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The Cost-Effectiveness of Patient Self-Managed vs. Physician-Managed Oral Anticoagulation: A Bayesian Approach

Development of an Educational Sabbatical Program for Pharmacists

Apotex Award (Management Issues in Pharmaceutical Care)
Emily Musing, RPh, BScPhm, MHSc, ACPR, FCSHP, CHE; Alice Tseng, RPh, BScPhm, PharmD, ACPR, FCSHP; Gary Wong, RPh, BScPhm; University Health Network, Toronto, Ontario

Background: In order to improve job satisfaction and career fulfillment, our department developed an innovative program to address continuing education needs of staff pharmacists.

Objective: The Educational Sabbatical Program (ESP) is a unique learning opportunity for pharmacists interested in expanding clinical, research or administrative knowledge under the mentorship of an experienced clinician. The goals are to provide protected educational time, expand expertise within the department, and promote mentoring.

Methods: Structured ESP goals were created, with specific objectives defined by applicants. Full-time pharmacists with at least 3 years experience could apply. Candidates were interviewed, and provided written and verbal feedback following completion of the ESP.

Results: In 2004, 3 pharmacists completed one-month ESP rotations. All had prior residency training with 3-7 years practice, and were actively involved in patient care and department initiatives. Goals included increasing clinical knowledge, gaining experience in different settings and developing administration skills. Sabbaticals were completed in medical surgical intensive care, ambulatory care, and pharmacy administration. Feedback from pharmacists, mentors and practice sites was overwhelmingly positive.

Conclusions: An ESP was successfully developed and introduced within a hospital pharmacy department. Benefits of an ESP include broadened clinical expertise, improved job satisfaction, and provision for succession planning.

The Development of a Prediction Tool for Chemotherapy-Induced Anemia in Breast Cancer Patients Receiving Adjuvant Chemotherapy

Baxa Award (Innovative Practitioner)
George Dranitsaris, M.Pharm.; Mark Clemons, MD; Sunil Verma, MD; Cathy Lau, MD; Mark Vincent, MD; Sunnybrook Regional Cancer Centre, Toronto, Ontario; Ortho Biotech Inc., North York, Ontario; London Regional Cancer Centre, London, Ontario

Background: Anemia remains a common problem in breast cancer patients receiving adjuvant chemotherapy. Many oncologists acknowledge that anemia is unpredictable and usually act on a low hemoglobin (Hb) value once the patient is clinically anemic (i.e. reactively). It is possible that patient care could substantially be improved if the occurrence of anemia could be accurately predicted through the use of validated mathematical models.

Objective: To develop and validate a prediction model for anemia, defined as a blood Hb (100 g/L in breast cancer patients receiving adjuvant chemotherapy.

Methods: The medical records of 331 patients who had received adjuvant breast cancer chemotherapy were reviewed. Clinical and biochemistry data that could potentially be associated with anemia were collected. The patient sample was then randomly divided into a 2/3 derivation and 1/3 internal validation sample. A third external sample consisting of 119 patients enrolled into the control arm of a randomized epoetin alfa trial (Chang, 2004) were also used to validate the model. Multivariable logistic regression was applied to develop the initial model. A risk scoring system based on the final regression parameters was then created ranging from 0 to 50. As a final step, a receiver operating characteristic curve (ROC) analysis was done to measure the predictive accuracy of the scoring system when applied to the validation samples.

Results: Precycle Hb, platelets (200 10/mm3, cycle number, patient age (65, type of adjuvant chemotherapy and the use of prophylactic antibiotics were identified as being important predictors for anemia. The ROC analysis on the internal and external validation datasets had acceptable areas under the curve of 0.88 and 0.84 respectively. A prechemotherapy risk score of (24 to < 25 for a given patient was identified as being the optimal cut off to maximize both the sensitivity (83.5%) and specificity (92.3%) of the prediction tool. Patients with a score at or beyond this threshold would be considered high risk for developing anemia following a particular cycle of chemotherapy.

Conclusions: This study outlines the development of an accurate anemia prediction tool for breast cancer patients receiving adjuvant chemotherapy. The application and the planned continued refinement of this prediction tool will be an important source of patient specific risk information for the practicing oncologist and can enhance patient care by utilizing anemia therapies earlier in a proactive manner.

Acknowledgements: We would like to express our gratitude to Ms. Geetha Yogendran who conducted the chart review.

Key words: anemia, breast cancer, chemotherapy, risk, prediction

The RIPPLE Effect: An Introduction to Evidence-Based Healthcare

Baxter Award (Innovation in Safe Medication Practices)
Trudy Arbo, PharmD; Aaron Tejani, PharmD

Background: The RIPPLE (Regional Initiative for Physicians and Pharmacists Learning Evidence-based Medicine) Effect Workshop Series was created to provide all Fraser Health Authority clinicians with the skills to evaluate and interpret the increasing body of biomedical literature. This project was developed by several clinical pharmacists employed by the Fraser Health Pharmacy Services department in conjunction with the Therapeutics Initiative.

Objective: To provide clinicians with practical skills to: 1) evaluate the biomedical literature, 2) search for reliable, high-quality evidence summaries, and 3) incorporate evidence into daily practice.

Methods: The first lecture introduced evidence-based healthcare and why it is an essential component in clinical decision-making. The second session covered basic critical appraisal skills required for evaluating the evidence. The third session provided the participant with a list of reliable, high-quality evidence summaries as well as basic skills on how to interpret this information.

Results: The impact of the series was measured by asking participants to complete evaluation forms after each session. The following is a summary of what participants felt that they learned: 1) the role of evidence in clinical decision-making, 2) how to formulate a clinical question, 3) how to search for reliable evidence summaries, 4) how to critically appraise the evidence, 5) how to interpret basic statistics, 6) how to assess the validity of clinical trial findings and 7) how to incorporate evidence into daily practice.

Conclusion: The workshops succeeded in providing clinicians with practical skills to evaluate the biomedical literature. In addition, clinicians were given the skills to locate reliable and high quality summaries of the evidence.

Acknowledgements: We would like to acknowledge the following people for their help and dedication throughout the project, as it would not have been possible without them: Dr. Anisha Lakhani, BSc(Pharm), PharmD; Dr. Sue Corrigan, BSc(Pharm), PharmD; Mr. Bob Nakagawa, BSc(Pharm); Ms. Mary Mah; Members of the Therapeutics Initiative

Keywords: evidence based medicine, healthcare professional, workshop

Drug-Related Hospitalization to a Tertiary Care Internal Medicine Service: A Prospective Study

Bristol-Myers Squibb Award (Clinical Pharmacy Program)
Leslie Jo Samoy, B.Sc.(Pharm); Peter J. Zed, B.Sc., B.Sc.(Pharm), Pharm.D., FCSHP; Kerry Wilbur, B.Sc.(Pharm), Pharm.D.; Robert M. Balen, B.Sc.(Pharm), Pharm.D.; Riyad B. Abu-Laban, M.D., M.H.Sc, FRCPC; James M. Roberts, M.D., FRCPC; CSU Pharmaceutical Sciences, Department of Medicine & Department of Emergency Medicine, Vancouver General Hospital; Faculty of Pharmaceutical Sciences & Faculty of Medicine, University of British Columbia, Vancouver, British Columbia

Background: Adverse drug-related events (ADREs) are defined as unfavourable medical events related to the use of medications. Several studies have estimated the incidence drug-related hospitalization (DRH); however, few data are available for the DRH rate and characterization in Canada.

Objective: To determine the frequency, severity, preventability and classification of ADREs resulting in hospitalization in a large tertiary care Canadian hospital, and to evaluate patient, prescriber, drug and system factors associated with these events.

Methods: Consecutive adult patients admitted to a tertiary care internal medicine service were prospectively enrolled during a 12-week period in 2005. Hospitalization was defined as drug-related if it was directly-related to one of the eight predefined classes defined by Hepler and Strand. Severity and preventability were also classified. Multivariate regression analysis was used to evaluate patient, prescriber, drug and system factors associated with DRH.

Results: During the study period 565 patients were enrolled. DRH was found to be 24.1% (95% CI 20.6-27.8%) of which 72.1% (95% CI 63.7-79.4%) were deemed preventable. Severity was classified as mild, moderate, severe and fatal in 8.1% (95% CI 4.1-14.0%), 83.8% (95% CI 76.5-89.6%), 7.4% (95% CI 3.6-13.1%) and 0.7% (95% CI 0.0-4.0%), respectively. Adverse drug reactions 35.3% (95% CI 27.3-43.9%), wrong/suboptimal drug 17.6% (95% CI 11.6-25.1%) and non-compliance 16.2% (95% CI 10.4-23.5%) were the most common classes of DRH. No independent risk factors for DRH were identified.

Conclusion: Approximately one-quarter of patients in our study were admitted for a drug-related cause and over 70% were deemed preventable. Drug-related hospitalization is a significant problem that merits further research and intervention.

Antibiotic Consumption in Populations: How Does a North American Jurisdiction Compare with Europe?

Hoffmann-La Roche Award (Specialties in Pharmacy Practice)
Fawziah Marra, PharmD, FCSHP

Background: Antibiotic consumption in human populations is a factor in the emergence of resistant organisms. Heretofore, population-based consumption data from North America have been scarce.

Methods: The British Columbia (BC) Pharmanet program captures all information on outpatient prescriptions. Data from 1996-2000 were converted into SAS files, classified by the Anatomical Therapeutic Chemical system, and defined daily dose (DDD) conversions were performed using 2001 standards of the WHO Collaborating Group on Antimicrobial Resistance. Overall and class-specific rates of consumption were described by year and compared with published rates from European countries.

Results: From 1996-2000, consumption in British Columbia declined from 19.5 to 17.9 DDD/1000 inhabitant-days. While below the European median in 2000, British Columbia consumption exceeded that of northern European countries with established antibiotic surveillance and control programs. The consumption rates for fluoroquinolones, newer macrolides and cephalosporins exceeded those of Denmark (1.44 vs. 0.15, 1.59 vs. 0.92 and 1.86 vs. 0.02 DDD/1000 inhabitant-days, respectively).

Conclusions: BC has a higher rate of antibiotic consumption than some countries of northern Europe. This could have implications for the emergence of resistant organisms.

The Development of a Prediction Tool for Chemotherapy-Induced Anemia in Breast Cancer Patients Receiving Adjuvant Chemotherapy

Mayne Pharma Award (Oncology)
George Dranitsaris, M.Pharm.; Mark Clemons, MD; Sunil Verma, MD; Cathy Lau, MD; Mark Vincent, MD; Sunnybrook Regional Cancer Centre, Toronto, Ontario; Ortho Biotech Inc., North York, Ontario; London Regional Cancer Centre, London, Ontario

Background: Anemia remains a common problem in breast cancer patients receiving adjuvant chemotherapy. Many oncologists acknowledge that anemia is unpredictable and usually act on a low hemoglobin (Hb) value once the patient is clinically anemic (i.e. reactively). It is possible that patient care could substantially be improved if the occurrence of anemia could be accurately predicted through the use of validated mathematical models.

Objective: To develop and validate a prediction model for anemia, defined as a blood Hb (100 g/L in breast cancer patients receiving adjuvant chemotherapy.

Methods: The medical records of 331 patients who had received adjuvant breast cancer chemotherapy were reviewed. Clinical and biochemistry data that could potentially be associated with anemia were collected. The patient sample was then randomly divided into a 2/3 derivation and 1/3 internal validation sample. A third external sample consisting of 119 patients enrolled into the control arm of a randomized epoetin alfa trial (Chang, 2004) were also used to validate the model. Multivariable logistic regression was applied to develop the initial model. A risk scoring system based on the final regression parameters was then created ranging from 0 to 50. As a final step, a receiver operating characteristic curve (ROC) analysis was done to measure the predictive accuracy of the scoring system when applied to the validation samples.

Results: Precycle Hb, platelets (200 10/mm3, cycle number, patient age (65, type of adjuvant chemotherapy and the use of prophylactic antibiotics were identified as being important predictors for anemia. The ROC analysis on the internal and external validation datasets had acceptable areas under the curve of 0.88 and 0.84 respectively. A prechemotherapy risk score of (24 to < 25 for a given patient was identified as being the optimal cut off to maximize both the sensitivity (83.5%) and specificity (92.3%) of the prediction tool. Patients with a score at or beyond this threshold would be considered high risk for developing anemia following a particular cycle of chemotherapy.

Conclusions: This study outlines the development of an accurate anemia prediction tool for breast cancer patients receiving adjuvant chemotherapy. The application and the planned continued refinement of this prediction tool will be an important source of patient specific risk information for the practicing oncologist and can enhance patient care by utilizing anemia therapies earlier in a proactive manner.

Acknowledgements: We would like to express our gratitude to Ms. Geetha Yogendran who conducted the chart review.

Key words: anemia, breast cancer, chemotherapy, risk, prediction

An Evaluation of a Multidisciplinary Approach to the Treatment of Osteoporosis in Patients Following a Low Trauma Hip Fracture

Merck Frosst Award (Rational Drug Use)
Tara Markowski, BSP, ACPR; Jane Richardson, BSP, PhD, FCSHP

Background: Osteoporosis is a skeletal disorder that compromises bone strength and increases fracture risk. Despite strong evidence supporting treatment, most patients do not receive osteoporosis therapy following a fragility fracture.

Objectives: To determine osteoporosis treatment rates following low-trauma hip fractures under usual care; to develop an education package for fracture patients and an information letter for their family physicians; and to assess treatment rates following these interventions.

Methods: Treatment rates under usual care were determined for discharged low-trauma hip fracture patients. New fracture patients were provided with information regarding osteoporosis and fall prevention, and letters were sent to their family physicians suggesting osteoporosis evaluation and treatment. Treatment rates were assessed following hospital discharge.

Results: Under usual care, 5% of patients began osteoporosis therapy within 3-6 months of their low-trauma fracture. Following education and a letter to their family physician, 61% of patients began osteoporosis therapy within 4-6 weeks of hospital discharge, and 5.6% had a BMD test scheduled.

Conclusion: Providing patients with information on osteoporosis and fall prevention in conjunction with sending a letter to their family physician resulted in an improved osteoporosis treatment rate following low-trauma hip fracture.

Acknowledgements: We would like to express our gratitude to the following people, as it was with their help and support that this project was possible: Barb Evans, Patrick Robertson, Brenda Thiessen, Janet Harding, Linda Gartner, Cindy Graham, and Carol Melymick.

Key words: osteoporosis, low-trauma fracture, bisphosphonates, calcium, vitamin D, education

Pharmacoeconomic Analysis of Dalteparin vs. Warfarin for the Prevention of Recurrent Venous Thromboembolic Events in Cancer Patients

Novartis Award (Pharmacoeconomics)
George Dranitsaris, M.Pharm.; Mark Vincent, MD; Mark Crowther, MD; Consultant Pharmacist, London Regional Cancer Centre, London, Ontario, and St. Joseph's Hospital, Hamilton, Ontario

Background: Deep vein thrombosis (DVT) and pulmonary embolism (PE) are manifestations of venous thromboembolic events (VTE). Compared to other populations, patients with cancer are at increased risk of VTE. Additionally, such patients are also at increased risk of a recurrent DVT and subsequent PE when compared with patients who do not have cancer. To reduce the risk of recurrent VTE, prolonged prophylaxis with warfarin is typically offered to many patients. However, warfarin therapy can be unpredictable in some cancer patients because of drug-drug interactions, liver dysfunction and gastrointestinal dysfunction. Dalteparin, a low molecular weight heparin, has been used for many years in the management of VTE. In a recent randomized trial (CLOT), which evaluated secondary prophylaxis of VTE in cancer patients (Lee et al, 2003), dalteparin reduced the relative risk of recurrent VTEs by 52% compared to oral anticoagulation therapy (P=0.002).

Objective: To conduct a Canadian pharmacoeconomic analysis to measure the economic value of dalteparin for this indication.

Methods: The first part of the study utilized the CLOT trial database. Resource utilization data contained within the database was converted into Canadian cost estimates. Univariate and multivariate regression analysis was conducted to compare the total cost of therapy between patients randomized to treatment with dalteparin or oral therapy. Health state utilities and treatment preferences were then measured in 24 oncology care providers using the Time Trade-Off technique.

Results: When all of the cost components were combined for the entire population (n=676), patients in the dalteparin group had significantly higher overall costs than the control group ($Can4,162 vs. $Can2,003; $p < 0.001$). The preference assessment revealed that 23 of 24 respondents (96%) selected dalteparin over warfarin with an associated gain of 0.157 quality adjusted life years (QALYs). When the incremental cost of dalteparin was combined with the QALY gain, dalteparin was associated with a cost of approximately $Can13,800 (95%CI: $Can12,400 - $Can15,100) per QALY gained.

Conclusions: Given the practical advantages of dalteparin in terms of convenience, improved efficacy, long-term dalteparin therapy is an economically sound alternative to warfarin for the prevention of recurrent VTEs in patients with cancer.

Acknowledgements: We would like to express our gratitude to Ms. Claudie Charbonneau of Pfizer Canada who made the clinical trial database available to us.

Key words: thromboembolic events, cancer, prophylaxis, cost analysis

Randomized Evaluation of Patient Medication Teaching by Videotape in a Cardiac Care Unit

Novopharm Award (New Programs in Patient Counselling)
Kiran Sidhu, B.Sc.Pharm; Rubina Sunderji, Pharm.D., FCSHP; Nilufar Partovi, PharmD, FCSHP; Pharmaceutical Sciences, Vancouver General Hospital, Vancouver, British Columbia

Background: Patients who undergo percutaneous coronary intervention (PCI) are discharged home on multiple medications and are at increased risk for noncompliance. While these patients would benefit from medication teaching, time and resource constraints are major barriers. Video-based teaching (VBT) is an attractive strategy as it is both convenient and time-efficient for the patient.

Objective: To assess the effectiveness of VBT compared to conventional pharmacist teaching on imparting knowledge of medications to patients based on test scores.

Methods: Randomized, open-label trial involving patients ≥18 years, discharged on at least 4 of 5 post-PCI medications discussed in the video. Patients had to be fluent in English and mentally competent. They were randomized to pharmacist teaching or VBT. All patients were administered a 12-item test to assess baseline knowledge. An identical test was repeated immediately post-teaching and one month later to assess knowledge retention.

Results: Fifty patients were randomized (25 per group). There was no difference between groups in mean scores post-teaching and at one month. Both groups showed a 25% improvement in scores from baseline. Teaching by video significantly reduced pharmacist time by 75% and was associated with high patient acceptance.

Conclusion: Video was as effective as pharmacist teaching in improving medication knowledge.

Keywords: Cardiac, education, medication, pharmacist, teaching, video

Comparison of a Frail-Friendly Nomogram with Physician-Adjusted Warfarin Dosing for Prophylaxis after Orthopedic Surgery on a Geriatric Rehabilitation Unit

Pfizer Award (Long-Term Health Care)
Susan K. Bowles, PharmD, FCSHP, FCCP; Susan H. Freter, MD, FRCPC; Capital District Health Authority and Dalhousie University, Halifax, Nova Scotia

Background: Thromboembolism is a common complication following orthopedic surgery. Use of warfarin post-operatively can significantly reduce the risk, but often limited by lag time between INR reporting and dosage adjustment. Warfarin dosing nomograms can improve quality and efficiency of warfarin use, but need to be tailored to individual populations.

Purpose: We modified an existing post-arthroplasty nomogram to a frail-friendly version and compared the mean proportion of time within the target international normalized ratio (INR) range and number of INR-related phone calls to physicians.

Methods: Patients on the study unit were assigned to either usual care (physician-adjusted warfarin dosing) or the nomogram based on the team they were admitted to. Information regarding bleeding or thromboembolic episodes and INR values were collected via chart review, with secondary review of laboratory records to ensure completeness of data. INR-related phone calls were logged by nursing staff as part of routine documentation of physician contacts. Comparison of proportions and Student's t-test were used to identify differences in proportion of time in the target INR range and number of INR-driven phone calls, respectively.

Results: Proportion of days within the target INR range was significantly higher in the nomogram group (77%, 95% CI 74-81%) compared to usual care (53%, 95% CI 46-60%) with no major bleeding or thromboembolic episodes. Number of INR-related phone calls was significantly reduced by ten-fold.

Conclusions: Use of a frail-friendly nomogram improved quality and efficiency of warfarin dosing on a geriatric rehabilitation unit.

Clinical Outcomes and Patient Satisfaction of a Pharmacist-Managed Emergency Department-Based Outpatient Deep Vein Thrombosis Treatment Program: 6-Year Results

Pharmascience Award (Patient Care Enhancement)
Peter J. Zed, B.Sc., B.Sc.(Pharm), Pharm.D., FCSHP; CSU Pharmaceutical Sciences, Vancouver General Hospital; Faculty of Pharmaceutical Sciences & Faculty of Medicine, University of British, Vancouver, British Columbia

Introduction: The purpose of this study is to evaluate the efficacy, safety and patient satisfaction of a pharmacist-managed, emergency department-based outpatient deep vein thrombosis (DVT) treatment program.

Methods: We conducted a prospective cohort study of patients enrolled in the VGH outpatient DVT treatment program over a 6-year period, between June 1, 1999 and May 31, 2005. Efficacy outcomes include recurrent venous thrombolembolic (VTE) events at 3- and 6-months following discharge from the program. Safety evaluation included minor and major bleeding complications as well as the development of thrombocytopenia during the acute phase of therapy. Patient satisfaction was assessed using an 18-question patient satisfaction survey which was mailed to all patients following discharge from the program.

Results: Overall, 240 patients were include in the study. Of the 189 evaluable patients, 1 (0.5%, 95% CI 0.1-2.9%) patient experienced a recurrent VTE at 3 months while at 6 months 4 (2.1%, 95% CI 0.9-5.3%) patients had recurrence. No patient experienced a major bleeding complication or thrombocytopenia while 7 (2.9%, 95% CI 1.4-5.9%) patients experienced a minor bleeding complication. Overall, 97.3% of patients were comfortable having their condition treated as an outpatient while 85.9% felt it was more convenient to return to hospital daily for medications and assessment than to be admitted to hospital. Overall, 98.4% of respondents were very satisfied/satisfied with the treatment received in the outpatient program and 95.1% would enroll again if future treatment was indicated.

Conclusion: A pharmacist-managed, ED-based outpatient DVT treatment program is safe, effective and is able to achieve a high level of patient satisfaction.

The Cost-Effectiveness of Patient Self-Managed versus Physician-Managed Oral Anticoagulation: A Bayesian Approach

Sanofi-Aventis (Specialty Practice in Cardiology)
Rubina Sunderji, Pharm.D., FCSHP; Carlo Marra, Pharm.D., Ph.D., FCSHP

Background: Patient self-management (SM) of long-term oral anticoagulation is an effective management strategy in a number of clinical situations but is currently not a funded option in the Canadian health care system. Cost-effectiveness studies examining SM versus (vs.) physician-management (PM) have been performed in Germany but have relied on several limiting assumptions or failed to conduct adequate sensitivity analyses.

Objective: To evaluate the incremental costs and health benefits of patient self-managed vs. physician-managed chronic oral anticoagulation therapy from the Canadian health-care payer perspective over a five-year time horizon.

Design: We developed a Bayesian Markov model with five health states: no events, minor hemorrhagic events, major hemorrhagic events, thrombotic events, and death. Multiple data sources from published literature were used for transition probabilities. Resource utilisation for costs was derived from literature and published guidelines. Costs are reported in 2003 Canadian dollars and were obtained from a fully-allocated hospital cost model and from published literature.

Results of Base-Case Analysis: Results indicate that per 100 patients over a 5 year period SM is expected to result in 3.5 fewer thrombotic events, 0.78 fewer major hemorrhagic events and 0.12 fewer deaths. The discounted incremental cost of SM over PM was found to be $989 (95% CI $310-$1,655) per patient and discounted incremental QALYs gained is 0.07 (95%CI, 0.06-0.08). The incremental cost-effectiveness of SM over five years is $14,129 per QALY gained. There was a 95% chance that SM would be cost-effective if decision-makers are willing to pay $23,800 per QALY.

Conclusion: SM appears to be an effective and economically attractive strategy.