**Methods:** We generated datasets of 2000 observations each (i.e. the typical size of studies reporting use of the propensity method) including a fixed binary outcome (incidence $= 10\%$) and treatment variable (prevalence $= 50\%$), two confounders (1 binary, 1 continuous). We also fixed the prevalence of the binary confounder (prevalence $= 50\%$), the relation between the treatment and outcome (Odds ratio (OR): 0.50), the relation between the binary confounder and the treatment (OR: 1.25), the relation between the binary confounder and the outcome (OR $= 1.25$), and the linear relationship between the continuous variable and the outcome (OR $= 1.04$). We simulated a quadratic relationship between the continuous confounder and receipt of treatment. The magnitude of the quadratic relationship between the continuous variable and the treatment varied. Using these simulated data, we estimated propensity scores under 2 scenarios: 1) correctly specifying the quadratic relation between the continuous variable and the receipt of treatment and 2) incorrectly specifying a linear relationship (i.e. omitting the quadratic term). We compared the propensity score model fit using the Hosmer-Lemeshow Goodness of Fit (GOF) test and compared the causal effects estimated under both scenarios to estimate the percent residual confounding owing to use of a propensity score derived from a model with a mis-specified function form of a continuous variable.

**Results:** The GOF test detected poor model fit for the propensity score model with mis-specified functional form of the continuous variable. Residual confounding in the treatment-outcome relation ranged from 2–12%.

**Conclusion:** The GOF test applied to the logistic regression model from which the propensity score was estimated detected problems in the model with mis-specified functional form of a continuous variable. Nevertheless, such departures from model fit had little effect on balance with estimates of residual confounding modest.

### 120. Comparing Analytic Strategies Using Propensity and Disease Risk Scores: The Example of Nonsteroidal Antiinflammatory Drugs (NSAID) and Short-Term Mortality in the Elderly (352)

Til Sturmer,[1,2] Sebastian Schneeweiss,[1] Alan M Brookhart,[1] Kenneth J Rothman,[1] Jerry Avorn,[1] Robert J Glynn[1,2]. *[1]Division of Pharmacoepidemiology and Pharmacoeconomics, Brigham and Women's Hospital, Harvard Medical School, Boston, MA, United States; [2]Division of Preventive Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, MA, United States.*

**Background:** Exposure propensity scores (EPS) are increasingly popular to control for confounding.

**Objective:** To study the comparative behavior of EPS and disease risk scores (DRS, combining several risk indicators into a single score), particularly with small study size.

**Methods:** We compared different methods to control for confounding including propensity and disease risk scoring methods in evaluation of the effect of NSAID use on 1-year mortality from any cause in a cohort of 103 133 hospitalized elderly Medicaid beneficiaries. We chose this relation because it is subject to strong confounding, and the most plausible relation is at or near the null. From this cohort, we re-sampled 1000 random subcohorts of 10 000, 1000 and 500 people to assess the distribution of estimates. For each sample, we estimated the EPS and DRS using forward variable selection (alpha $= 0.3$) and the 'traditional' multivariable outcome model using forward variable selection (alpha $= 0.2$), additionally limiting the number of variables so as to have at least 8 outcomes per variable in the model. We used the estimated EPS to control for confounding by matching, by inverse probability of treatment weighting (IPTW), stratification, linear splines, and as a continuous variable in a proportional hazards outcome model.

**Results:** In the full cohort, the crude relative risk (RR) of dying for NSAID users was 0.68 (95% confidence interval: 0.66–0.71). The 'traditional' multivariate adjustment resulted in a RR of 0.80 (0.77–0.84). The RR closest to the most plausible truth of no protective effect of NSAID was achieved by IPTW (0.85; 0.82–0.88). With decreasing cohort size, estimates remained further from the null, suggesting more residual confounding (despite an increasing c-statistic of the EPS predicting exposure), which was most pronounced for IPTW (for cohorts of N $= 500$: RR $= 0.72$; 0.26–1.68).

**Conclusion:** In this setting, the various ways to apply EPS and DRS behaved differently with smaller study size. Analytic techniques using EPS or DRS were not generally superior to 'traditional' multivariable outcome modelling. The c-statistic did not perform well in predicting the ability of EPS or IPTW to control confounding.

### 121. Identifying Patients with Medication Errors Using the QRESEARCH Database (615)

Anthony J Avery,[1] Julia Hippisley-Cox,[1] Ronan Ryan,[1] Sarah Armstrong,[2] Caroline J Morris,[3] Judith A Cantrill[3]. *[1]Division of Primary Care, University of Nottingham, Nottingham, United Kingdom; [2]Trent Institute for Health Services Research, University of Nottingham, Nottingham, United Kingdom; [3]School of Pharmacy and Pharmaceutical Sciences, University of Manchester, Manchester, United Kingdom.*

**Background:** Medication errors in primary care are an important cause of morbidity. We have done previous research to develop methods for interrogating general (family) practice computer systems to identify patients with medication error. QRESEARCH (www.qresearch.org) is a new primary care database that offers potential for undertaking research into medication errors.

**Objective:** To use the QRESEARCH database to estimate the proportions of patients with a number of clinically important medication errors.

**Methods:** We undertook a descriptive study using data from 43 general practices in the Trent Region of the UK that provide data for the QRESEARCH database. Data were extracted on the following (probable) medication errors: 1) The percentage of patients with a computer-recorded diagnosis of asthma (before 1.1.03) who had received two or more prescriptions for a beta-adrenoceptor blocking drug between 1.1.03 and 30.6.03; 2) The percentage of patients with a computer-recorded diagnosis of peptic ulcer (before 1.1.03) who had received a prescription for a non-selective non-steroidal anti-inflammatory drug (NSAID) between 1.1.03 and 30.6.03 (patients in receipt of proton pump inhibitors (PPIs) were excluded from the numerator and denominator); 3) The percentage of patients with a computer-recorded diagnosis of chronic heart failure (CHF) who were receiving long-term prescriptions for loop diuretics or angiotensin converting enzyme inhibitors (ACEIs) who had not had a recorded blood test to check renal function or electrolytes between 1.4.02 and 30.6.03.

**Results:** There was a total of 192 216 patients aged $> 17$ years in the sample. Of these, 18 919 (9.84%) had a recorded diagnosis of asthma and 2714 (1.41%) a previous peptic ulcer. For the blood test monitoring variable, we analysed data from 181 007 patients in 41 practices. Of these 2024 (1.12%) had a recorded diagnosis of CHF and were also receiving diuretics or ACEIs. The median percentages (inter-quartile ranges) of asthma patients receiving beta-adrenoceptor blocking drugs was 1.9% (1.27–3.08); peptic ulcer patients receiving non-selective NSAIDs, 5.76% (3.76–7.85) and CHF patients not having recorded blood test monitoring, 15.9% (12.5–26.2).

**Conclusion:** Using the QRESEARCH database we were able to identify patients at risk from a number of medication errors. The results suggest that in a practice of 10 000 patients there will be approximately 44 patients with one of these types of error. We believe that there would be value in undertaking intervention studies aimed at correcting and preventing these errors.

## 122. Pitfalls in Drug Management Systems and Quality of Anti-Tuberculosis Drug in Lower Southern Thailand (19)

Korngamon Rookkapan,[1] Virasakdi Chongsuvivatwong,[1] Srirat Kasiwong,[2] Saijai Pariyawatee,[3] Yuthichai Kasetcharoen,[4] Petchawan Pungrassami[4]. [1]*Epidemiology Unit, Faculty of Medicine, Prince of Songkla University, Hat-Yai, Songkhla, Thailand;* [2]*Department of Pharmaceutical Chemistry, Faculty of Pharmaceutical Sciences, Prince of Songkla University, Hat-Yai, Songkhla, Thailand;* [3]*Drug section, Regioanl Medical Science Center, Muang, Songkhla, Thailand;* [4]*Tuberculosis Center 12 Yala Province, Muang, Yala, Thailand.*

**Background:** There were anecdotal reports that deteriorated drugs for tuberculosis (TB) were dispensed from Thai hospitals. This information required validation, along with management evaluation.

**Objective:** To analyze quality of anti-tuberculosis drugs (ATBDs), to describe its management system, and to propose strategic management response.

**Methods:** This study is cross-sectional study using questionnaire interview, in-depth interview, document review, inspection of drug inventory, examine physical characteristics of drugs, and laboratory analysis of drug samples. Data were obtained from the Tuberculosis Cluster Office in Bangkok, the Regional Disease Control Office, Regional TB Center, seven provincial health offices, two regional hospitals, and eight general hospitals. Data were also obtained from 38 randomly selected community hospitals. Totally 52 hospitals/ institutes were survey. Key informants were those responsible for management of anti-TB drugs. From these settings, four first-line anti-TB drugs were sampled for laboratory analysis and 280 TB patients were interviewed.

**Results:** At least one kind of deteriorated anti-TB drug was encountered by 85% of the responsible officers within the past year, was found in 54% of the inspected drug inventories, and was reported by 15% of the TB patients. Percentages of failure in active ingredient tests for isoniazid, rifampicin, pyrazinamide, and ethambutol were 0, 0, 0, and 14 and in dissolution tests were 0, 62, 26, and 0, respectively. The following storage problems were found in hospitals: not air-conditioned (43%), temperature more than 30°C (14%), more than 75% relative humidity (46%), drugs exposed to direct sunlight (10%), had water sink near drug shelf (37%), no use of a 'first-in, first-out' system (38%), and expired drugs (23%). All observed 300 mg rifampicin capsules were kept in non-light-resistant plastic bags or bottles during dispensing. Of the hospitals, 25% removed coated ethambutol from the foil and 21% bisected the tablet before dispensing.

**Conclusion:** Sub-standard ATBDs is a serious problem. ATBDs in the study area were not managed properly. Further improvements are needed to strengthen drug quality assurance systems, drug management, and supervision.

## 123. Trends in Antimicrobials Consumption in a Multi-Profile Hospital in Belarus and Underlying Financial Influences (47)

Maksim N Mily,[1] Irina M Samsonova,[2] Vladimir Y Lugovoy,[2] Sergey A Golubev[3]. [1]*Epidemiology and Public Health, Umea University, Umea, Sweden;* [2]*City Emergency Hospital, Vitebsk, Belarus;* [3]*Regional Clinical Hospital, Vitebsk, Belarus.*

**Background:** Monitoring of systemic antimicrobials (AM) consumption and its determinants are essential for effective antibiotics usage control in a hospital. However, the results