CT scans are not helpful in identifying patients requiring operative treatment for a small bowel obstruction.

**Background:** Adhesive small bowel obstruction (SBO) is common. Most patients can be managed non-operatively, although the worry about missing ischemic bowel is always a worry. Signs and symptoms that indicate an urgent trip to the operating room are still lacking even in this day and age of CT assessment of patients with SBO.

**Objective:** To evaluate a treatment algorithm for patients with SBO.

**Design:** Prospective clinical study.

**Participants:** 118 patients with 123 episodes of SBO.

**Methods:** Patients were assessed for SBO based on clinical history and symptoms. Initial evaluation included physical findings, plain radiographs, and CT scanning with IV contrast. Patients were divided into 3 groups based on surgical intervention. Group 1 was taken directly to surgery, Group 2 had a successful nonoperative trial, and Group 3 had a failed nonoperative trial. An attempt was made to define factors that predicted surgical intervention.

**Interventions:** Patients with clinical signs of peritonitis or CT evidence of ischemia were taken immediately to the operating room. All others received a nasogastric tube. After 2 hours of suction and resolution of symptoms, 100 cc of Gastrografin® was instilled in the nasogastric tube which was clamped for 4 hours. A plain abdominal film was taken at 12 hours. If clinical improvement occurred and colon was opacified at 12 hours, patients progressed to oral intake. Return of symptoms prompted operative intervention.

**Results:** 36 patients were taken immediately to the operating room and all had ischemic bowel. CT scan was helpful in making this decision in 5 patients (14%). Of patients, 59 were successfully treated medically and 28 developed recurrent symptoms and required surgery. None of these patients had the contrast reach the colon by 12 hours. Median time to operative intervention was 28 hours. No differences were noted when examining CT findings between groups. Additionally, no parameters were helpful in predicting the need for exploratory laparotomy.

**Conclusions:** Gastrografin might help identify patients who will fail nonoperative management.

**Reviewer's Comments:** We all have had at least one patient with a SBO that received Gastrografin. Sometimes it works and others it does not. This article suggests that Gastrografin may be able to predict which patients need an operation earlier than our clinical assessment. A slow transit of Gastrografin into the colon at 12 hours correlated with the need for operative intervention. CT scans were not all that helpful after an initial one and the authors actually suggest that follow-up CT scans in these patients should not be done. The authors avoid making a claim that Gastrografin can treat SBO. Finally, the authors reaffirm that no test is accurate enough to say it can be used to separate SBO patients into groups that require early or late operative exploration. (Reviewer-John A. Weigelt, MD).

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Keywords: Small Bowel Obstruction, CT Scan, Surgery

Print Tag: Refer to original journal article
Hormone Replacement Recommended After Thyroid Lobectomy

Thyroid Hormone Replacement After Thyroid Lobectomy.
Stoll SJ, Pitt SC, et al:
Surgery 2009; 146 (October): 554-558

Hypothyroidism is common after thyroid lobectomy for benign disease.

**Background:** Thyroid lobectomy is performed for a number of benign and malignant conditions. Hypothyroidism is known to occur after thyroid lobectomy especially associated with certain conditions.

**Objective:** To identify incidence of hypothyroidism after lobectomy and determine risk factors for its occurrence.

**Design:** Retrospective patient review.

**Participants:** 547 patients who had a thyroid lobectomy and isthmusectomy for benign disease from May 2004 through December 2007.

**Methods:** Patient demographics were collected. Thyroid condition treated was recorded. Hypothyroidism was defined as a thyroid-stimulating hormone (TSH) level above the upper limit of normal ≥6 weeks after surgery. TSH levels were also collected preoperatively and patients were placed into 3 groups based on the preoperative TSH level: (1) TSH level <1.5 µIU/mL; (2) TSH level 1.51 to 2.50 µIU/mL; and (3) TSH level >2.5 µIU/mL. Median follow-up was 32 months with a range of 12 to 54 months. Primary outcome was to determine number of hypothyroid patients and any risk factors that predicted hypothyroidism after lobectomy.

**Interventions:** Thyroid lobectomy with isthmusectomy.

**Results:** 78 patients (14.3%) were discovered to be hypothyroid. Mean age was 50 years for all patients and age did not impact the hypothyroidism rate. More females developed hypothyroidism although the difference was not significant. Rate of hypothyroidism did correlate with preoperative TSH levels: 14% for <1.5 µIU/mL; 21% for 1.51 to 2.5 µIU/mL; and 41% for >2.5 µIU/mL. Patients with Hashimoto's thyroiditis were also more likely to develop hypothyroidism.

**Conclusions:** Hypothyroidism is common after thyroid lobectomy for benign disease and correlates with preoperative TSH levels and Hashimoto's pathology.

**Reviewer's Comments:** Not surprising results. An elevated TSH level preoperatively would suggest that the patient is already developing hypothyroidism. Thus, to find that higher TSH levels preoperatively correlated with a higher rate of postoperative hypothyroidism should not be surprising. Likewise, the Hashimoto's correlation is not new. What is interesting is the authors’ refusal to use replacement thyroid hormone routinely in these patients. Hypothyroidism can be insidious and associated with morbidity and mortality. Use of replacement thyroid hormone is recommended to prevent this complication after lobectomy and especially when treating inflammatory conditions of the thyroid like Hashimoto's. I would echo the comment which is made in the discussion of this article by members of the audience. Safe, easy, and relatively inexpensive. Not many things we do these days can qualify for all three. (Reviewer-John A. Weigelt, MD).

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Keywords: Thyroid Surgery, Hormone Replacement, Hypothyroidism

Print Tag: Refer to original journal article
**Is Perioperative Enriched Oxygen Beneficial?**

*Effect of High Perioperative Oxygen Fraction on Surgical Site Infection and Pulmonary Complications After Abdominal Surgery: The PROXI Randomized Clinical Trial.*

Meyhoff CS, Wetterslev J, et al:

JAMA 2009; 302 (October 14): 1543-1550

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Perioperative enriched oxygen has little benefit for surgical site infection rates.

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**Background:** Surgical site infections (SSI) continue to plague surgical care. Various methods to reduce SSI exist and have been incorporated into SCIP. One intervention that has conflicting data is the use of high oxygen concentrations in the perioperative period.

**Objective:** To determine if 80% inspired oxygen in the perioperative period can reduce SSI rates.

**Design:** Prospective blinded clinical trial.

**Participants:** 1386 patients having an acute or elective laparotomy.

**Methods:** Perioperative care was standardized including antibiotic choices. Randomization was done centrally. Primary outcome was SSI rates of patients. SSI rates were tabulated at 14 days with Centers for Disease Control definitions. Secondary endpoint was pulmonary complications including atelectasis, pneumonia, respiratory failure and mortality. All complications were recorded within 14 days, except mortality, which was recorded at 30 days.

**Interventions:** Oxygen concentrations were given throughout the operative case and for 2 hours postoperatively. Ventilation was given to maintain normocapnia.

**Results:** 685 patients received 80% oxygen and 701 received 30% oxygen. Patients were well matched by comorbidities and operative procedure. Of patients, 27% in each group had emergency surgery. SSI occurred in 19% of the 80% oxygen and 20% of the 30% oxygen patients. Type of SSI was also not different. Superficial infection occurred in 57% of the 80% and 54% of the 30% patients. Deep infections occurred in 15% of the 80% and 18% of 30% patients. Colorectal SSI rates were not different based on oxygen concentration. Organ space infections occurred in 27% of both groups. Respiratory complications were also not different between groups. In patients, 30 day mortality was 4% in the 80% and 3% in the 30% patients.

**Conclusions:** Enriched oxygen perioperatively did not reduce SSI rates.

**Reviewer's Comments:** Well, is this data adequate to squelch this practice? Not sure I can tell. I am sure there will be some non-believers that say this study is still underpowered to say high oxygen concentrations do not alter SSI rates. The study is well done and the statistics seem solid although the authors point out that they could not detect a 10% difference in SSI rates if that is the magnitude of the benefit. Lack of respiratory compromise will also be suggested as a benefit and since little harm occurs, I am sure some may cling to a potential benefit from oxygen use in this fashion. So, now we have a large well done study, I guess the final decision will be up to all of us in our daily practice. (Reviewer-John A. Weigelt, MD).

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**Keywords:** Surgical site infection, abdominal surgery, perioperative oxygen

**Print Tag:** Refer to original journal article
Higher Intensity Renal Replacement Therapy Is Not Better

Intensity of Continuous Renal-Replacement Therapy in Critically Ill Patients.
Bellomo R, Cass A, et al:


An effluent flow rate of 40 ml/kg does not improve survival in critically ill patients with renal failure compared to an effluent rate of 25 ml/kg.

**Objective:** To determine if high-intensity continuous renal replacement therapy is associated with improved outcomes compared to the standard effluent flow rate in critically ill patients.

**Design:** Randomized multicenter control trial.

**Methods:** This study compared a high intensity effluent rate of 40 ml/kg to a lower intensity flow rate of 25 ml/kg performed in Intensive Care Units (ICUs) in Australia and New Zealand. Patients with criteria of renal failure were randomized to 1 of 2 continuous renal replacement strategies and all-cause 90-day mortality was analyzed in addition to hospital resource use.

**Results:** The mortality rate in each group was identical at 44.7% at 90 days. Length of ICU and overall hospital stay was the same in both groups. Proportion of patients requiring renal replacement therapy at 28 days and the average number of days of renal replacement therapy was equivalent between groups. Adverse events were similar between groups with the exception of a higher rate of hypophosphatemia in the higher intensity group.

**Conclusions:** The use of higher intensity continuous renal replacement therapy offers no survival advantage or reduction in resource utilization compared to the lower intensity flow rates traditionally used.

**Reviewer's Comments:** The authors have performed a well randomized trial despite the fact that it was not blinded and the results should be believed. Use of higher intensity continuous renal replacement offers no benefit to traditional effluent flow rates in terms of mortality or hospital length of stay. Curiously, the duration of renal replacement therapy on average was only 6 days. This short duration likely represents the early use of hemodialysis in their centers before full blown renal failure has occurred. In the United States, early use of renal replacement therapy is not widespread. It may be that results are not generalizable to patients in our critical care units. However, this study adds an important piece of information to the management of critically ill renal failure patients. The question also remains as to the optimal time to begin renal replacement therapy to determine if early dialysis is associated with improved survival. (Reviewer-Raminder Nirula, MD).

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Keywords: Renal Failure, Critically Ill, Dialysis, Flow

Print Tag: Refer to original journal article
Reoperation Rate -- Another Quality Indicator for Surgical Care

Variability in Reoperation Rates at 182 Hospitals: A Potential Target for Quality Improvement.

Merkow RP, Bilimoria KY, et al:

Objective: To determine if risk factors associated with the need for reoperation could be identified which could be provided to hospitals that have a higher than expected rate of unplanned reoperation.

Methods: The National Surgical Quality Improvement Project database (NSQIP) was queried for patients undergoing elective colorectal procedures over a recent 2-year period. This dataset contains data from 182 hospitals on surgical procedures. Emergent operations and those with underlying sepsis or who were on the ventilator prior to surgery were excluded to limit the analysis to elective colorectal procedures. Patient demographics, lifestyle factors, American Society of Anesthesiology (ASA) Class, comorbidities, lab values, preoperative blood transfusion, and BMI were analyzed to determine their association with the need for reoperation. Operations were classified by extent, indication, and wound class in terms of contamination.

Results: Reoperation occurred in 5.7% of the more than 23,000 patients. Reasons for reoperation included organ space infections, wound dehiscence, deep wound infection, and bleeding. Of the hospitals in NSQIP, 8.8% had a higher than expected rate of reoperations after adjusting for case mix and patient risk factors. Factors associated with a higher reoperation rate were higher ASA class, male gender, contaminated operations, surgical extent - total abdominal colectomy, proctectomy, total proctocolectomy, surgical indication, and albumin. Several other factors were included in the model; however, the aforementioned risk factors allowed for accurate prediction of the need for reoperation.

Conclusions: As with other quality indicators, there appears to be variability in the rate of reoperation across the United States. Several risk factors may be used to identify patients at risk for the need for reoperation.

Reviewer's Comments: As the need for improved outcomes and quality health care increases, we strive to identify valid quality indicators which can be used for benchmarking. The authors propose that need for reoperation is an indicator of quality care. They have identified a number of risk factors which are associated with an increased risk for reoperation. Unfortunately, only a few of these risk factors are potentially modifiable which makes me wonder whether there will be any clinical utility in this benchmark. A few factors may be modifiable such as ASA class, smoking, alcohol, and BMI, but only to a certain degree since in many instances the need for the "elective surgery" may not allow for a lengthy preoperative period in which to modify such risk factors. Many of these risk factors are patient specific and rely on patient compliance for which hospitals will be held accountable if this benchmark is to be used as a quality indicator. (Reviewer-Raminder Nirula, MD).

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Keywords: Benchmark, Quality, Indicator, Reoperation

Print Tag: Refer to original journal article
Don’t Take Too Long Taking Out the Colon Laparoscopically

Laparoscopic Colon Surgery: Does Operative Time Matter?
Scheer A, Martel G, et al:

Dis Colon Rectum 2009; 52 (October): 1746-1752

Laparoscopic total abdominal colectomy taking >270 minutes is associated with increased postoperative complications.

Objective: To determine if operative time is associated with postoperative outcome in laparoscopic colectomy.

Design/Methods: A retrospective review of a prospectively-collected dataset of laparoscopic colectomies over a 14-year period was performed. Patients were analyzed based upon the type of colectomy -- right, sigmoid, or total abdominal colectomy. Outcomes assessed were mortality, complications, ileus, and length of stay. Logistic regression was performed to determine if the length of operation was associated with outcome while controlling for diagnosis and obesity.

Results: With increasing operative time in both right/ileocecal and sigmoid resections, there was no significant association between intraoperative and postoperative complications, days to surgical diet, or length of stay. Rectal resection and left hemicolectomies were excluded to maintain homogeneity. Obesity was associated with increased operative time. In total abdominal colectomy patients, a longer operative time was associated with postoperative complications, ileus, and hospital length of stay. In this group, if the operative time was >270 minutes patients were almost 4 times more likely to experience a negative outcome adjusting for obesity and diagnosis.

Conclusions: Increased operative time for segmental colon resections is not associated with worse outcome. In total abdominal colectomy, a longer operative time is associated with worse outcome.

Reviewer's Comments: This review indicates that prolonged operative time for laparoscopic total colectomy is associated with worse outcomes but that such an association was not present for segmental colon resections. While small numbers may account for the absence of association in the segmental groups, it is interesting to note that there were only 46 total abdominal colectomies and a relationship was identified. Noteworthy is that most total colectomies are for inflammatory bowel disease and the use of steroids is high in this group. This may be the reason that prolonged operative times play a role in complications which was not observed in the segmental resections. Regardless of the reason, it is clear that longer operative times in this patient population are detrimental. The question is, if you convert to open resection when the operation reaches a certain time point will it reduce the risk of complications? (Reviewer-Raminder Nirula, MD).

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Keywords: Laparoscopic, Colectomy, Operative Time, Complication

Print Tag: Refer to original journal article
Identifying the Best Ventilator Strategy for Patients With ARDS


Putensen C, Theuerkauf N, et al:
Ann Intern Med 2009; 151 (October 20): 566-576

Low tidal volume should be used for patients with acute lung injury and acute respiratory distress syndrome.

Objective: To determine the optimal ventilator strategy for patients with acute respiratory distress syndrome (ARDS).

Methods: Search strategies identified all randomized, controlled trials comparing lower tidal volume and higher positive end-expiratory pressure (PEEP) in patients with acute lung injury and/or ARDS. Acute lung injury and ARDS were defined according to American-European Consensus Conference criteria (acute lung injury PaO$_2$/FiO$_2$ ratio <300, ARDS PaO$_2$/FiO$_2$ ratio <200). Low tidal volume was defined as a maximal inspiratory plateau pressure of ≤30 cm H$_2$O (tidal volume ≤8 cc/kg). High PEEP trials titrated PEEP based on lower inflection point of the static pressure-volume curve or used highest PEEP possible while keeping maximal inspiratory plateau pressure of ≤30 cm H$_2$O with low PEEP defined by fixed FiO$_2$-PEEP scales. Primary outcome was mortality at hospital discharge. Secondary outcomes included barotrauma, use of rescue therapy, hypoxemia, ventilator settings, and pulmonary function. Trials in postoperative patients were excluded. Study quality was assessed by use of randomization, allocation concealment, blinding, selection of study population, similarity of groups at baseline, use of a predefined treatment protocol, absence of confounders, absence of co-interventions, a priori definition of endpoints and calculation of sample size, use of intention to treat analysis, and follow-up.

Results: 9 trials of 1111 initially identified were included in the analysis. Of trials, 4 tested lower versus higher tidal volume ventilation at similar PEEP levels, 3 compared lower versus higher PEEP at low tidal volume, and 2 compared low tidal volume and high PEEP to high tidal volume and low PEEP. Lower tidal volume reduced hospital mortality at similar PEEP, with an odds ratio (OR) of 0.75 (95% CI, 0.58 to 0.96). Higher PEEP did not reduce mortality compared to low PEEP at low tidal volume ventilation (OR 0.86; 95% CI, 0.72 to 1.02). Higher PEEP did reduce the need for rescue therapy to treat hypoxemia (OR 0.51; 95% CI, 0.36 to 0.71).

Conclusions: Mortality is reduced with routine use of low tidal volume ventilation in patients with ARDS and acute lung injury.

Reviewer's Comments: It is notable, and not surprising, that only 9 studies investigated the topic of interest. It is clear that conventional management strategies for patients with acute lung injury and ARDS should use low tidal volume ventilation. Optimal PEEP is still unclear; there is significant enthusiasm for high PEEP in many circles, which is not substantiated by this meta-analysis. Use of rescue therapies, addressed in another review this month, is also unclear. The majority of rescue therapies have been shown to improve oxygenation without appreciably improving survival; however, many have not been tested as an overlay to optimal conventional management. (Reviewer-Karen J. Brasel, MD).

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Keywords: Acute Respiratory Distress Syndrome, Positive End-Expiratory Pressure

Print Tag: Refer to original journal article
Treat First Things First With Breast Cancer

Factors Associated With Improved Outcome After Surgery in Metastatic Breast Cancer Patients.

McGuire KP, Eisen S, et al:


Patients undergoing mastectomy with metastatic breast cancer have improved survival.

Objective: To review institutional experience in patients with metastatic breast cancer.

Methods: Records of all patients with metastatic breast cancer treated between 1990 and 2007 were reviewed. Demographic information, tumor characteristics, sites of metastasis, treatment, overall survival, and disease status at last follow-up were abstracted. Primary end point was overall survival.

Results: 566 patients were seen with metastatic breast cancer, including 154 in whom the primary tumor was removed. Median age was 53 years, significantly younger in patients not undergoing surgery (52.5 vs 60.0 years, \( P < 0.001 \)). Median tumor size was 4 cm, not significantly different between groups. Of patients, 65% had invasive ductal cancer, 18% had invasive lobular cancer, and 17% were listed as other. Mean number of metastatic sites (1.5), hormone receptor status (35%), and type of nonsurgical treatment was not different between groups. Median follow-up was 37 months, with a median survival of 27 months. Patients undergoing surgery had an overall survival of 33%, compared to 20% for those not undergoing surgery (\( P = 0.0012 \)). Mastectomy was performed in 98 patients, and breast conservation therapy in 56 patients. Overall survival was better in patients undergoing mastectomy than breast conservation therapy (37% vs 20%, \( P = 0.04 \)). Patients undergoing mastectomy had fewer positive margins (3% vs 26%, \( P < 0.001 \)), had axillary node dissection performed more frequently (71% vs 56%, \( P = 0.065 \)), and received preoperative chemotherapy more often (34% vs 15%, \( P = 0.02 \)).

Conclusions: Removal of the primary tumor in patients with metastatic breast cancer is associated with improved survival, and survival is best with mastectomy.

Reviewer's Comments: The initial concept of breast cancer was that it was a local disease, prompting the radical surgery of Halstead and others to extirpate all possibly involved tissue. Further understanding recognized the systemic nature of the disease, with less aggressive local treatment and more aggressive, multimodal systemic treatment advocated. The biologic arguments in favor of local treatment in the face of metastatic disease include removal of immunosuppressive factors, increased efficacy of adjuvant chemotherapy possibly secondary to increased angiogenesis once the primary tumor is removed, and removal of necrotic tissue inaccessible to chemotherapeutic agents. Debulking of the primary tumor as well as metastatic deposits is commonly used in the treatment of ovarian cancer, and decreasing tumor burden has also shown improved survival in colorectal, renal, and gastric cancers. One of the big remaining questions is whether the groups being compared in this review are truly comparable; clearly some of the data presented suggests that they are not. (Reviewer-Karen J. Brasel, MD).

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Keywords: Breast Cancer, Metastases, Outcome, Risk Factors, Surgery

Print Tag: Refer to original journal article
Nortriptyline and gabapentin should be used together for neuropathic pain.

**Objective:** To compare gabapentin and nortriptyline alone and in combination for the treatment of neuropathic pain.

**Methods:** Eligible patients suffered from diabetic polyneuropathy or postherpetic neuralgia. Patients were randomized to receive either nortriptyline, gabapentin, or both using a crossover design with 6 weeks per treatment period. NSAIDS, paracetamol, and long-acting narcotics were continued throughout the duration of the study if the patient had been taking them prior to enrollment. All procedural pain treatments, including nerve blocks and acupuncture, were discontinued during the study period. Standard dose-escalation regimens were followed based on patients pain ratings. Patients were contacted twice weekly by a study nurse and asked for pain ratings as well as occurrence and severity of adverse events. Primary outcome was pain intensity, which was rated 3 times daily. Mean score over 7 days at the maximum tolerated dose was used to measure the primary outcome.

**Results:** 56 patients were randomized, with 47 completing at least 2 treatment periods. There were no significant effects of treatment sequence, treatment period, or carryover. Pain intensity with combination treatment was significantly lower than with either gabapentin or nortriptyline alone ($P = 0.0043$). There was a 53% reduction in pain with combination treatment, compared to 39% with nortriptyline, and 31% with gabapentin alone ($P = 0.0002$). Maximum tolerated dose of both gabapentin and nortriptyline was higher with monotherapy than with combination therapy. The most common adverse event was dry mouth, seen least frequently in patients receiving gabapentin alone compared to either nortriptyline alone or combination therapy ($P < 0.0001$). There were no serious adverse events reported.

**Conclusions:** Combined gabapentin and nortriptyline is more efficacious than monotherapy in patients with diabetic neuropathy or postherpetic neuralgia.

**Reviewer's Comments:** The authors chose to include both patients with diabetic neuropathy and postherpetic neuralgia in order that their findings might be more generalizable. Whether these findings will generalize to other populations, including patients with inguinodynia, trauma patients, and others, is unclear. (Reviewer-Karen J. Brasel, MD).

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Keywords: Chronic Pain, Neuropathic Pain, Nortriptyline, Gabapentin

Print Tag: Refer to original journal article
A uniform delayed gastric emptying classification system provides an objective platform for treatment by surgeons performing a pancreaticoduodenectomy.

**Background:** Delayed gastric emptying (DGE) is one of the leading postoperative complications after pancreaticoduodenectomy (PD). In 2007, the International Study Group of Pancreatic Surgery (ISGPS) proposed a universally applicable definition of DGE. However, this definition has not been applied to clinical data sets.

**Objective:** To apply the ISGPS definition of DGE to a series of PD cases at a high-volume hospital.

**Design/Participants/Methods:** 129 consecutive PDs performed at a single institution were evaluated and reviewed for the occurrence of DGE. Severity of DGE was scored and risk factors were identified and evaluated.

**Results:** There were no cases of hospital mortality and overall complication rate of ≥1 postoperative complication was 58.1%. Overall incidence of DGE was 33.3% with a 12.4% grade A, 10.9% grade B, and 10.1% grade C incidence of DGE. As would be expected, outcomes of length of stay as well as resumption of oral intake were negatively impacted by the occurrence DGE. DGE was also associated with the need for nutritional support and the use of prokinetic drugs. Multivariate analysis identified clinically relevant postoperative pancreatic fistulas (grade B/C) and benign pancreatic pathology as independent risk factors for DGE. This was the first study to employ a universal definition of delayed gastric emptying based on postoperative clinical parameters to a series of PD patients. Grade C postoperative DGE was associated with poorer outcomes. The proposed definition and classification of DGE appeared applicable to this patient population, but warrants further analysis in larger clinical series of PDs. Interestingly, this and other more recent reviews have not identified pylorus preservation as compared to standard antrectomy as a significant risk factor associated with DGE.

**Conclusions:** Results of this study confirm that the presence of a postoperative intra-abdominal complication was one of the strongest predictors of postoperative DGE. DGE using the ISGPS definition resulted in a significant increase in length of stay, longer time to resumption of oral diet, and need for more diagnostic and therapeutic modalities. Higher grade (B/C) DGE was also associated with a higher rate of postoperative pancreatic fistula.

**Reviewer’s Comments:** This system provides the advantage of uniform classification of postoperative DGE as well providing an objective platform for treatment of DGE by surgeons performing PD. This will allow for better, more objective, comparisons of DGE across institutions. Furthermore, newer approaches and techniques (ie, laparoscopic Whipple) can be more objectively compared with definitions like this one for DGE in future studies. (Reviewer-Sam G. Pappas, MD).

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Keywords: Delayed Gastric Emptying, Pancreaticoduodenectomy

Print Tag: Refer to original journal article
Laparoscopic Nissen fundoplication is associated with a lower rate of incisional hernia as compared to conventional open Nissen fundoplication.

**Background:** Despite laparoscopic Nissen gaining acceptance as the procedure of choice for refractory reflux, little level 1 evidence actually exists as to the long-term effectiveness and reoperation rate in these patients. Studies have focused on short-term outcomes and have not focused on relief of symptoms and procedure durability.

**Objective:** To report the 10-year results of the trial comparing laparoscopic Nissen fundoplication (LNF) and conventional open Nissen fundoplication (CNF).

**Design:** Multicenter randomized controlled trial.

**Participants:** 179 patients treated from 1971 to 1979 for proton pump inhibitor (PPI)-refractory gastroesophageal reflux disease (GERD).

**Methods:** Interim analysis at 3 months showed a higher rate of symptomatic dysphagia requiring dilation or surgical re-intervention and the study was terminated. The majority of patients were available for re-evaluation at 5 years follow-up. At 10 years, both the LNF and CNF group were re-evaluated and the majority of patients were off therapy. Results in all patients of surgery on reflux symptoms, general health, PPI use, and reoperation rates are described. Symptomatic patients in both groups were on acid suppression therapy and were subjected to high-resolution manometry, 24-hour pH-impedance monitoring, and barium swallow.

**Results:** Of patients, 79 LNF and 69 CNF participated in the 10-year follow-up study. Number of patients with persistent relief of reflux and independence from PPI therapy were similar in both the LNF and CNF groups. Quality of life improved for both groups compared to the preoperative state. In symptomatic patients, high-resolution manometry identified lower esophageal sphincter dysrelaxation in 7 of 8 patients reporting moderate to severe retrosternal pain. There was no difference in recurrence of GERD between LNF and CNF. Patients undergoing re-operative intervention were evaluated according to the intention-to-treat principle, and differences between re-intervention rates were mainly due to incisional hernias in the CNF. CNF was associated with a higher risk of reoperation at 10 years as compared to the laparoscopic group. The 10-year effectiveness of the operation in terms of symptom improvement, PPI use, life quality, and objective reflux control were comparable between groups.

**Conclusions:** This confirms at a high level of evidence the safety, efficacy and superiority of LNF when reoperation is considered.

**Reviewer’s Comments:** This demonstrates the benefit of long-term follow-up for surgical approaches like LNF. Disparities in outcomes and reoperation rates did not become apparent until >5 years of postoperative follow-up. This was the first study to demonstrate that LNF was associated with a lower rate of incisional hernia as compared to CNF. Therefore, the 10-year outcome in the LNF group as compared to the CNF group supports the enthusiasm for LNF as the preferred procedure for patients with refractory reflux. (Reviewer-Sam G. Pappas, MD).

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Keywords: Laparoscopic, Nissen, Fundoplication

Print Tag: Refer to original journal article
Another Choice for VTE Prophylaxis in High-Risk Trauma Patients

Fondaparinux for Prevention of Venous Thromboembolism in High-Risk Trauma Patients: A Pilot Study.
Lu J-P, Knudson MM, et al:

Fondaparinux is an effective venous thromboembolism prophylaxis with a once daily dose.

**Background:** Venous thromboembolism (VTE) events for major trauma patients remain high. Aggressive prophylaxis is recommended that includes mechanical and pharmacologic interventions. Unfractionated heparin or low molecular weight heparin are commonly used.

**Objective:** To assess the ability of fondaparinux to provide adequate VTE prophylaxis in trauma patients.

**Design:** Prospective clinical study.

**Participants:** 81 patients prospectively enrolled from a pool of 282 consecutive high-risk patients.

**Methods:** Patients were stratified into high-risk and very high-risk groups based on clinical criteria. Contraindications to anticoagulation were also noted and excluded the use of fondaparinux. Patients were followed daily. Clinical signs of VTE were sought by physical exam. Complications noted included thrombocytopenia (defined as <50,000 uL) and bleeding. Deep vein thrombosis (DVT) was defined as a clot in the subclavian, iliac, femoral or popliteal vein. Surveillance Doppler exams were performed weekly until discharge or 3 weeks of treatment. Primary outcome was the DVT rate.

**Interventions:** High-risk patients received either mechanical, pharmacologic, or both as their prophylactic regimen.

**Results:** Among patients receiving fondaparinux, DVT developed in 2 (2.5%). However, 1 of these patients was demonstrated to have a DVT before receiving a dose of fondaparinux, thus only 1.2% of patients receiving timely fondaparinux prophylaxis developed a DVT. No complications of treatment were noted. Of interest, 6 patients had contraindications to heparin and only received mechanical prophylaxis and 2 developed DVTs on surveillance ultrasound.

**Conclusions:** Fondaparinux is effective prophylaxis for DVT in high-risk trauma patients.

**Reviewer's Comments:** Small study, but it appears to document that fondaparinux is a safe, effective VTE prophylactic agent. There is no comparison group which weakens the claims, but it is doubtful that a different anticoagulant would be better than heparin. So having a DVT rate with treatment that is similar to heparin studies allows the authors to conclude that fondaparinux would be similarly effective. Our fondaparinux use has been aimed toward patients with heparin induced thrombocytopenia (HIT). It can be used in this patient population to provide ongoing protection especially as the patient is being assessed for HIT. It can be continued if HIT is documented and is easier to use than the direct thrombin inhibitors and less expensive. (Reviewer-John A. Weigelt, MD).

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Keywords: Venous Thromboembolism, Prophylaxis, High-Risk Trauma

Print Tag: Refer to original journal article
**Background:** Breast surgery for cancer is a common procedure in the United States. High surgical site infection (SSI) rates are frequently reported after non-cosmetic breast surgery. These rates are higher than one would expect for a clean surgical wound. Perioperative antibiotics for gram-positive coverage are commonly used.

**Objective:** To determine the type of bacteria recovered from breast SSIs.

**Design:** Retrospective review of patient data.

**Participants:** 53 patients identified that had a SSI after a breast operation.

**Methods:** All patients had SSI cultures. Culture data were used to identify patients with breast cultures. Charts were reviewed to exclude any patient that did not have a breast operation preceding the breast culture. These patients represented breast SSIs and had their charts reviewed for demographic information, type of procedure, and culture results. Primary outcome was to determine the type of bacteria isolated from the breast SSI. SSI rates were compared in 2 time frames: 1997 to 2002 and 2003 to 2008.

**Interventions:** Mastectomy was performed in 42% of patients, lumpectomy in 34%, augmentation in 15%, and reduction in 9%. Axillary sampling was done in 32%.

**Results:** Average age was 51 years with a range of 27 to 81 years. Of patients, 39 had their operation for a malignancy. In all patients with SSIs, 63 bacterial isolates were found. Polymicrobial isolates were present in 15%. Gram-positive isolates comprised 51% and gram-negative isolates 49%. Type of bacterial isolates was not different based on time period, diagnosis, or type of procedure. Of all isolates, 17.5% were resistant to cefazolin.

**Conclusions:** Gram-negative bacteria account for 50% of SSIs following breast surgery.

**Reviewer's Comments:** The authors comment that a Cochrane review suggests that perioperative antibiotics for breast procedures lower SSI rates, especially when a patient can be classified as high risk. High-risk classification coincides with factors associated with increased SSI rates for almost any surgery. They use their data to suggest that cefazolin may not be the best choice for SSI prophylaxis in breast surgery. They explore use of other single and even double drug regimens to broaden the bacterial coverage. I would say wait a darn minute. Cefazolin covered 82.5% of the bacteria isolated. Not bad considering 50% of the isolates were gram-negative and we consider cefazolin a gram-positive drug. To reach 100% coverage we must ask: what is the downside? How much drug toxicity might we incur? How much selection of more resistant bacteria will occur? I do think the authors are overstating their case. I think cefazolin is just fine! (Reviewer-John A. Weigelt, MD).

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Keywords: Breast Surgery, Complications, Surgical Site Infection, Antibiotics

Print Tag: Refer to original journal article
Axillary sentinel node biopsy results predict intramammary node status.

**Background:** Intramammary nodes are defined as lymph nodes surrounded by breast parenchyma and are found anywhere in the breast. Intramammary lymph nodes are often reported by the pathologist as specimens are examined. Positive intramammary lymph nodes may negatively impact survival. Detecting patients with positive intramammary lymph nodes would appear to be necessary.

**Objective:** To determine if axillary sentinel lymph node (SLN) status can be used to predict the status of the remaining axillary nodes when the patient has a positive intramammary lymph node.

**Design:** Retrospective review of Memorial Sloan Kettering Cancer Center's SLN data base.

**Participants:** 7140 patients with 151 (2%) having intramammary nodes.

**Methods:** Intramammary nodes were classified as being identified preoperatively or postoperatively. Pathologic findings of axillary SLN biopsy and intramammary nodes were correlated and represented the primary outcome.

**Interventions:** All patients had an axillary SLN biopsy and an axillary lymph node dissection for positive SLN biopsy results.

**Results:** 136 patients had intramammary nodes identified by the pathologist and 15 identified preoperatively. Among patients, 36 (24%) had a positive intramammary node. Of these 36 patients, 22 (61%) had a positive axillary SLN biopsy. The axillary lymph node dissection (ALND) was positive in 10 and negative in 10 patients. Of patients, 2 did not have an ALND. The remaining 14 had a negative axillary SLN biopsy; 7 had a negative ALND and 7 did not, but follow-up at a median of 75 months showed no axillary disease. Among the 15 patients identified preoperatively, 5 had positive intramammary nodes and only 1 had a positive axillary SLN biopsy who also had a positive ALND. The other 4 patients had no axillary disease by either ALND or negative follow-up.

**Conclusions:** When a breast cancer patient has a positive intramammary node, the status of axillary lymph nodes can be determined by axillary SLN biopsy.

**Reviewer's Comments:** This patient series is comprised of approximately 50% mastectomy and 50% lumpectomy specimens. This accounts for a slightly lower incidence of intramammary nodes. Regardless, a negative SLN biopsy accurately predicted a negative axillary even when the intramammary node was positive. Since most positive intramammary nodes are found on specimen examination, knowing that the SLN biopsy results can define the need for ALND is clinically helpful. In these clinical circumstances, the clinician can rely on the SLN results and not have to consider further surgery when a positive intramammary lymph node is reported in the final specimen. (Reviewer-John A. Weigelt, MD).
The majority of practicing breast surgeons feels 2 mm is a minimally acceptable margin for ductal carcinoma in situ and invasive breast cancer.

**Objective:** To determine the current practice among breast surgeons regarding attaining negative margins in breast conserving operations.

**Methods:** A 27-item survey was developed and piloted, revised, piloted a second time, revised, and then sent to members of the American Society of Breast Surgeons, the Cancer and Leukemia Group B Surgery Committee, and the Cancer Liaisons Group of the American College of Surgeons. Questions covered intraoperative margin assessment, acceptable margins, positive margins, and intraoperative radiologic evaluation. Invitations were sent through the mail, with survey administration done via the web. Non-respondents received up to 3 invitations to participate.

**Results:** 351 surgeons responded. Of respondents, 67% were community surgeons and 33% university surgeons; 67% did not have additional fellowship training in either surgical oncology or breast surgery. For breast conservation, intraoperative margin assessment was performed by the minority of surgeons. Of surgeons, 72% do not perform frozen section, 85% do not do intraoperative touch prep, and 52% do not assess margins grossly with a pathologist. For focally positive deep margins, 57% would not perform a reexcision. For focally positive anterior (skin) margins, 53% would perform a reexcision. For patients with lymphovascular invasion, 63% would not reexcise; and for patients with lobular carcinoma, 83% would not reexcise. Of surgeons, 65% confirmed excision of a radiographically localized excision with a one-view specimen radiograph and 15% used a microradiograph. For intraoperative localization, 22% used sonography. For ductal carcinoma in situ (DCIS), 12% felt any negative margin was acceptable, 22% felt 1 mm was the minimal acceptable positive margin, 52% felt 2 mm was acceptable, 10% accepted 5 mm, and 4% accepted a 1-cm margin. For invasive cancer, 15% were satisfied with any negative margin, 21% felt 1 mm was the minimally acceptable, 50% required 2-mm margins, 12% required a 5-mm margin, and 3% required a 10-mm margin.

**Conclusions:** There is wide variety among practicing breast surgeons regarding margin status when performing breast conservation therapy, and additional study is therefore needed.

**Reviewer’s Comments:** It is of interest that surgeons accept different margins for DCIS and invasive cancer, and that the margin for DCIS is slightly more rigorous. This highlights the wide variety in practice, the lack of a disseminated evidence base on which to make decisions, and supports the authors’ call for further study. (Reviewer-Karen J. Brasel, MD).

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Keywords: Margins, Breast Conservation, Surgeons

Print Tag: Refer to original journal article
Consider ECMO for Patients With Severe Acute Respiratory Failure

Efficacy and Economic Assessment of Conventional Ventilatory Support Versus Extracorporeal Membrane Oxygenation for Severe Adult Respiratory Failure (CESAR): A Multicentre Randomised Controlled Trial.

Peek GJ, Mugford M, et al:

Lancet 2009; 374 (October 17): 1351-1363

Treatment at a specialized center, with extracorporeal membrane oxygenation capabilities, improves outcome in patients with severe acute respiratory failure.

Objective: To determine the most cost-effective treatment of patients with severe adult respiratory failure.

Design: Randomized controlled trial.

Participants: Patients aged 18 to 65 years with severe, potentially reversible respiratory failure.

Methods: The definition of respiratory failure was a Murray score of ≥2.5, or a pH of ≤7.2 with optimal conventional treatment. Patients were randomized to conventional management with intermittent positive pressure or high-frequency oscillatory ventilation, or consideration for treatment with extracorporeal membrane oxygenation (ECMO). Conventional treatment strategies were not mandated. Patients randomized to ECMO consideration were transferred to the single center providing ECMO and then were ventilated with a low tidal volume strategy, FiO$_2$ titrated to maintain saturation ≥90%, diuresis to dry weight, transfusion to a hematocrit of 40%, prone positioning, and full enteral nutrition. If the patient did not meet target saturation within 12 hours, percutaneous venovenous ECMO was instituted.

Results: 766 patients were screened during the 5-year time period, with 180 enrolled. Of 90 patients randomized to ECMO consideration, 3 died prior to transport and 2 died during transport. There were no demographic differences between groups. There was no difference in the duration of high-pressure or high FiO$_2$ ventilation between groups. However, the number of patients receiving low-volume low-pressure ventilation at any time was significantly lower in the conventional group than the ECMO group (70% vs 93%, respectively). The number of days receiving low-volume low-pressure ventilation was also lower in the conventional group (15 vs 24 days, respectively, $P <0.0001$). The number of patients receiving steroids in the ECMO group was significantly greater, 84% versus 64%, respectively ($P =0.001$). Of patients, 63% in the ECMO group survived to 6 months without disability, compared to 47% in the conventional group. Relative risk of death or disability at 6 months for the ECMO group was 0.69 (95% CI, 0.05 to 0.97).

Conclusions: Patients with severe acute respiratory distress syndrome should be considered for ECMO and treated or transferred to a center that is able to provide ECMO.

Reviewer's Comments: It is not clear from the data how the patients who did not receive ECMO fared compared to those treated in other centers with conventional ventilation. It is clear that patients in the ECMO group received "better" conventional management, in that more of them received low-volume low-pressure ventilation, and they received it for a longer period of time. More of them received steroids, which may also have contributed to improved survival. (Reviewer-Karen J. Brasel, MD).

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Keywords: Extracorporeal Membrane Oxygenation, Acute Respiratory Failure

Print Tag: Refer to original journal article
Objective: To compare future physician workforce estimates based upon recent workforce trends using the American Medical Association Physician Masterfile and the U.S. Census Bureau Population Survey.  
Design: Parallel retrospective cohort analysis.  
Methods: Both datasets were used to analyze employment trends for physicians by age and gender over a 30-year period. Estimates of the number of active physicians were made based upon trends observed in the past with respect to the age and gender. It is also assumed that the number of newly trained physicians remains constant.  
Results: On average, the U.S. Census estimates 10% fewer active physicians than data derived from the Masterfile largely due to the Masterfile overestimating the number of older active physicians. Census data estimate a greater number of active younger physicians than the Masterfile. Projections from both sources indicate an increase by 20% in the number of active physicians between 2005 and 2020, but that the absolute number of physicians is approximately 9% lower when U.S. Census data are used compared to Masterfile data.  
Conclusions: U.S. Census data estimates indicate a smaller and younger physician workforce when compared to Masterfile data.  
Reviewer's Comments: This study indicates that we must be careful when making projections for our future workforce needs since the data we use can significantly alter the picture of our future workforce. The question is which estimate is correct? Arguments that U.S. Census data provide a more accurate projection than the Masterfile data are based upon delays in updating the Masterfile when a physician changes job status, activity, or location. One has to wonder whether any projection will be accurate in terms of the activity of an older physician given the current economic climate. Physicians who might have retired at age 60 may now feel the need to work into their late 60s or early 70s. This factor is not included in the projections made. Realistically, I think that it is going to be very difficult to make accurate projections with respect to the physician workforce based upon past trends given the uncertainty of our current economic situation. Changes that may occur in physician reimbursement would likely have significant impact in the number of physicians entering and remaining in the workforce. (Reviewer-Rayminder Nirula, MD).

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Keywords: Work Force, Projection, Physician, Estimate

Print Tag: Refer to original journal article
**Objective:** To determine magnitude and duration of risk for infection in patients who have undergone splenectomy.

**Design:** Population-based cohort study.

**Participants:** 3812 patients in Denmark who underwent splenectomy from 1996 to 2005.

**Methods:** A case-control design was employed to measure the risk of infection in splenectomized patients compared to 3 other cohorts -- the general population, patients who underwent appendectomy, and patients who have an indication for splenectomy but still have their spleens. This European study utilized population databases to provide information of hospital admissions for infections; specifically, bacteremia, pneumonia, and other infections. Adjustment for comorbidities, age and gender as well as indication for splenectomy was performed.

**Results:** Highest risk for infection was within the first 90 days after splenectomy. Risk of infection in this time frame was 18-fold higher compared to the general population. Risk for infection, when compared to appendectomy patients, was about 2.4 times higher during this 90-day interval. Beyond 90 days, risk for infection remained elevated in splenectomized patients compared to the general population, appendectomy patients, and matched-splenic indication patients. Long-term infection rates beyond one year remained significantly elevated when compared to the general population and appendectomy patients, but were only mildly increased (odds ratio 1.2) when compared to matched splenic-indication patients.

**Conclusions:** Splenectomy is associated with increased risk of infection requiring hospital admission.

**Reviewer’s Comments:** This paper provides some important insights into the importance of splenic immune function. Types of infections noted in this study included pneumonia, bacteremia, intra-abdominal infection, and urinary tract infection. Notably, infections with encapsulated organisms was rarely a cause of infection in the splenectomized group indicating that the infection risk in this group goes beyond what we strive to protect against with vaccines. The adjustment for confounders is crucial in such an analysis which was appropriate in this study with the exception of the use of appendectomy patients as a cohort for comparison. Since most splenectomies were open, a similar cohort for comparison should have utilized laparotomy for some other indication that would provide a similar postoperative hospital length of stay and blood loss which would be risk factors for early postoperative infection. Use of a better surgical matched cohort would provide a more accurate indication of the degree to which the surgical procedure, rather than the absence of a spleen, contributes to the observed increase in infection rate. The fact that infection risks remain only slightly elevated in splenectomized patients compared to splenic indication-matched controls who still have their spleens may indicate that the procedure itself is what is causing this infection risk rather than the absence of a spleen.

(Reviewer-Raminder Nirula, MD).

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Keywords: Splenectomy, Infection, Risk, Postoperative
The oncologic outcomes of aggressive surgical approaches to peritoneal surface malignancies have improved at programs designed to treat these tumors.

**Background:** Peritoneal surface malignancies comprise a heterogeneous group of tumors that have been historically associated with poor short-term survival and quality of life. Since the mid 1990s, several centers have reported their success with aggressive approaches to these tumors including cytoreductive surgery and hyperthermic chemoperfusion (HIPEC) with improved oncologic outcomes.

**Objective:** To evaluate the interval 5-year treatment results with cytoreductive surgery (CRS) and HIPEC at 1 of 2 national treatment centers in the United Kingdom.

**Design:** Prospective database analysis.

**Methods:** Patients had peritoneal surface malignancies mostly of appendiceal origin. CRS involved radical tumor debulking procedures to achieve complete cytoreduction and to leave either no visible evidence of tumor (CC0) or tumor burden <2.5cm in size (CC1). Only patients who were completely cytoreduced were considered for HIPEC and the remaining patients with higher disease burden were considered debulkings. Oncologic outcomes were evaluated using standard statistical tests.

**Results/Conclusions:** Referred and managed were 278 patients along 7 different clinical pathways. Of 118 patients undergoing attempted CRS, 81 patients underwent CC0 or CC1 complete cytoreduction and 37 had debulking procedures. Interestingly, the number of patients achieving a complete cytoreduction stayed constant throughout the study period at about one third per year. There were no 30-day mortalities and an overall morbidity rate of one third of cases. Incomplete cytoreduction and higher tumor grade were independently associated with a statistically poorer survival.

**Reviewer's Comments:** There are multiple lessons to be learned from well-constructed studies like these. First and most importantly, is that the favorable oncologic outcomes can be replicated at centers with designated multidisciplinary teams with a specific interest in these tumors. Second, there is an obvious requirement of alternative pathways for patients with debulkings who are not completely cytoreduced or who are not candidates for surgical consideration. Third, these procedures can be performed safely with no mortality and acceptable morbidity. This study also supports the consideration of more liberal use of CRS and HIPEC for histologies other than appendiceal neoplasms like tumors of colorectal or ovarian origin. (Reviewer-Sam G. Pappas, MD).

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Keywords: Peritoneal Surface Tumors, Centralized National Service

Print Tag: Refer to original journal article
Families affected with Lynch Syndrome have a higher risk of pancreatic cancer.

**Background:** Lynch Syndrome is an inherited autosomal dominant condition caused by deficits in mismatch repair genes (MMR) that predispose patients to colorectal cancers. Several extracolonic tumors, including pancreatic cancer, have been associated with Lynch syndrome but the precise risk is unknown and not quantified.

**Objective:** To quantify the risk of pancreatic cancer in families with germline mutations in MMR genes.

**Design/Participants/Methods:** The analysis looked at cancer histories of probands and their relatives at the Dana Farber Cancer Institute and the University of Michigan. All families enrolled prior to June 2008 were eligible. Using a technique called modified segregation analysis, age-specific pancreatic cancer risk in MMR carriers were estimated. Hazard ratios were calculated compared with the general population with correction for ascertainment.

**Results/Conclusions:** Available for analysis were 6342 patients from 147 families with mutations in MMR genes. A pathogenic mutation was detected in 302 individuals (8.2%). Among 31 families, 47 pancreatic cancers were reported. There were no differences in age of diagnosis between males and females noted. Cumulative risk in the MMR mutation families increased from 1.31% at age ≤50 years to 3.68% at age ≤70 years, which represented an 8-fold increase compared with the general population.

**Reviewer’s Comments:** Studies like these help further identify families that may be at an elevated risk for pancreatic cancer compared with the U.S. population. They also have implications for the care of patients and families with a known MMR mutation; this may help physicians prevent cancer in patients at a known elevated risk. Further analysis of screening programs provides more information on the risk and benefits of early detection and intervention of pancreatic lesions in families at elevated risk for the disease. (Reviewer-Sam G. Pappas, MD).

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Keywords: Pancreas Cancer, Familial Risk, Lynch Syndrome

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Even with limited Level I evidence, there are data to support the concept that most primary hyperparathyroidism patients would benefit from parathyroidectomy.

**Background:** While the only cure for primary hyperparathyroidism (pHPT) is surgical removal of the parathyroid gland responsible for the disease, there is much debate over which patient with pHPT will benefit from parathyroidectomy (PTx). The National Institute of Health has developed guidelines concerning which patients with pHPT should be offered PTx. Randomized trials are lacking and many studies have demonstrated clinical benefits of PTx in both patients who do and do not meet NIH criteria.

**Objective:** To explore classic and potential symptoms associated with pHPT and what impact surgical cure may have in these patients.

**Design:** Evidence-based literature review.

**Methods:** Clinical symptoms and conditions associated with pHPT were assessed. These included bone, quality of life, cognition, psychiatric, and neuromuscular symptoms. Levels of evidence regarding recommendations were assigned to key studies to determine indications and potential benefits of parathyroidectomy in patients with pHPT. Level I evidence was designated an A recommendation, Level II and III a Grade B, and Levels IV and V were a Grade C recommendation.

**Results:** Parathyroidectomy improves bone mineral density (BMD) in patients who have BMD loss and pHPT (B recommendation). A population cohort study supports pHPT as a cause of increasing fracture risk and Level II and IV studies suggest a beneficial effect of PTx in reducing this risk (C recommendation). pHPT is associated with vague neuropsychiatric symptoms and successful PTx can reduce many of these vague complaints (C recommendation). PTx improves quality of life in many patients with pHPT (B recommendations).

**Conclusions:** The preponderance of evidence, while not achieving a Grade A recommendation, supports parathyroidectomy as treatment for pHPT symptoms.

**Reviewer's Comments:** Although the value of PTx for pHPT is not disputed when patients are symptomatic from hypercalcemia, more patients are being classified as asymptomatic hypercalcemia based on biochemical testing. Vague complaints associated with bones, muscles, and neuropsychiatric problems are attributed to the disease. How appropriate this assignment is remains questioned. This review does a nice job of identifying data and assigning its value. While this is a starting place, all recommendations really require a judicious assessment of patient complaints. Final decisions regarding the value of PTx in these minimally symptomatic patients will require an experienced physician and an informed patient. Not much different than what we must do with many clinical situations. (Reviewer-Sam G. Pappas, MD).

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Keywords: Parathyroidectomy, Primary Hyperparathyroidism

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