to 1998, 652 patients undergoing primary, unilateral total knee arthroplasty were randomized by surgeon into two groups: one group underwent preoperative insertion of an indwelling bladder catheter (306 patients), and one group (346 patients) had a catheter inserted postoperatively as necessary.	**RESULTS**: Sixty-six percent (229 of 346) of these patients required catheterization (203 had indwelling catheters and 26 had intermittent straight catheters). A urinary tract infection developed in five patients (1.6%) in whom a catheter was inserted preoperatively. A urinary tract infection developed in six patients (1.7%) in whom a catheter was inserted if necessary. Five of these urinary tract infections developed in patients with delayed indwelling bladder catheters. A urinary tract infection did not develop in any patient in whom a straight catheter was inserted. There was no significant difference in the length of stay in the hospital between the two groups. **CONCLUSIONS**: The group in whom a catheter always was inserted generated $491 greater cost for total knee arthroplasty than patients in whom a catheter was inserted if necessary.

Reference	Study Description Catheter Use/Important Exclusions in Patient Selections	Results & Conclusions Key Outcomes: Catheter use/Urinary Retention/Urinary Infections/Other Outcomes
10. van den Brand ICJB, Castelein RM. Total joint arthroplasty and incidence of postoperative bacteriuria with an indwelling catheter or intermittent catheterization with one-dose antibiotic prophylaxis: A prospective randomized trial. J Arthroplasty. 2001;16(7):850-855.	**AIMS**: This study examined the difference in postoperative bacteriuria in total joint arthroplasty after use of either an indwelling catheter or intermittent catheterization. **METHODS**: A prospective, randomized, controlled trial was conducted in primary total hip and primary total knee arthroplasty patients. One dose of cefazolin, 1 g, was administered intravenously immediately preoperatively.	**RESULTS**: Five of 13 (38%) men in the indwelling catheter group and 0 of 14 (0%) men in the intermittent catheterization group developed postoperative bacteriuria (P = .016), and 6 of 33 (18%) women in the indwelling catheter group and 3 of 39 (8%) women in the intermittent catheterization group developed postoperative bacteriuria (not significant). A total of 11 (24%) patients in the indwelling catheter group (n = 46) and 3 (6%) patients in the intermittent catheterization group (n = 53) developed postoperative bacteriuria (P = .018). **CONCLUSIONS**: In this setting with 1-dose antibiotic prophylaxis, intermittent catheterization resulted in a lower incidence of postoperative bacteriuria compared with an indwelling catheter. For men, this difference is significant.
11. Johansson I, Athlin E, Frykholm L, Bolinder H, Larsson G. Intermittent versus indwelling catheters for older patients with hip fractures. Journal of Clinical Nursing. 2002;11(5):651-656.	**BACKGROUND**: Nursing staff identified postoperative urinary tract infection (UTI) in patients with hip fracture as an increasing problem. A quality improvement project was carried out to investigate the problem and to reduce the incidence. **AIM**: The aim of the study was to describe the occurrence of UTI among patients with hip fracture before and after surgery, to assess whether the decision to use intermittent catheters instead of indwelling catheters was adopted and to test the hypothesis that hospital stay is significantly longer for patients with UTI than for those without infection. One hundred and forty-four patients were investigated for bacteriuria before the first catheterization and 1 week after the last catheterization.	**RESULTS**: Positive urine cultures on admission to hospital were found in 38% of patients. Among those free from bacteria on admission, 61% had a positive urine culture after indwelling catheterization compared with 32% in the group treated with intermittent catetherization. A significantly longer hospital stay (P <= 0.05) was found among patients with UTI. The reason for using an indwelling catheter was not found in any medical or nursing documentation for 29% of the patients. **CONCLUSIONS**: The study points to the necessity for systematic assessment to detect and prevent UTI among older patients with hip fracture.

Reference	Study Description Catheter Use/Important Exclusions in Patient Selections	Results & Conclusions Key Outcomes: Catheter use/Urinary Retention/Urinary Infections/Other Outcomes
12. Stephan F, Sax H, Wachsmuth M, Hoffmeyer P, Clergue F, Pittet D. Reduction of urinary tract infection and antibiotic use after surgery: A controlled, prospective, before after intervention study. Clinical Infectious Diseases. Jun 2006;42(11):1544-1551.	**BACKGROUND**: Urinary tract infection is the most frequent health care-associated complication. We hypothesized that the implementation of a multifaceted prevention strategy could decrease its incidence after surgery. **METHODS**: In a controlled, prospective, before-after intervention trial with 1328 adult patients scheduled for orthopedic or abdominal surgery, nosocomial infection surveillance was conducted until hospital discharge. A multifaceted intervention including specifically tailored, locally developed guidelines for the prevention of urinary tract infection was implemented for orthopedic surgery patients, and abdominal surgery patients served as control subjects. Guidelines for perioperative urinary catheter insertion and management in orthopedic surgery patients were implemented. Infectious and noninfectious complications, adherence to guidelines, and antibiotic use were monitored before and after the intervention and again 2 years later.	**RESULTS**: The incidence of urinary tract infection decreased from 10.4 to 3.9 episodes per 100 patients in the intervention group (incidence-density ratio, 0.41; 95% CI, 0.20 - 0.79; P = .004). Adherence to guidelines was 82.2%. Both the frequency and the duration of urinary catheterization decreased following the intervention. Recourse to antibiotic therapy after surgery dropped in the intervention group from 17.9 to 15.6 defined daily doses per 100 patient-days (P < .005) because of a reduced need for the treatment of urinary tract infection (P < .001). Follow-up after 2 years revealed a sustained impact of the strategy and a subsequent low use of antibiotics, consistent with stable adherence to guidelines (80.8%). **CONCLUSIONS**: A multifaceted prevention strategy can dramatically decrease postoperative urinary tract infection and contribute to the reduction of the overall use of antibiotics after surgery.

Reference	Study Description Catheter Use/Important Exclusions in Patient Selections	Results & Conclusions Key Outcomes: Catheter use/Urinary Retention/Urinary Infections/Other Outcomes
13. Colon Cabassa S. Nurse-generated reminder system to reduce catheter associated urinary tract infection, Fairleigh Dickinson University; 2010.	**BACKGROUND**: The Centers for Disease Control and Prevention (CDC) (2008) and the National Healthcare Safety Network (NHSN) (2008) identified catheter associated urinary tract infections (CAUTIs) as one of the most common hospital-acquired infections in the United States affecting one million patients each year and significantly raising the cost of healthcare. On October 1, 2008, The Centers for Medicare and Medicaid Services (CMS) stopped reimbursing healthcare facilities for added cost of preventable hospital-acquired conditions known as "never events." There are numerous studies in the literature that show that a nurse-generated reminder system can significantly decrease the duration of urinary catheterization, a primary risk for CAUTI. In concert with the hospital performance improvement initiative for reducing CAUTI, this evidence-based practice project was implemented in a 42 bed orthopedic unit in a Northern, New Jersey Hospital to determine whether a nurse-generated reminder system along with best practices related to indwelling catheter management would further decrease CAUTIs by 1-2% among adult post operative hip and knee replacement patients. **METHODS**: A nurse-generated reminder system was implemented to prompt the physicians on a regular basis to consider whether a patient still needs a urinary catheter.	**RESULTS**: A prospective and retrospective chart review was conducted using the surveillance protocols by the CDC/NHSN. The intervention resulted in a reduction of CAUTIs and catheter days. Infection rate was 0% (n=40) a decrease from 3% and the number of catheter days was 162 days (n=40), a decrease from 235 days. **CONCLUSIONS**: It is recommended that this pilot project be replicated using a larger sample size and for a longer period of time. Additionally, it is recommended that automatic prompts using computer technology be implemented to remind healthcare providers about discontinuing the urinary catheters, thereby reducing CAUTI risk and preventing harm to patients.

Reference	Study Description Catheter Use/Important Exclusions in Patient Selections	Results & Conclusions Key Outcomes: Catheter use/Urinary Retention/Urinary Infections/Other Outcomes
14. Balderi T, Mistraletti G, D'Angelo E, Carli F. Incidence of postoperative urinary retention (POUR) after joint arthroplasty and management using ultrasound-guided bladder catheterization. Minerva Anestesiol. Nov 2011;77(11):1050-1057.	**BACKGROUND**: Postoperative urinary retention (POUR) following lower limb arthroplasty is a common complication. The aim of this observational study was to establish the incidence of POUR and assess the usefulness of an ultrasonographic nurse-driven protocol, thereby avoiding elective bladder catheterization. **METHODS**: Two-hundred and eighty six consecutive patients undergoing elective hip and knee arthroplasty were retrospectively studied. None of the patients received elective bladder catheterization. Data on risk factors for POUR, urinary tract infections, length of hospital stay and analgesia were collected. Student's t, Wilcoxon rank-sum, ANOVA and Kruskall-Wallis tests were performed for comparison among two or more groups. Categorical variables were studied using Pearson's chi2 test. Results were considered significant when the P value <0.05.	**RESULTS**: Of the 286 patients studied, 49 (17%) required indwelling catheter for 24-48 h. Patients who had POUR had more risk factors (P<0.05) and had longer hospital stays (P<0.05). When comparing analgesia, continuous peripheral nerve block (CPNB) had the least impact on POUR (15.8%), while epidural analgesia had the greatest impact (48.1%). **CONCLUSION**: Bladder scanners timely detect POUR following lower joint arthroplasty, making elective bladder catheterization unnecessary.

Reference	Study Description Catheter Use/Important Exclusions in Patient Selections	Results & Conclusions Key Outcomes: Catheter use/Urinary Retention/Urinary Infections/Other Outcomes
15. Emmett P, Faulkerson J, Gaudoin T. Reduction in duration of post-operative urinary catheters following implementation of an electronic reminder system. American Journal of Infection Control. 2012;40(5):e62.	**ISSUE**: The risk of catheter-associated urinary tract infection (CAUTI) increases each day that the indwelling urinary catheter remains in place. Reduced duration of indwelling urinary catheter use is an important strategy to reduce CAUTI. Through process measurement, we determined that we had poor compliance with prompt removal of indwelling urinary catheters from surgical inpatients. **PROJECT**: Our private non-profit community non-teaching 166 bed acute care California hospital serves medical-surgical, oncology, family birthing, level II nursery, and critical care including open heart surgery patients. 799 Surgical Care Improvement Project (SCIP) procedure cases were studied for this project and included total hip and knee replacements, abdominal hysterectomy, vascular cases, colon cases, coronary artery bypass graft cases, and other cardiac surgery cases, e.g. valvular surgery. **AIM**: Our project aim was to measure and improve compliance with removal of indwelling urinary catheters from the selected population on post-operative day one or two. Data collection began in quarter 4, 2009 and continues to date. Education was provided to physicians in an online physician newsletter, Bruits and Murmurs. Education was provided to nurses in two online venues, The Nursing Newsletter and NetLearning Infection Prevention, at the start of quarter 1, 2010. An electronic reminder to orthopedic and general surgeons was implemented in the patient's computerized medical record at the start of quarter 2, 2011. Compliance was determined prior to intervention (data quarter 4, 2009), after education the following quarter (data quarter 1-4, 2010; and quarter 1, 2011), and again after an electronic reminder system was implemented in quarter 2, 2011 (data quarter 2-3, 2011).	**RESULTS**: 1) Compliance with removal of indwelling urinary catheters from the selected population on post-operative day one or two, without any intervention, was 47.1% (104 surgical procedures). 2) Compliance after education rose from 47.1% to 64.3%, and fell to approximately 50.0% for a sustained period (486 surgical procedures). 3) Compliance after use of the electronic reminder reached 81.0% after two quarters (209 surgical procedures). Lesson Learned: 1) An electronic reminder displayed to the orthopedic and general surgeons when opening the patient's electronic chart provided the greatest improvement from 47% baseline compliance to 81% post-intervention compliance. 2) Expanded use of this method beyond the SCIP cases may further reduce the risk of CAUTI, and is planned for 2012. 3) Continue to integrate education to involve nurses in best practices during catheter insertion, maintenance, and working in an advocate role for patient safety from infection. (Figure presented).

Reference	Study Description Catheter Use/Important Exclusions in Patient Selections	Results & Conclusions Key Outcomes: Catheter use/Urinary Retention/Urinary Infections/Other Outcomes
16. Schneider MA. Prevention of Catheter-Associated Urinary Tract Infections in Patients With Hip Fractures Through Education of Nurses to Specific Catheter Protocols. Orthop Nurs. Jan-Feb 2012;31(1):12-18.	**BACKGROUND**: The majority of patients who experience hip fractures are elderly, and complications in these patients increase length of hospital stays, medical costs, and mortality rates. Catheter-associated urinary tract infections (CAUTI) are one of the common complications in this patient population. Studies have demonstrated that the use of specific indwelling urinary catheter protocols will decrease the catheter use and prevent CAUTI. **PURPOSE**: The purpose of this evidence-based practice change project was to demonstrate that education of nurses on specific catheter protocols decreases the incidence of urinary tract infections in the population with hip fracture. The effectiveness of the education was measured by pre- and posttests given to the nurses.	The actual number of CAUTI was also tracked and the outcomes suggest that the education and implementation of specific protocols decreased the overall incidence of CAUTI in these patients.

Reference	Study Description Catheter Use/Important Exclusions in Patient Selections	Results & Conclusions Key Outcomes: Catheter use/Urinary Retention/Urinary Infections/Other Outcomes
17. Uberoi V, Calixte N, Orlando R, Lerner L. A strategy to reduce Foley days, post operative urinary retention, and catheter-associated urinary tract infections. J Urol. 2012;187(4):e111-e112.	**INTRODUCTION AND OBJECTIVES**: Given the significant morbidity, cost, and loss of reimbursement for hospital acquired infections, preventing catheter-related urinary tract infections (CAUTI) is more important than ever. Over 80% of hospital acquired UTIs are associated with Foley catheters, leading to aggressive attempts to reduce Foley days. Surgical patients who develop acute urinary retention (AUR) are at particularly high risk for repeated catheterization, prolonged Foley days, and CAUTI. At VA Boston, 8% of patients post joint replacement developed AUR after Foley removal requiring intervention. In an effort to reduce recatheterization rates, a Bladder Management Protocol (BMP) was designed and implemented in 2009. **METHODS:** All joint patients underwent post void bladder scan in the pre-operative clinic. Patients with residuals >500 cc were referred to urology prior to surgery. Those with residuals between 200- 400cc were offered alpha-blocker therapy. Post-operatively, patients were scanned at regular intervals after Foley removal and straight catheterized (SC), if indicated based on the BMP, regardless of symptoms. Patients from July 2009-June 2010 were compared to a pre-BMP group (April 2008-March 2009).	**RESULTS**: The pre and post bladder management protocol groups were similar as regards age, American Society of Anesthesiologists score (ASA), benign prostatic hyperplasia (BPH), and diabetes. Foleys were replaced for acute urinary retention in 18 patients from each group. However, total Foley days were less post BMP than pre BMP (1.84 days vs 2.4 days, p=<0.001), as were UTIs (3 vs 5). Post BMP, only those that failed repeated SC received Foleys. Early attempts were made to remove replaced Foleys, as well. **CONCLUSIONS**: The bladder management protocol was developed to reduce Foley days and risk for CAUTI through aggressive use of bladder scanning and better pre-operative screening. The goals were to pre-empt significant acute urinary retention, encourage SC over Foleys, make nurses the driving force behind Foley decisions to provide consistency, and improve patient selection for Foley replacement (those that fail SC). The bladder management protocol successfully reduced Foley days and UTIs. Nurses felt more confident having the bladder scan and were empowered to take ownership of Foley days. The bladder management protocol is now hospital wide and we predict CAUTI's will decrease to a more substantial degree.

Reference	Study Description Catheter Use/Important Exclusions in Patient Selections	Results & Conclusions Key Outcomes: Catheter use/Urinary Retention/Urinary Infections/Other Outcomes
18. Karason S, Olafsson TA. Avoiding bladder catheterisation in total knee arthroplasty: patient selection criteria and low-dose spinal anaesthesia. Acta Anaesthesiol Scand. May 2013;57(5):639-645.	**BACKGROUND**: Bladder catheterisation may be inconvenient for patients, delay mobilisation and risk complications. We hypothesised that by excluding pre-operatively patients at high risk of post-operative urinary retention, the majority of patients could avoid perioperative catheterisation during low-dose spinal anaesthesia. **METHODS**: Patients undergoing total knee arthroplasty were assigned if fit for spinal anaesthesia and without severe symptoms of lower urinary tract obstruction, gross incontinence, mobilisation difficulties hindering micturition and > 200 ml residual urine volume. Bladder volume was monitored by ultrasound and temporary catheterisation advised if > 400 ml.	**RESULTS**: Fifty-two patients (men 54%, age 65 +/- 9 years, body mass index 31 +/- 5, 30% with history of urinary tract problems) were included. Intrathecal hyperbaric bupivacaine given was 7.8 +/- 1.08 mg and always 7.5 mug sufentanil providing sufficient anaesthesia in all cases. Crystalloid given during surgery was 8.5 +/- 4.0 ml/kg. Voluntary micturition was reached by 46 patients (88%, confidence interval (CI) 79-97%), but six (12%, CI 3-21%) needed temporary catheterisation once (four men/two women). Larger bladder volumes were found in those catheterised than those with voluntary micturition on the pre-operative (131 +/- 76 ml vs. 68 +/- 57 ml, P = 0.03) and first post-operative bladder scan (445 +/- 169 ml vs. 271 +/- 129 ml, P = 0.004). All but two patients (96%) could be mobilised the same day. No patient suffered bladder dysfunction. **CONCLUSION**: Low-dose spinal anaesthesia combined with simple selection criteria allowed for early mobilisation (96%) and avoidance of bladder catheterisation in the vast majority (88%) of patients undergoing total knee arthroplasty, and the rest (12%) only needed a single temporary catheterisation.
19. Miller AG, McKenzie J, Greenky M, et al. Spinal anesthesia: should everyone receive a urinary catheter?: a randomized, prospective study of patients undergoing total hip arthroplasty. J Bone Joint Surg Am. Aug 21 2013;95(16):1498-1503.	**BACKGROUND**: The objective of this randomized prospective study was to determine whether a urinary catheter is necessary for all patients undergoing total hip arthroplasty under spinal anesthesia. **METHODS**: Consecutive patients undergoing total hip arthroplasty under spinal anesthesia were randomized to treatment with or without insertion of an indwelling urinary catheter. All patients received spinal anesthesia with 15 to 30 mg of 0.5% bupivacaine. The catheter group was subjected to a standard postoperative protocol, with removal of the indwelling catheter within forty-eight hours postoperatively. The experimental group was monitored for urinary retention and, if necessary, had straight catheterization up to two times prior to the placement of an indwelling catheter.	**RESULTS**: Two hundred patients were included in the study. There was no significant difference between the two groups in terms of the prevalence of urinary retention, the prevalence of urinary tract infection, or the length of stay. Nine patients in the no-catheter group and three patients in the catheter group (following removal of the catheter) required straight catheterization because of urinary retention. Three patients in the catheter group and no patient in the no-catheter group had development of urinary tract infection. **CONCLUSIONS**: Patients undergoing total hip arthroplasty under spinal anesthesia appear to be at low risk for urinary retention. Thus, a routine indwelling catheter is not required for such patients.

Reference	Study Description Catheter Use/Important Exclusions in Patient Selections	Results & Conclusions Key Outcomes: Catheter use/Urinary Retention/Urinary Infections/Other Outcomes
20. Nyman MH, Gustafsson M, Langius-Eklöf A, Johansson J-E, Norlin R, Hagberg L. Intermittent versus indwelling urinary catheterisation in hip surgery patients: A randomised controlled trial with cost-effectiveness analysis. *Int J Nurs Stud.* 2013;50(12):1589-1598.	**BACKGROUND**: Hip surgery is associated with the risk of postoperative urinary retention. To avoid urinary retention hip surgery patients undergo urinary catheterisation. Urinary catheterisation, however, is associated with increased risk for urinary tract infection (UTI). At present, there is limited evidence for whether intermittent or indwelling urinary catheterisation is the preferred choice for short-term bladder drainage in patients undergoing hip surgery. **OBJECTIVES**: The aim of the study was to investigate differences between intermittent and indwelling urinary catheterisation in hip surgery patients in relation to nosocomial UTI and cost-effectiveness. **DESIGN**: Randomised controlled trial with cost-effectiveness analysis. **SETTING**: The study was carried out at an orthopaedic department at a Swedish University Hospital. **METHODS**: One hundred and seventy hip surgery patients (patients with fractures or with osteoarthritis) were randomly allocated to either intermittent or indwelling urinary catheterisation. Data collection took place at four time points: during stay in hospital, at discharge and at 4 weeks and 4 months after discharge.	**RESULTS**: Eighteen patients contracted nosocomial UTIs, 8 in the intermittent catheterisation group and 10 in the indwelling catheterisation group (absolute difference 2.4%, 95% CI -6.9-11.6%) The patients in the intermittent catheterisation group were more often catheterised ($p<0.001$) and required more bladder scans ($p<0.001$) but regained normal bladder function sooner than the patients in the indwelling catheterisation group ($p<0.001$). Fourteen percent of the patients in the intermittent group did not need any catheterisation. Cost-effectiveness was similar between the indwelling and intermittent urinary catheterisation methods. **CONCLUSIONS**: Both indwelling and intermittent methods could be appropriate in clinical practice. Both methods have advantages and disadvantages but by not using routine indwelling catheterisation, unnecessary catheterisations might be avoided in this patient group.

Appendix Table 4.
Detailed Final Results for All Rated Clinical Scenarios for Orthopedic Surgery Panel

Summary Results from Round 3 ORTHOPEDIC Panel Meeting

Scenarios for Considering Appropriateness of Urinary Catheter Use in Patients Undergoing Hip and Knee Surgeries

KEY

1) The bolded numbers on top of each box indicate the frequency of each numbered response
2) The number in parenthesis at the end of each cell is the median response for that indication
3) Color Codes:

Green	Appropriate (median of 7-9)
Orange	Neutral (median of 4-6)
Red	Inappropriate (median of 1-3)
Yellow	Disagreement (at least 4 rated appropriate and 4 rated inappropriate)

Example:

a. Indication	**7**	**3**			**1**							(1)	***←frequency of each response***
	1	2	3	4	5	6	7	8	9	10	11		*←response options 1-9*

(median response)

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Important Reminders:

1. Please rate the appropriateness of a transurethral **Foley** catheter placement and duration of use in these clinical settings with respect to the need for the Foley catheter because the patient has undergone a specific, **ROUTINE** surgical procedure. We are **NOT** asking about the need for Foley catheter to manage or monitor **unexpected** intra-operative or post-operative conditions or other medical comorbidities (such as needing hourly urine output to manage critical illness, managing urinary incontinence with respect to open pressure ulcers, or a pre-existing need for indwelling urinary catheter).
2. These scenarios are requesting the appropriateness of using a Foley catheter, not any other type of urinary catheter. If there are scenarios where an indwelling urinary catheter is always needed other than a Foley catheter (such as suprapubic catheter), please note.
3. We are **NOT** asking you to rate the appropriateness of a Foley placement or duration of use with respect to the type of anesthesia. A separate panel is rating the appropriateness of Foley catheter placement and removal with respect to the need for spinal and epidural anesthesia and analgesia used for intra-operative and post-operative care.
4. Assume that the patient has **no other indication** for a urinary catheter other than what is provided in the scenario. If you feel there is more information that you need to make a decision, **please rate the scenario as it is** and write a note describing the type of information you'd need on the document (near the scenario in question, or in the space permitted in Section II).
5. Assume the patients would have **no difficulty** with catheter placement, meaning that a nurse could place an indwelling (Foley) or intermittent straight (ISC), or assess urine volumes using a bladder scanner unless otherwise stated.
6. **Urinary retention protocols** including symptom evaluation and bladder scanning *vary greatly by institution*: **assume you could obtain the desired frequency and schedule of bedside assessment by nursing and bladder scanning needed for the duration of time you would recommend for your patient**. *A later panel will be assessing appropriateness for details of urinary retention protocols such as frequency of symptom, exam and bladder scanner assessment, bladder volume criteria, and use of ISC or Foley for management of confirmed and persistent post-operative urinary retention.*

A. Hip Surgery: In this section we are asking you to rate the appropriateness of placing and timing of removal of Foley catheters for common types of hip surgery cases to repair fracture or provide joint replacement that are considered **ROUTINE** – meaning we are excluding patients who considered a critically ill trauma patient. Assume the decision to perform the procedure detailed in the clinical scenarios is appropriate, in comparison to either a different procedure or non-operative management.

Clinical Scenarios	**Pre-Operative Urinary Management Strategies**			
	MALE PATIENTS		**FEMALE PATIENTS**	
	Appropriateness of **placing a Foley** at presentation for hip fracture when patient has **acute pain that is uncontrolled and decreased mobility**	Appropriateness for **continued use of Foley** before hip surgery despite **pain becoming better controlled** since occurrence of fracture	Appropriateness of **placing a Foley** at presentation for hip fracture when patient has **acute pain that is uncontrolled and decreased mobility**	Appropriateness for **continued use of Foley** before hip surgery despite **pain becoming better controlled** since occurrence of fracture
A1. What is the appropriateness of use of a Foley catheter due to pain and decreased mobility in a patient with a recent hip fracture who is expected to undergo hip surgery to repair fracture in the timeframe listed below?	An overview of hip fracture repair and prosthetic hip joint replacement (arthroplasty) procedures can be located in the "Review" articles in Appendix A from UpToDate provided on the USB drive labeled "Hip fractures in adults," "Overview of surgical therapy of knee and hip osteoarthritis," and "Total hip arthroplasty."		An overview of hip fracture repair and prosthetic hip joint replacement (arthroplasty) procedures can be located in the "Review" articles in Appendix A from UpToDate provided on the USB drive labeled "Hip fractures in adults," "Overview of surgical therapy of knee and hip osteoarthritis," and "Total hip arthroplasty."	
a. Expected surgery to repair the hip fracture in < 24 hours	**5 1 1 1 1 1 1** (2)	**4 1 1 1 1 3** (4)	**5 1 2 1 1 1** (5)	**4 1 1 1 1 3** (4)
b. Expected surgery to repair the hip fracture in 24 to <48 hours	**5 1 1 1 1 1 1** (2)	**4 1 2 1 2 1** (4)	**5 1 2 1 1 1** (5)	**4 1 2 2 1 1** (4)
c. Expected surgery to repair the hip fracture in 48 to <72 hours	**4 4 1 1 1** (2)	**7 1 3** (1)	**4 1 2 2 1 1** (3)	**6 1 2 1 1** (1)
d. Expected surgery to repair the hip fracture 72 hours or more	**4 3 3 1** (2)	**8 1 1 1** (1)	**3 1 1 2 4** (5)	**7 1 1 1 1** (1)

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

A. Hip Surgery: In this section we are asking you to rate the appropriateness of placing and timing of removal of Foley catheters for common types of hip surgery cases to repair fracture or provide joint replacement that are considered **ROUTINE** – meaning we are excluding patients who considered a critically ill trauma patient. Assume the decision to perform the procedure detailed in the clinical scenarios is appropriate, in comparison to either a different procedure or non-operative management.

Clinical Scenarios	**Pre-Operative Urinary Management Strategies**		
	Appropriateness of **having patient attempt to void before surgery** to empty bladder (**WITHOUT using a bladder scanner protocol or Foley catheter**) for this type of surgery	Appropriateness of having a patient attempt to void before surgery and using a **routine bladder scanner protocol** with an **"in and out" catheter or ISC as needed to empty the bladder** for this type of surgery	Appropriateness of **placing a Foley routinely for operating room use** for this type of surgery (assuming no Foley was already in place)
A2. What is an appropriate urinary management strategy for h**ip surgeries to repair fracture** immediately before the following surgeries?	An overview of hip fracture repair and prosthetic hip joint replacement (arthroplasty) procedures can be located in the “Review” articles in Appendix A from UpToDate provided on the USB drive labeled "Hip fractures in adults," “Overview of surgical therapy of knee and hip osteoarthritis," and “Total hip arthroplasty."		
a. Unilateral **closed reduction percutaneous pinning** (CRPP) for femoral neck fracture	1 2 3 4 **5** **6** 7 **8** **9** (9)	**1** 2 3 4 5 6 **7** **8** **9** (8)	**4** **4** 3 4 **5** 6 **7** 8 9 (2)
b. Unilateral **open reduction and internal fixation** (ORIF) for hip fracture	1 2 **3** **4** **5** 6 **7** **8** **9** (8)	**1** 2 **3** 4 5 6 **7** **8** **9** (8)	**3** 2 **3** **4** **5** 6 **7** 8 9 (5)
c. Unilateral **partial prosthetic replacement** (hemiarthroplasty) for hip fracture	1 2 **3** **4** **5** **6** 7 **8** **9** (8)	**1** 2 **3** 4 5 **6** **7** **8** **9** (8)	**3** **1** **1** 4 **5** **6** **7** **8** 9 (5)
d. Unilateral **total prosthetic replacement (total hip arthroplasty)** for hip fracture	1 2 **3** **4** **5** **6** 7 **8** **9** (8)	**1** 2 **3** **4** 5 **6** **7** **8** **9** (8)	**3** **1** **1** 4 **5** **6** **7** **8** 9 (5)

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

A. Hip Surgery: In this section we are asking you to rate the appropriateness of placing and timing of removal of Foley catheters for common types of hip surgery cases to repair fracture or provide joint replacement that are considered **ROUTINE** – meaning we are excluding patients who considered a critically ill trauma patient. Assume the decision to perform the procedure detailed in the clinical scenarios is appropriate, in comparison to either a different procedure or non-operative management.

Clinical Scenarios	**Post-Operative Urinary Management Strategies** Appropriateness of **removing Foley catheter in this timeframe** (if had been place for Surgery). In other words, what is the appropriateness of **WAITING** until the timeframe listed before removing the Foley if one had been placed? Assume that a protocol is in place for urinary retention management if patient fails first trial of void (e.g. intermittent straight catheterization or replacement of Foley)			
	First trial of void on **post-op day #0**	Waiting until **post-op day #1** for first trial of void	Waiting until **post-op day #2** for first trial of void	Waiting until **post-op day #3** or greater for first trial of void
A3. Assuming a Foley catheter was placed for hip surgery to repair fracture, when is it appropriate to do a first trial of void after the following surgeries?	An overview of hip fracture repair and prosthetic hip joint replacement (arthroplasty) procedures can be located in the "Review" articles in Appendix A from UpToDate provided on the USB drive labeled "Hip fractures in adults," "Overview of surgical therapy of knee and hip osteoarthritis," and "Total hip arthroplasty."			
a. Unilateral **closed reduction percutaneous pinning** (CRPP) for femoral neck fracture	1 2 3 4 **5** 6 **7** **8** **9** (9)	1 2 3 4 5 6 **7** **8** **9** (9)	**1** 2 3 4 5 6 7 8 9 (1)	**11** 1 2 3 4 5 6 7 8 9 (1)
b. Unilateral **open reduction and internal fixation** (ORIF) for hip fracture	1 2 3 4 **5** **6** **7** 8 **9** (9)	1 2 3 4 5 6 7 **8** **9** (9)	**5** **2** **3** **1** 5 6 7 8 9 (2)	**11** 1 2 3 4 5 6 7 8 9 (1)
c. Unilateral **partial prosthetic replacement** (hemiarthroplasty) for hip fracture	1 2 3 4 **5** 6 **7** **8** **9** (9)	1 2 3 4 5 6 7 **8** **9** (9)	**6** **2** **1** **2** 5 6 7 8 9 (1)	**11** 1 2 3 4 5 6 7 8 9 (1)
d. Unilateral **total prosthetic replacement (total hip arthroplasty)** for hip fracture	1 2 3 4 **5** **6** **7** **8** **9** (9)	1 2 3 4 5 6 7 **8** **9** (9)	**6** **1** **2** **2** 5 6 7 8 9 (1)	**11** 1 2 3 4 5 6 7 8 9 (1)

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

A. Hip Surgery: In this section we are asking you to rate the appropriateness of placing and timing of removal of Foley catheters for common types of hip surgery cases to repair fracture or provide joint replacement that are considered **ROUTINE** – meaning we are excluding patients who considered a critically ill trauma patient. Assume the decision to perform the procedure detailed in the clinical scenarios is appropriate, in comparison to either a different procedure or non-operative management.

Clinical Scenarios	**Pre-Operative Urinary Management Strategies**		
	Appropriateness of **having patient attempt to void before surgery** to empty bladder (**WITHOUT using a bladder scanner protocol or Foley catheter**) for this type of surgery	Appropriateness of having a patient attempt to void before surgery and using a **routine bladder scanner protocol** with an **"in and out" catheter as needed to empty the bladder** for this type of surgery	Appropriateness of **placing a Foley routinely for operating room use** for this type of surgery
A4. What is an appropriate urinary management strategy for prosthetic hip replacement (arthroplasty) to treat conditions other than fracture immediately before the following surgeries?	An overview of prosthetic hip joint replacement (arthroplasty) procedures to address conditions other than fracture can be located in the "Review" articles in Appendix A from UpToDate provided on the USB drive labeled "Overview of surgical therapy of knee and hip osteoarthritis" and "Total hip arthroplasty." Conditions being addressed by these procedures include to osteoarthritis, inflammatory arthritis, avascular necrosis or congenital deformities in adults		
a. **Unilateral** total prosthetic hip replacement (total hip arthroplasty) - initial surgery	1 2 **1** 4 **2** 6 7 **1** **7** (9)	**1** 2 3 4 5 **1** **5** **1** **2** **5** (8)	**4** 2 3 **3** 5 6 **1** **1** 9 (3)
b. **Bilateral** total prosthetic hip replacement (total hip arthroplasty) - initial surgery. *NOTE for column 3, includes option of using a bladd scanner and "in and out" catheter if needed both before the surgery and inbetween the first and second hip surgeries.	**1** **1** **1** 4 **2** 6 **1** **1** **4** (7)	**1** **1** 3 4 5 **1** **1** **5** **2** (8)	2 3 4 **2** **1** **1** **4** **1** (7)
c. **Revision** prosthetic hip replacement expected duration ≤ 2 hours	**1** 2 **1** 4 **2** 6 7 **1** **6** (9)	**2** 2 3 4 5 **1** **1** **1** **2** **4** (8)	**3** 2 **2** **1** **3** 6 **1** **1** 9 (4)
d. **Revision** prosthetic hip replacement expected duration > 2 hours	1 **4** **1** 4 **2** 6 7 8 **4** (5)	**1** **3** **1** **1** **1** 6 **1** 8 **3** (4)	1 **1** 3 4 **2** **1** 7 **5** **2** (8)

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

A. Hip Surgery: In this section we are asking you to rate the appropriateness of placing and timing of removal of Foley catheters for common types of hip surgery cases to repair fracture or provide joint replacement that are considered **ROUTINE** – meaning we are excluding patients who considered a critically ill trauma patient. Assume the decision to perform the procedure detailed in the clinical scenarios is appropriate, in comparison to either a different procedure or non-operative management.

Clinical Scenarios	**Urinary Management Strategies**			
	Appropriateness of **removing Foley catheter in this timeframe** (if had been place for Surgery). In other words, what is the appropriateness of **WAITING** until the timeframe listed before removing the Foley if one had been placed? Assume that a protocol is in place for urinary retention management if patient fails first trial of void (e.g. intermittent straight catheterization or replacement of Foley)			
	First trial of void on **post-op day #0**	Waiting until **post-op day #1** for first trial of void	Waiting until **post-op day #2** for first trial of void	Waiting until **post-op day #3** or greater for first trial of void
A5. Assuming a Foley catheter was placed for prosthetic hip replacement (arthroplasty) to treat conditions other than fracture , when is it appropriate to do a first trial of void after the following surgeries?	An overview of prosthetic hip joint replacement (arthroplasty) procedures to address conditions other than fracture can be located in the "Review" articles in Appendix A from UpToDate provided on the USB drive labeled "Overview of surgical therapy of knee and hip osteoarthritis" and "Total hip arthroplasty." Conditions being addressed by these procedures include to osteoarthritis, inflammatory arthritis, avascular necrosis or congenital deformities in adults			
a. **Unilateral** total prosthetic hip replacement (total hip arthroplasty) - initial surgery	1 2 3 4 5 6 **7** **8** **9** (8)	1 2 3 4 5 6 **7** 8 **9** (8)	**10** **1** 1 2 3 4 5 6 7 8 9 (1)	**11** 1 2 3 4 5 6 7 8 9 (1)
b. **Bilateral** total prosthetic hip replacement (total hip arthroplasty) - initial surgery	1 2 3 **4** 5 6 **7** **8** **9** (7)	1 2 3 4 5 6 **7** **8** **9** (8)	**8** **1** **2** 1 2 3 4 5 6 7 8 9 (1)	**11** 1 2 3 4 5 6 7 8 9 (1)
c. **Revision** prosthetic hip replacement expected duration ≤ 2 hours	1 2 3 4 **5** 6 **7** **8** **9** (8)	1 2 3 4 5 6 **7** **8** **9** (8)	**10** 1 2 3 4 5 6 7 8 9 (1)	**11** 1 2 3 4 5 6 7 8 9 (1)
d. **Revision** prosthetic hip replacement expected duration > 2 hours	1 2 **3** 4 **5** 6 **7** **8** **9** (7)	1 2 3 4 5 6 **7** **8** **9** (8)	**8** 1 **3** 1 2 3 4 5 6 7 8 9 (1)	**11** 1 2 3 4 5 6 7 8 9 (1)

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

A. Hip Surgery: In this section we are asking you to rate the appropriateness of placing and timing of removal of Foley catheters for common types of hip surgery cases to repair fracture or provide joint replacement that are considered **ROUTINE** – meaning we are excluding patients who considered a critically ill trauma patient. Assume the decision to perform the procedure detailed in the clinical scenarios is appropriate, in comparison to either a different procedure or non-operative management.

Clinical Scenarios	Appropriateness of placing a Foley routinely because of this description **DURING use of an occlusive dressing**										Appropriateness of placing a Foley routinely because of this description **AFTER REMOVAL of an occlusive dressing**									
A6. Urinary management and wound care																				
a. Is it appropriate to use a Foley catheter after hip surgery in a patient with incontinence soley because of concern of surgical wound infection WITH a draining wound	**9**	**2**								(1)	**7**	**1**	**1**		**1**	**1**				(1)
	1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7	8	9	
b. Is it appropriate to use a Foley catheter after hip surgery in a patient with incontinence soley because of concern of surgical wound infection when the wound IS NOT draining	**11**									(1)	**9**	**1**	**1**							(1)
	1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7	8	9	

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

B. Knee Surgery: In this section we are asking you to rate the appropriateness of placing and timing of removal of Foley catheters for common types of knee procedures when considered **ROUTINE** – meaning we are excluding patients who considered a critically ill trauma patient. Assume the decision to perform the procedure detailed in the clinical scenarios is appropriate, in comparison to either a different procedure or non-operative management.

Clinical Scenarios	**Urinary Management Strategies**		
	Appropriateness of **having patient attempt to void before surgery** to empty bladder (**WITHOUT using a bladder scanner protocol or Foley catheter**) for this type of surgery	Appropriateness of having a patient attempt to void before surgery and using a **routine bladder scanner protocol** with an **"in and out" catheter as needed to empty the bladder** for this type of surgery	Appropriateness of **placing a Foley routinely for operating room use** for this type of surgery
B1. What is an appropriate urinary management strategy for knee procedures immediately before the following surgeries?	An overview of knee procedures can be provided in the "Review" article in Appendix A from UpToDate provided on the USB drive labeled "Total knee arthroplasty." Conditions being addressed by these procedures include to osteoarthritis, inflammatory arthritis, avascular necrosis or congenital deformities in adults.		
a. Unilateral **total** knee arthroplasty	1 2 3 4 **3** 6 7 **1** **7** (9)	**1** 2 3 4 **1** 6 **2** **3** **4** (8)	**4** 2 **3** 4 5 **2** **2** 8 9 (3)
b. Bilateral **total** knee arthroplasty	1 2 **2** 4 **2** 6 **1** **1** **5** (8)	**1** 2 3 **1** **1** 6 **2** **3** **3** (8)	1 **2** 3 4 **4** 6 **2** **2** **1** (5)
c. Unilateral **unicompartmental** knee arthroplasty	1 2 3 4 **2** 6 7 **1** **8** (9)	**1** 2 3 4 5 **1** 7 **4** **5** (8)	**7** **2** 3 4 **1** 6 **1** 8 9 (1)
d. Bilateral **unicompartmental** knee arthroplasty	1 2 3 4 **4** 6 7 **1** **6** (9)	**1** 2 3 4 5 **1** **2** **3** **4** (8)	**3** 2 **4** 4 **1** 6 **2** **1** 9 (3)
e. Unilateral **osteotomy** to address unicompartmental and non-inflammatory knee disease	1 2 3 4 **3** 6 7 **1** **7** (9)	**1** 2 3 4 5 **1** **2** **3** **4** (8)	**3** **1** **4** 4 **1** **1** **1** 8 9 (3)
f. **Revision** knee arthroplasty expected duration ≤ 2 hours	1 2 3 4 **3** 6 7 **1** **7** (9)	**1** 2 3 4 **1** **1** **1** **3** **4** (8)	**2** **1** **3** **2** **1** 6 **1** **1** 9 (3)
g. **Revision** knee arthroplasty expected duration > 2 hours	1 **1** **2** 4 **3** 6 7 8 **5** (5)	**1** **1** **1** 4 **2** 6 **1** **1** **4** (7)	**1** 2 3 **1** **2** 6 **2** **4** **1** (7)

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate

B. Knee Surgery: In this section we are asking you to rate the appropriateness of placing and timing of removal of Foley catheters for common types of knee procedures when considered **ROUTINE** – meaning we are excluding patients who considered a critically ill trauma patient. Assume the decision to perform the procedure detailed in the clinical scenarios is appropriate, in comparison to either a different procedure or non-operative management.

Clinical Scenarios	**Urinary Management Strategies**			
	Appropriateness of **removing Foley catheter in this timeframe** (if had been place for Surgery). In other words, what is the appropriateness of **WAITING** until the timeframe listed before removing the Foley if one had been placed?			
	First trial of void on **post-op day #0**	Waiting until **post-op day #1** for first trial of void	Waiting until **post-op day #2** for first trial of void	Waiting until **post-op day #3** or greater for first trial of void
B2. Assuming a Foley catheter was placed for a knee procedure, when is it appropriate to do a first trial of void after the following surgeries?	An overview of knee procedures can be provided in the "Review" article in Appendix A from UpToDate provided on the USB drive labeled "Total knee arthroplasty." Conditions being addressed by these procedures include to osteoarthritis, inflammatory arthritis, avascular necrosis or congenital deformities in adults.			
a. Unilateral **total** knee arthroplasty	1 2 3 4 **1** 6 **1** **2** **7** (9)	1 2 3 4 **1** **1** 6 **6** **3** (8)	**10** 2 **1** 4 5 6 7 8 9 (1)	**11** 1 2 3 4 5 6 7 8 9 (1)
b. Bilateral **total** knee arthroplasty	1 **1** 3 4 5 6 **2** **4** **4** (8)	1 2 3 4 5 6 **2** **3** **6** (9)	**8** **1** **2** 4 5 6 7 8 9 (1)	**11** 1 2 3 4 5 6 7 8 9 (1)
c. Unilateral **unicompartmental** knee arthroplasty	1 2 3 4 5 6 7 **1** **10** (9)	**2** **2** **1** 4 5 6 **2** **2** **2** (7)	**10** **1** 3 4 5 6 7 8 9 (1)	**11** 1 2 3 4 5 6 7 8 9 (1)
d. Bilateral **unicompartmental** knee arthroplasty	1 2 3 4 5 6 **2** **1** **8** (9)	1 **1** **3** 4 5 6 7 **5** **2** (8)	**10** 2 **1** 4 5 6 7 8 9 (1)	**11** 1 2 3 4 5 6 7 8 9 (1)
e. Unilateral **osteotomy** to address unicompartmental and non-inflammatory knee disease	1 2 3 4 **1** 6 7 **2** **8** (9)	**1** **1** **1** 4 **1** 6 **2** **2** **3** (7)	**10** **1** 3 4 5 6 7 8 9 (1)	**11** 1 2 3 4 5 6 7 8 9 (1)
f. **Revision** knee arthroplasty expected duration ≤ 2 hours	1 2 3 4 **1** 6 **2** **3** **5** (8)	1 **1** 3 4 5 6 **1** **5** **4** (8)	**10** 2 **1** 4 5 6 7 8 9 (1)	**11** 1 2 3 4 5 6 7 8 9 (1)
g. **Revision** knee arthroplasty expected duration > 2 hours	**1** **1** 3 4 **1** 6 **4** **1** **3** (7)	1 2 3 4 5 6 **2** **5** **4** (8)	**8** 2 **3** 4 5 6 7 8 9 (1)	**11** 1 2 3 4 5 6 7 8 9 (1)

Scoring: 1=Highly inappropriate; 5=Neutral or uncertain; 9=Highly appropriate