Permanente Abstracts

Abstracts of articles authored or coauthored by Permanente clinicians.

As Robert Aquinas McNally mentions in his article "Something in the Genes," p 15, when Henry Kaiser and Sidney Garfield, MD, created what is today Kaiser Permanente (KP), their vision "… extended to bridging the institutional gap separating medical research from clinical medicine." As our founders recognized the importance of independent research, and as KP continues this legacy today,* The Permanente Journal *has recognized the important work of Permanente researchers and promotes this work by reprinting abstracts in each issue. To further bridge this gap, we are now inviting the authors to briefly describe how his or her research can be embedded into daily practice. Beginning with this issue there will be a number of "Clinical Implications" boxes adjoining the related abstract from which you can glean the basic relevance of the abstract to your practice.

From Northern California: Glycemic control and heart failure among adult patients with diabetes

Iribarren C, Karter AJ, Go AS, et al. Circulation 2001 Jun 5;103(22):2668-73

BACKGROUND: Glycemic control is associated with microvascular events, but its effect on the risk of heart failure is not well understood. We examined the association between hemoglobin (HbA1c) and the risk of heart failure hospitalization and/or death in a population-based sample of adult patients with diabetes and assessed whether this association differed by patient sex, heart failure pathogenesis, and hypertension status.

METHODS AND RESULTS: A cohort design was used with baseline between January 1, 1995, and June 30, 1996, and follow-up through December 31, 1997 (median 2.2 years). Participants were 25,958 men and 22,900 women with (predominantly type 2) diabetes, ≥ 19 years old, with no known history of heart failure. There were a total of 935 events (516 among men; 419 among women). After adjustment for age, sex, race/ethnicity, education level, cigarette smoking, alcohol consumption, hypertension, obesity, use of beta-blockers and ACE inhibitors, type and duration of diabetes, and incidence of interim myocardial infarction, each 1% increase in HbA1c was associated with an 8% increased risk of heart failure (95% CI 5% to 12%). An HbA1c ≥ 10, relative to HbA1c <7, was associated with 1.56-fold (95% CI 1.26 to 1.93) greater risk of heart failure. Although the association was stronger in men than in women, no differences existed by heart failure pathogenesis or hypertension status.

CONCLUSIONS: These results confirm previous evidence that poor glycemic control may be associated with an increased risk of heart failure among adult patients with diabetes.

CLINICAL IMPLICATIONS: *These data show apparently linearly progressive increase in the risk of heart failure with progressively worse glycemic control (8% increased heart failure risk for each 1% increase in HbA1c). The 22% of the cohort judged to have poor glycemic control had a 56% higher risk of heart failure than subjects who had the best glycemic control. Thus, I hope that our study increases the awareness of potential cardiac complications of diabetes at the macro- and micro-vascular levels and emphasizes the importance of tight glycemic control. In order to encourage patients to maintain glycemic control, I would first stress behavioral modifications such as losing weight through exercise and a healthy diet appropriate for diabetes. Second, I would suggest compliance with instructions for home self-monitoring of blood glucose level. And third, I would recommend adherence to the prescribed insulin and/or oral hypoglycemic therapy. —CI*

From Northern California: Self-monitoring of blood glucose levels and glycemic control: the Northern California Kaiser Permanente Diabetes Registry

Karter AJ, Ackerson LM, Darbinian JA, et al. Am J Med 2001 Jul;111(1):1-9

PURPOSE: We sought to evaluate the effectiveness of self-monitoring blood glucose levels to improve glycemic control.

SUBJECTS AND METHODS: A cohort design was used to assess the relation between self-monitoring frequency (1996 average daily glucometer strip utilization) and the first glycosylated hemoglobin (HbA1c) level measured in 1997. The study sample included 24,312 adult patients with diabetes who were members of a large, group model, managed care organization. We estimated the difference between HbA1c levels in patients who self-monitored at frequencies recommended by the American Diabetes Association compared with those who monitored less frequently or not at all. Models were adjusted for age, sex, race, education, occupation, income, duration of diabetes, medication refill adherence, clinic appointment "no show" rate, annual eye exam attendance, use of nonpharmacological (diet and exercise) diabetes therapy, smoking, alcohol consumption, hospitalization and emergency room visits, and the number of daily insulin injections.

RESULTS: Self-monitoring among patients with type 1 diabetes (≥ 3 times daily) and pharmacologically treated type 2 diabetes (at least daily) was associated with lower HbA1c levels (1.0 percentage points lower in type 1 diabetes and 0.6 points lower in type 2 diabetes) than was less frequent monitoring ($p < 0.0001$). Although there are no specific recommendations for patients with nonpharmacologically treated type 2 diabetes, those who practiced self-monitoring (at any frequency) had a 0.4 point lower HbA1c level than those not practicing at all ($p < 0.0001$).

CONCLUSION: More frequent self-monitoring of blood glucose levels was associated with clinically and statistically better glycemic control regardless of diabetes type or therapy. These findings support the clinical recommendations suggested by the American Diabetes Association.

From Georgia:

Prevalence of clinical and isolated subclinical cardiovascular disease in older adults with glucose disorders: the Cardiovascular Health Study

Barzilay JI, Spiekerman CF, Kuller LH, et al. Diabetes Care 2001 Jul;24(7):1233-9

OBJECTIVE: Clinical cardiovascular disease (CVD) is highly prevalent among people with diabetes. However, there is little information regarding the prevalence of subclinical CVD and its relation to clinical CVD in diabetes and in the glucose disorders that precede diabetes.

RESEARCH DESIGN AND METHODS: Participants in the Cardiovascular Health Study, aged ≥ 65 years (n = 5888), underwent vascular and metabolic testing. Individuals with known disease in the coronary, cerebral, or peripheral circulations were considered to have clinical disease. Those without any clinical disease in whom CVD was detected by ultrasonography, electrocardiography, or ankle arm index in any of the three vascular beds were considered to have isolated subclinical disease.

RESULTS: Approximately 30% of the cohort had clinical disease, and approximately 60% of the remainder had isolated subclinical disease. In those with normal glucose status, isolated subclinical disease made up most of the total CVD. With increasing glucose severity, the proportion of total CVD that was clinical disease increased; 75% of men and 66% of women with normal fasting glucose status had either clinical or subclinical CVD. Among those with known diabetes, the prevalence was approximately 88% (odds ratio [OR] 2.46 for men and 4.22 for women, $p < 0.0001$). There were intermediate prevalences and ORs for those with impaired fasting glucose status and newly diagnosed diabetes.

CONCLUSIONS: Isolated subclinical CVD is common among older adults. Glucose disorders are associated with an increased prevalence of total CVD and an increased proportion of clinical disease relative to subclinical disease.

CLINICAL IMPLICATIONS: *Subclinical cardiovascular disease (CVD) is highly prevalent in the glucose disorders that precede known diabetes mellitus. It is upon this background that clinical CVD prevalence is high in the stage of known diabetes mellitus. It therefore behooves the practicing physician to identify those with early glucose disorders in order to take appropriate measures (aspirin, lowering blood pressure and lipids) to prevent the progression of subclinical to clinical CVD. —JB*

From Northern California:

Emergency department right upper quadrant ultrasound is associated with a reduced time to diagnosis and treatment of ruptured ectopic pregnancies

Rodgerson JD, Heegaard WG, Plummer D, Hicks J, Clinton J, Sterner S. Acad Emerg Med 2001 Apr;8(4):331-6

OBJECTIVE: To determine whether the time to diagnosis and treatment of patients with ruptured ectopic pregnancy is significantly less for patients who had emergency department (ED) right upper quadrant (RUQ) ultrasound (US) compared with those who had US in the radiology department.

METHODS: The authors conducted a retrospective review of eligible patients presenting to an urban ED between January 1990 and December 1998. Patients were included in the study if they were seen in the ED, had a discharge diagnosis of ruptured ectopic pregnancy, were brought immediately to the operating room after a definitive diagnosis of ectopic pregnancy rupture was made, and had more than 400 mL of intraperitoneal blood found at the time of surgery. The ED, hospital, radiology, and operative records were reviewed to determine presenting vital signs, intraperitoneal blood loss, time to diagnosis, time to treatment, and type of US performed.

RESULTS: There were 37 patients enrolled; 16 received ED RUQ US (group I) and 21 had a formal US in radiology (group II). The ages, pulses, systolic blood pressures, and volumes of hemoperitoneum were similar between the two groups. The average time to diagnosis from ED arrival was 58 minutes for group I (SD = 57; 95% CI = 28 to 87) and 197 minutes for group II (SD = 82; 95% CI = 162 to 232) ($p \leq 0.0001$). The average time to operative treatment was 111 minutes (group I) (SD = 86; 95% CI = 69 to 153) and 322 minutes (group II) (SD = 107; 95% CI = 270 to 364) ($p \leq 0.0001$), respectively.

CONCLUSIONS: Patients with ruptured ectopic pregnancy, who were selected to have RUQ US performed in the ED by emergency physicians, had an average decrease in time to diagnosis of two and a quarter hours, and an average decrease in time to treatment of three and a half hours, compared with those having a formal pelvic US in the radiology department. Further prospective investigation is needed to determine whether ED RUQ US can safely expedite care of patients with suspected ectopic pregnancy.

From Northern California:

Prevalence and determinants of osteoporosis drug prescription among patients with high exposure to glucocorticoid drugs

Ettinger B, Chidambaran P, Pressman A. Am J Manag Care 2001 Jun;7(6):597-605

OBJECTIVE: To investigate use of osteoporosis drugs among patients with high exposure to glucocorticoid drugs.

STUDY DESIGN: Retrospective review of pharmacy records.

METHODS: We identified patients aged ≥ 20 years who received prescriptions for ≥ 2 g of prednisone (or equivalent) during any 12-month period between January 1, 1998, and December 31, 1999, and who initiated use of osteoporosis-specific drugs (alendronate sodium, etidronate disodium, and calcitonin) during that period.

RESULTS: Among 8807 patients who met study criteria, 772 (8.8%) received prescriptions for osteoporosis drugs. Prevalence of osteoporosis drug prescriptions increased linearly during the study and differed markedly by patient sex, age, and exposure to glucocorticoid drugs. Osteoporosis drugs were prescribed for 16.3% of women aged ≥ 65 years, for 6.1% of women aged < 50

years, for 6.5% of men aged ≥ 65 years, and for 2.2% of men aged < 50 years. Higher glucocorticoid exposure was also associated with higher rate of osteoporosis drug prescription (11.2% of patients exposed to > 4 g/year and 5.6% exposed to 2 to 3 g/year received such therapies). Osteoporosis drugs were 50% more likely to be prescribed by clinicians who prescribed glucocorticoid drugs to > 18 patients than by providers who prescribed glucocorticoid drugs to < 4 patients.

CONCLUSIONS: Despite ready availability of bone-specific osteoporosis drugs, few patients with high exposure to glucocorticoid drugs received such therapy. Likelihood of an osteoporosis drug being prescribed for such patients strongly depends on patient sex, age, and exposure to glucocorticoid drugs and on level of practitioner experience in prescribing glucocorticoid drugs.

From Northern California: **Variation in clinician recommendations for multiple injections during adoption of inactivated polio vaccine**

Lieu TA, Davis RL, Capra AM, et al. Pediatrics 2001 Apr;107(4):E49

OBJECTIVES: To describe variation in clinician recommendations for multiple injections during the adoption of inactivated poliovirus vaccine (IPV) in two large health maintenance organizations (HMOs), and to test the hypothesis that variation in recommendations would be associated with variation in immunization coverage rates.

DESIGN: Cross-sectional study based on a survey of clinician practices one year after IPV was recommended and computerized immunization data from these clinicians' patients.

STUDY SETTINGS: Two large West Coast HMOs: Kaiser Permanente in Northern California and Group Health Cooperative of Puget Sound.

OUTCOME MEASURES: Immunization status of 8-month-olds and 24-month-olds cared for by the clinicians during the study.

RESULTS: More clinicians at Group Health (82%), where a central guideline was issued, had adopted the IPV/oral poliovirus vaccine (OPV) sequential schedule than at Kaiser (65%), where no central guideline was issued. Clinicians at both HMOs said that if multiple injections fell due at a visit and they elected to defer some vaccines, they would be most likely to defer the hepatitis B vaccine (HBV) for infants (40%). At Kaiser, IPV users were more likely than OPV users to recommend the first HBV at birth (64% vs 28%) or if they did not, to defer the third HBV to eight months or later (62% vs 39%). In multivariate analyses, patients whose clinicians used IPV were as likely to be fully immunized at eight months old as those whose clinicians used all OPV. At Kaiser, where there was variability in the maximum number of injections clinicians recommended at infant visits, providers who routinely recommended three or four injections at a visit had similar immunization coverage rates as those who recommended one or two. At both HMOs, clinicians who strongly recommended all possible injections at a visit had higher immunization coverage rates at eight months than those who offered parents the choice of deferring some vaccines to a subsequent visit (at Kaiser, odds ratio [OR]: 1.2; 95% confidence interval [CI]: 1.0-1.5; at Group Health, OR: 1.8; 95% CI: 1.1-2.8).

CONCLUSIONS: Neither IPV adoption nor the use of multiple injections at infant visits were associated with reductions in immunization coverage. However, at the HMO without centralized immunization guidelines, IPV adoption was associated with changes in the timing of the first and third HBV. Clinical policymakers should continue to monitor practice variation as future vaccines are added to the infant immunization schedule.

From The Northwest: **Variations in pharmacotherapy for attention deficit hyperactivity disorder in managed care**

Boles M, Lynch FL, DeBar LL. J Child Adolesc Psychopharmacol 2001 Spring;11(1):43-52

The purpose of this study was to identify the patterns of pharmacotherapy in the treatment of children diagnosed with attention deficit hyperactivity disorder (ADHD) in a large, non-profit, group-model managed care organization from January 1997 through July 1998. We sought to determine whether children with uncomplicated ADHD use different drug therapies when compared to children with ADHD and psychiatric comorbidity. We also examined the relationships between the use of specialty mental health services and the use of various psychotropic medications for treatment of ADHD. We found that children with ADHD and psychiatric comorbidity were less likely to use psychostimulants (odds ratio [OR] = 0.71, 95% confidence interval [CI] = 0.55-0.93, p = 0.01) but more likely to use antidepressants (OR = 2.74, 95% CI = 1.95-3.86, p < 0.01), alpha adrenergic agonists (OR = 2.63, 95% CI = 1.93-3.57, p < 0.01), and other psychotropic medications (OR = 2.40, 95% CI = 1.27-4.50, p < 0.01) than children with uncomplicated ADHD (who were more likely to use stimulants only). Additionally, children with psychiatric comorbidity were more likely to use multiple psychotropic drugs (p < 0.01). The results of this study indicate that children with potentially more complex mental health needs are being treated with more varied drug therapy and/or specialty mental health care services.

From Northern California and Group Health, Northwest: **Targeted testing of children for tuberculosis: validation of a risk assessment questionnaire**

Froeblich H, Ackerson LM, Morozumi PA. Pediatrics 2001 Apr;107(4):E54

OBJECTIVE: Given the directive of the American Academy of Pediatrics to test children for tuberculosis (TB) only if they are at high risk for the disease, we sought to determine how well a risk assessment questionnaire can predict a positive tuberculin skin test (TST) result among children seen in a medical office setting.

METHODS: In a prospective observational study, we identified 31,926 children who received well-child care in 18 pediatric offices of the Kaiser Permanente Northern California Region from August 1996 through

November 1998 and who were due to receive a routine TST (Mantoux method) as part of universal screening. Parents were asked to complete a questionnaire about risk factors for TB infection that included demographic information. The TST result at 48 to 72 hours was compared with questionnaire responses to identify responses that were most highly associated with a positive TST result at both the 10-mm and 15-mm cutoffs. A concurrent study was conducted to determine whether parents can recognize induration.

RESULTS: This population was diverse in age (range: 0-18 years), race/ethnicity (white: 37%; Hispanic: 26.4%; Asian: 15.0%; black: 11.8%; other: 8.4%; not stated by parent: 1.6%), and household annual income (range: $10,524-$175,282). Overall incidence of positive TST results was 1.0% at the 10-mm cutoff and 0.5% at the 15-mm cutoff. Positive predictive value of selected individual risk factors at the 10-mm cutoff were: child born outside the United States, 10.4%; history of receiving bacille Calmette-Guerin vaccine, 5.5%; and child having lived outside the United States, 5.3%. Using multivariate analysis, we selected a subset of risk factors that were independently and significantly associated with a positive TST result ≥ 10 mm: history of receiving bacille Calmette-Guerin vaccine (odds ratio [OR]: 2.31; 95% confidence interval [CI]: 1.70-3.13); household member with history of positive TST result or TB disease (OR: 1.53; 95% CI: 1.14-2.04); child born outside the United States (OR: 8.63; 95% CI: 6.16-12.09); child having lived outside the United States (OR: 2.06; 95% CI: 1.49-2.85); and race/ethnicity reported by parent as Asian (OR: 2.28; 95% CI: 1.59-3.27) or Hispanic (OR: 1.57; 95% CI: 1.09-2.26). Several factors were not statistically significant predictors of a positive TST result: age, sex, household annual income, household member infected with human immunodeficiency virus or who had stayed in a homeless shelter, and being an adopted or foster child. Overall sensitivity of the nine main items on the questionnaire was 80.9%; when a subset of four of these questions plus the race/ethnicity questions were used, sensitivity of responses was 83.5%. Parents failed to recognize positive TST results at a rate of 9.9% (for the 10-mm cutoff) and 5.9% (at the 15-mm cutoff).

CONCLUSION: A five-question risk assessment questionnaire completed by parents can be used to accurately identify risk factors associated with TB infection in children. In our population, some risk factors suggested by the American Academy of Pediatrics could not be validated. Parents cannot be relied on to read TST results accurately. Screening for TB can be enabled by using a standardized, validated questionnaire to identify children who should be given tuberculin skin testing.

From Ohio:

Osteoporosis screening outreach trial: the role of the primary care physician

Binstock M. Obstet Gynecol 2001 Apr;97(4 Suppl 1):S26

OBJECTIVE: Screening and treatment rates for osteoporosis are low despite high prevalence and morbidity. The purpose of this study was to determine the impact of primary care physician (PCP) review and signature on a letter outreach campaign to promote densitometry (DXA) in a group of high-risk postmenopausal females.

METHODS: Computerized records of more than 35,000 women aged 55 years and older were obtained. Inclusion criteria were weight less than 127 pounds and current cigarette smoking. Exclusion criteria were prior DXA or having received a bone-protective drug during the past three months. Women with an odd record number had their letter sent to their PCP to review for clinical appropriateness and signature. Those with an even number were sent a letter with the name of the chief at the bottom.

RESULTS: DXA was done in 10% (37/364) of the PCP group and 20% (67/339) of the non-PCP group. The DXA results (PCP versus non-PCP) were: osteoporosis (54%, 41%), osteopenia (37%, 39%), and normal (8%, 19%). Among patients with osteoporosis, treatment was dispensed to 40% of the PCP patients versus 53% of the non-PCP patients. Among patients with osteopenia, treatment was dispensed to 36% of the PCP patients versus 42% of the non-PCP patients. Thirty-seven patients in both groups were dispensed bone-protective drugs (almost exclusively estrogen) despite not undergoing DXA.

CONCLUSION: Screening rates were low but consistent with prior outreach campaigns. Involving the PCP substantially reduced the response rate. Treatment rates were low in both groups, but higher in the non-PCP group. Many women in both groups began bone-protective drug therapy following the letter despite not having DXA.

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From Northern California:

Prevalence of diagnosed atrial fibrillation in adults: national implications for rhythm management and stroke prevention: the Anticoagulation and Risk Factors in Atrial Fibrillation (ATRIA) Study

Go AS, Hylek EM, Phillips KA, et al. JAMA 2001 May 9;285(18):2370-5

CONTEXT: Atrial fibrillation is the most common arrhythmia in elderly persons and a potent risk factor for stroke. However, recent prevalence and projected future numbers of persons with atrial fibrillation are not well described.

OBJECTIVE: To estimate prevalence of atrial fibrillation and US national projections of the numbers of persons with atrial fibrillation through the year 2050.

DESIGN, SETTING, AND PATIENTS: Cross-sectional study of adults aged 20 years or older who were enrolled in a large health maintenance organization in California and who had atrial fibrillation diagnosed between July 1, 1996, and December 31, 1997.

MAIN OUTCOME MEASURES: Prevalence of atrial fibrillation in the study population of 1.89 million; projected number of persons in the United States with atrial fibrillation between 1995-2050.

RESULTS: A total of 17,974 adults with diagnosed atrial fibrillation were identified during the study period; 45% were aged 75

years or older. The prevalence of atrial fibrillation was 0.95% (95% confidence interval, 0.94%-0.96%). Atrial fibrillation was more common in men than in women (1.1% vs 0.8%; p < .001). Prevalence increased from 0.1% among adults younger than 55 years to 9.0% in persons aged 80 years or older. Among persons aged 50 years or older, prevalence of atrial fibrillation was higher in whites than in blacks (2.2% vs 1.5%; p < .001). We estimate approximately 2.3 million US adults currently have atrial fibrillation. We project that this will increase to more than 5.6 million (lower bound, 5.0; upper bound, 6.3) by the year 2050, with more than 50% of affected individuals aged 80 years or older.

CONCLUSIONS: Our study confirms that atrial fibrillation is common among older adults and provides a contemporary basis for estimates of prevalence in the United States. The number of patients with atrial fibrillation is likely to increase 2.5-fold during the next 50 years, reflecting the growing proportion of elderly individuals. Coordinated efforts are needed to face the increasing challenge of optimal stroke prevention and rhythm management in patients with atrial fibrillation.

CLINICAL IMPLICATIONS: *Clinicians should recognize that the burden of atrial fibrillation and associated complications of ischemic stroke, arrhythmia-related symptoms, and effects on cardiac function are substantial now but will grow rapidly over the coming decades as the US population ages. Our study demonstrates that the occurrence of atrial fibrillation is tightly linked with increasing age, with about 1 in 25 patients age 60 years or older and 1 in 10 patients age 80 years or older having this arrhythmia, often without overt symptoms. Atrial fibrillation increases the annual risk of stroke by fivefold, and this effect persists throughout older age. In particular, early identification and risk stratification of older patients with atrial fibrillation would facilitate better targeting of persons who are most likely to benefit from chronic anticoagulation with warfarin therapy to prevent ischemic stroke and other systemic thromboembolism. —AG*

From Northern California: Comparison of quality and cost-effectiveness in the evaluation of symptomatic cholelithiasis with different approaches to ultrasound availability in the ED

Durston W, Carl ML, Guerra W, et al. Am J Emerg Med 2001 Jul;19(4):260-9

Ultrasound is the imaging study of choice for the detection of gallstones, but ultrasound through medical imaging departments (MI Sono) is not readily available on an immediate basis in many emergency departments (EDs). Several studies have shown that emergency physicians can perform ultrasound themselves (ED Sono) to rule out gallstones with acceptable accuracy after relatively brief training periods, but there have been no studies to date specifically addressing the effect of ED Sono of the gallbladder on quality and cost-effectiveness in the ED. In this study, we investigated measures of quality and cost-effectiveness in evaluating patients with suspected symptomatic cholelithiasis during three different years with distinctly different approaches to ultrasound availability. The study retrospectively identified a total of 418 patients who were admitted for cholecystectomy or for a complication of cholelithiasis within six months of an ED visit for possible biliary colic. The percentage of patients who had gallstones documented at the first ED visit improved from 28% in 1993, when there was limited availability of ultrasound through the Medical Imaging Department (MI Sono), to 56% in 1995, when MI Sono was readily available, to 70% in 1997, when both MI Sono and ED Sono were readily available (p < .001). There were also significant differences over the three years in the mean number of days from the first ED visit to documentation of gallstones (19.7 in 1993, 10.7 in 1995, 7.4 in 1997, p < .001); the mean number of return visits for possible biliary colic before documentation of gallstones (1.67 in 1993, 1.24 in 1995, and 1.25 in 1997, p < .001); and the incidence of complications of cholelithiasis in the interval between the first ED visit for possible biliary colic and the date of documentation of cholelithiasis (6.8% in 1993, 5.9% in 1995, 1.5% in 1997, p = .049). The number of MI Sonos ordered by emergency physicians per case of symptomatic cholelithiasis identified increased from 1.7 in 1993 to 2.5 in 1995 and dropped back to 1.7 in 1997, when 4.2 ED Sonos per study case were also done. The cost of ED Sonos was more than offset by savings in avoiding calling in ultrasound technicians after regular Medical Imaging Department hours. The indeterminate rate for ED Sonos was 18%. Excluding indeterminates, the sensitivity of ED Sono for detection of gallstones was 88.6% (95% CI 83.1-92.8%), the specificity 98.2% (95% CI 96.0-99.3%), and the accuracy 94.8% (95% CI 92.5-96.5%). We conclude that greater availability of MI Sono in the ED was associated with improved quality in the evaluation of patients with suspected symptomatic cholelithiasis but also with increased ultrasound costs. The availability of ED Sono in addition to readily available MI Sono was associated with further improved quality and decreased costs. The indeterminate rate for ED Sono was relatively high, but excluding indeterminates, the accuracy of ED Sono was comparable with published reports of MI Sono. ❖