Table 2, Chapter 35. Summary of randomized trials

| **Author** | **Diagnostic Error** | **Type of Intervention** | **Experimental Intervention** | **Compared intervention** | **Description of Outcome** | **Effect Size (95% CI)**5F**[[1]](#footnote-1)** |
| --- | --- | --- | --- | --- | --- | --- |
| **Diagnostic Accuracy Outcome** |
| Attard, 1992([72](#_ENREF_72)) | Incorrect diagnosis in patients presenting with abdominal pain | T | Pain relief with papaveretum for acute abdominal pain | Placebo | Wrong Diagnosis | 0.22 (0.05-0.98) |
| Thomas, 2003([26](#_ENREF_26)) | Diagnostic errors based on altered physical examination findings | T | Morphine sulfate administered for pain during diagnostic process | Placebo | Diagnostic accuracy (based on information from follow-up visits/hospital discharges) | 0.96 (0.73-1.27) |
| Hewett, 2010([78](#_ENREF_78)) | Missed colorectal adenoma diagnosis in colonoscopy | T | Cap-fitted colonoscopy (allows for flattening of haustral folds and/or improves mucosal exposure) | Regular high resolution colonoscopy | Missed adenoma diagnoses (per adenomas) | 0.63 (0.41-0.99) |
| McCarthy, 1990([86](#_ENREF_86))  | Incorrect diagnosis by parents of symptoms of serious illness   | EI | Teaching parents an Acute Illness Observation Scale (AIOS) to detect child’s serious illness   | 3-point global scoring system for evaluating the chance of serious illness  | False positives | 0.24 (*P* < 0.0001) |
| False negatives | 1.78 (not statistically significant ) |
| Klassen, 1993([92](#_ENREF_92)) | Missed positive radiographic findings (fracture, dislocation or effusion) after trauma  | SPC | Triage nurses using the Brand protocol (for ordering X-rays of injured extremities) in the pediatric emergency department  | Physicians carrying out standard procedures | Patients with false negative radiograph interpretations | 33.33 (2.01-554.09) |
| Wellwood, 1992([104](#_ENREF_104)) | Misdiagnosis of appendicitis  | TBS | Diagnostic aid with a standardized data collection form for abdominal pain interpretation | No diagnostic aid  | Diagnostic accuracy for appendicitis | *P* = 0.66 |
| Diagnostic aid with a standardized data collection form and computer-aided diagnostic tool for abdominal pain interpretation | Standardized data collection forms only | Diagnostic accuracy for appendicitis | *P* = 0.66 |
| Bogusevicius, 2002([27](#_ENREF_27)) | Missed acute mechanical small bowel obstruction | TBS | Computer-aided diagnosis for diagnosis of acute mechanical small bowel obstruction (SBO) | Contrast radiography | False positives for complete SBO6F[[2]](#footnote-2) | Relative risk could not be calculated (0 events) |
| False negatives for complete SBO | 0.54 (0.11-2.77) |
| False positives for partial SBO | 0.54 (0.11-2.77) |
| False negatives for SBO | Relative risk could not be calculated (0 events) |
| **Further Diagnostic Test Use Outcome** |
| Sakr, 1999([37](#_ENREF_37)) | Clinically important errors, including errors in the diagnosis pathway (i.e., history, physical examination, and radiographic interpretation errors) | PC | Use of nurse practitioner in providing care in the emergency department  | Use of junior doctors in the emergency department | Inappropriate radiologic follow-up (unnecessary request or failure to request) | 0.94 (0.75-1.18) |
| Klassen, 1993([92](#_ENREF_92)) | Missed positive radiographic findings (fracture, dislocation or effusion) after trauma  | SPC | Triage nurses using the Brand protocol (for ordering X-rays of injured extremities) in the pediatric emergency department  | Physicians carrying out standard procedures | Patients with radiographs ordered | 0.94 (0.75-1.18) |
| McPhee, 1989([62](#_ENREF_62))  | Missed cancer diagnosis  | ARM, EI, and TBS | Computer generated list of overdue tests at patients’ visits (cancer screening reminders) | No intervention | Further cancer screening (Results given as post-intervention compliance scores relative to standards according to the American Cancer Society recommendations) | Statistically significant7F[[3]](#footnote-3) |
| Audit with feedback | No intervention | Further cancer screening (results given as post-intervention compliance scores relative to standards according to the American Cancer Society recommendations) | Statistically significant 8F[[4]](#footnote-4) |
| Patient education | No intervention | Further cancer screening (results given as postintervention compliance scores relative to standards according to the American Cancer Society recommendations) | Statistically significant 9F[[5]](#footnote-5) |
| **Therapeutic Use Outcome** |
| Attard, 1992([72](#_ENREF_72)) | Incorrect diagnosis in patients presenting with abdominal pain | T | Pain relief with papaveretum for acute abdominal pain | Placebo | Inappropriate management (surgery or patient observation) | 0.22 (0.05-0.98) |
| Thomas, 2003([26](#_ENREF_26)) | Diagnostic errors based on altered physical examination findings | T | Morphine sulfate administered for pain during diagnostic process  | Placebo  | Admissions for observation or discharge home | *P* = 0.50 |
| Surgeries | *P* = 0.51 |
| Repeat physician visit for abdominal pain within 7 days | 2.84 (0.31-26.08) |
| Possible incorrect surgical management  | 2.84 (0.31-26.08) |
| Kuperman, 1999([28](#_ENREF_28)) | Delays between laboratory results and clinical action | TBS | Computer system to detect critical laboratory conditions and notify the physician via Hospital’s paging system | No automatic notification for alerts | Time to appropriate treatment | *P* = 0.003 |
| Sakr, 1999([37](#_ENREF_37)) | Clinically important errors, including errors in the diagnosis pathway (i.e., history, physical examination, and radiographic interpretation errors) | PC | Use of nurse practitioner in providing care in the emergency department  | Use of Junior Doctors in the emergency department | Unplanned follow-up visits | 0.65 (0.45-0.96) |
| Wellwood, 1992([104](#_ENREF_104)) | Misdiagnosis of appendicitis  | TBS | Diagnostic aid with a Standardized data collection form for abdominal pain interpretation  | No diagnostic aid   | Admissions | 0.91 (0.84-0.99) |
| Surgeries | 0.98 (0.82-1.16) |
| Diagnostic aid with a Standardized data collection form + computer-aided diagnostic tool for abdominal pain interpretation | Standardized data collection forms only  | Admissions | 1.01 (0.91-1.12) |
| Surgeries | 1.09 (0.90-1.32) |
| Rollman, 2002([38](#_ENREF_38))   | Missed depression diagnosis  | SPC and TBS  | Active care: Primary care providers (PCPs) were exposed to advisory messages on the paper encounter-based upon AHCPR’s guidelines AND advise to click on the computer desk top icon to obtain further treatment advise from the EMR intranet site | Passive care: PCPs provided with a reminder of their patients’ depression dx on the paper encounter form to treat depressive episodes, but offered no details on how to do so  | PCP counsels patient for depression | 1.25 (0.67-2.33) |
| Mental health referral suggested | 0.74 (0.45-1.23) |
| Antidepressant medications prescribed | 1.25 (0.67-2.33) |
| Passive care: PCPs provided with a reminder of their patients’ depression diagnosis on the paper encounter form to treat depressive episodes, but offered no details on how to do so    | Usual care   | PCP counsels patient for depression | 0.95 (0.49-1.87) |
| Mental health referral suggested | 1.01 (0.64-1.59) |
| Antidepressant medications prescribed | 0.95 (0.49-1.87) |
| Active care: PCPs were exposed to advisory messages on the paper encounter-based upon AHCPRs guidelines AND advise to click on the computer desk top icon to obtain further treatment advise from the EMR intranet site   | Usual care   | PCP counsels patient for depression | 1.19 (0.63-2.25) |
| Mental health referral suggested | 0.75 (0.44-1.25) |
| Antidepressant medications prescribed | 1.19 (0.63-2.25) |
| **Patient Outcomes** |
| Sakr, 1999([37](#_ENREF_37)) | Clinically important errors, including errors in the diagnosis pathway (i.e., history, physical examination, and radiographic interpretation errors) | PC | Use of nurse practitioner in providing care in the emergency department | Use of junior doctors in the emergency department | Non improvement in condition | 0.94 (0.68-1.30) |
| Bogusevicius, 2002([27](#_ENREF_27))   | Missed acute mechanical small bowel obstruction   | TBS   | Computer-aided diagnosis for diagnosis of acute mechanical small bowel obstruction   | Contrast radiography   | Mortality | 5 (0.25-100.97) |
| Morbidity outcome | 1.33 (0.32-5.58) |
| Fitzgerald, 2011([34](#_ENREF_34))   | Errors during reception and resuscitation of severely injured adult trauma patients (including errors in the diagnosis pathway)   | TBS     | Real time computer-prompted evidence-based decision support system (with decision and action algorithms) during reception and resuscitation of severely injured adults in Level I adult trauma center   | Control (without computer-aided decision support system)   | Error rate | 0.89 (0.79-1.00) |
| Morbidity from shock management | *P* = 0.03 |
| Aspiration pneumonia | *P* = 0.046 |
| Sepsis | Not statistically significant |
| ARDS (acute respiratory distress syndrome) | Not statistically significant |
| Functional independence measure score | Not statistically significant |
| Hospital length of stay | Not statistically significant |
| Transfusion of blood productions | *P* < 0.001 |
| Mortality | 1.15 (0.65-2.03) |
| Kuperman, 1999([28](#_ENREF_28))  | Delays between laboratory results and clinical action  | TBS  | Computer system to detect critical laboratory conditions and notify the physician via hospital’s paging system | No automatic notification for alerts  | Time to resolution of alerting conditions | *P* = 0.11 |
| Adverse events | *P* = 0.41 |
| Rollman, 2002([38](#_ENREF_38)) | Missed depression diagnosis | SPC   | Active care: PCPs were exposed to advisory messages on the paper encounter-based upon AHCPRs guidelines AND advise to click on the computer desk top icon to obtain further treatment advise from the EMR intranet site | Passive care: PCPs provided with a reminder of their patients’ depression diagnosis on the paper encounter form to treat depressive episodes, but offered no details on how to do so  | Nonimprovement of depressive symptoms | 1.06 (0.78-1.44) |
| Passive care: PCPs provided with a reminder of their patients’ depression dx on the paper encounter form to treat depressive episodes, but offered no details on how to do so  | Usual care | Nonimprovement of depressive symptoms | 0.88 (0.65-1.19) |
| Active care: PCPs were exposed to advisory messages on the paper encounter-based upon AHCPRs guidelines AND advise to click on the computer desk top icon to obtain further treatment advise from the EMR intranet site | Usual care | Nonimprovement of depressive symptoms | 0.93 (0.70-1.25) |
| **Composite Clinical Outcomes** |
| Sakr, 1999([37](#_ENREF_37)) | Clinically important errors, including errors in the diagnosis pathway (i.e., history, physical examination, and radiographic interpretation errors) | PC | Use of nurse practitioner in providing care in the emergency department | Use of junior doctors in the emergency department | DAO+ TUO: Clinically important errors (composite outcome for diagnostic errors, treatment/follow-up errors) | 0.86 (0.63-1.18) |
| Schriger, 2001([39](#_ENREF_39)) | Misdiagnosis of occult mental illness | SPC | Report of a computerized psychiatric interview (PRIME-MD) given to the physician | PRIME-MD report not given to the Physician | Consultation or referral for mental illness plus other (psychiatric diagnosis) | 1.60 (0.47-5.48) |
| Kuperman, 1999(28) | Delays between laboratory results and clinical action | TBS | Computer system to detect critical laboratory conditions and notify the physician via hospital’s paging system | No automatic notification for alerts | TUO+PO: Adverse events (cardiopulmonary arrest, ICU admissions, strokes, acute renal failure, death, need for surgery) | 1.20 (0.78-1.84) |

**Abbreviations:** AHCPR = Agency for Health Care Policy and Research; ARM = additional review methods; DAO = diagnostic accuracy outcome; EI = educational intervention; EMR = electronic medical record; ICU: intensive care unit; nss = not statistically significant; PC = personnel change; PCP = primary care physician; PO = patient outcomes; PRIME-MD: Primary Care Evaluation of Mental Disorders; SPC = structured process change; ss = statistically significant; T= technique; TBS = technology-based systems intervention; TUO = therapeutic use outcome.

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1. Effect size is relative risk except for Fitzgerald et al. where error rate was used; McPhee et al,where difference in scores post intervention was used and Kuperman et al.al where time to appropriate treatment was used . [↑](#footnote-ref-1)
2. Small Bowel Obstruction [↑](#footnote-ref-2)
3. Results were significant for: Stool occult blood testing, Rectal examination, Sigmoidoscopy, Pelvic exam, Breast exam, Mammography AND Non-significant for Pap smear [↑](#footnote-ref-3)
4. Results were significant for: Breast exam, Mammography AND Non-significant for: Occult blood test, Rectal exam, Sigmoidoscopy, Pap smear, Pelvic exam [↑](#footnote-ref-4)
5. Results were significant for Breast exam AND Non-significant for Mammography [↑](#footnote-ref-5)