Newsletter of the International Society for Evidence-Based Health Care
Newsletter 13, October 2013

Mission

The mission of the International Society for Evidence-Based Health Care is to develop and encourage research in evidence-based health care and to promote and provide professional and public education in the field.

Vision

The society is inspired by a vision to be a world-wide platform for interaction and collaboration among practitioners, teachers, researchers and the public to promote EBHC. The intent is to provide support to frontline clinicians making day-to-day decisions, and to those who have to develop curricula and teach EBHC.

Key objectives of the Society

- To develop and promote professional and public education regarding EBHC
- To develop, promote, and coordinate international programs through national/international collaboration
- To develop educational materials for facilitating workshops to promote EBHC
- To assist with and encourage EBHC-related programs when requested by an individual national/regional organization
- To advise and guide on fundraising skills in order that national foundations and societies are enabled to finance a greater level and range of activities
- To participate in, and promote programs for national, regional and international workshops regarding EBCP
- To foster the development of an international communications system for individuals and organizations working in EBHC-related areas
- To improve the evidence systems within which health care workers practice.

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Teaching Tips: Explaining Hazard Ratios

Fares Alahdab, Alaa Al Nofal, Qusay Haydour, M. Hassan Murad

In many randomized trials, particularly in oncology, survival analysis is performed and the results are expressed as hazard *ratios (HRs). Compared to risk ratio (relative risk, RR),* HR is less intuitive to readers and is more difficult to explain to learners because of complicated calculations that require use of statistical software. Here we describe our approach to teaching about HRs based on learner's level and statistical expertise.

For a beginner level learner:

Occasionally, learners will not have the appropriate background, skills, experience, or interest to fully understand survival analysis. Or, the teaching opportunity maybe very limited (e.g., a resident rotating on oncology service who is trying to quickly review a recent cancer trial between seeing patients). In these cases, we recommend communicating that for all practical purposes, HR is a type of RR and can be interpreted in the same way (i.e., a rate of incidence of event rates). HR of 1 means no effect; HR of 2 means the intervention doubles the risk of outcome; and HR of 0.5 means that the intervention halves the risk of outcome. Emphasis can also be given to interpreting the effect size with consideration to the associated measure of precision (e.g. a confidence interval or p value). We also caution the learner that this explanation is not technically (statistically) accurate, but is fairly close and sufficient for applying the evidence to patient care.

For an advanced level learner:

If the learner has the background (at a minimum knows how to calculate RR) or is interested in knowing more (specifically asks about the difference between RR and HR), we recommend the following approach in terms of language and sequence:

-Why use it?

Time to event analysis provides a method to include patients who fail to complete the trial or do not reach the study endpoint by making comparisons between the groups at multiple points in time. Therefore, we don't lose data from these patients (more power and validity). Also, sometimes we are interested in how long a person survives rather than if they survive (example, a trial on patients with advanced cancer in which at the end of the trial most patients do not survive, but those treated survive longer).

-What is it?

The HR is the probability that if the event in question has not already occurred, it will occur in the next time interval, divided by the length of that interval. It helps here to give learners a 2x2 table for a trial and inform them about the number of patients lost or who have experienced the outcome, and have the learner calculate several consecutive RRs. Then advise that during the course of a trial, an instantaneous RR can be estimated at any point. If these instantaneous RRs are averaged over the whole course of the trial (through complicated statistics), we can get a measure that can apply anytime during the trial to reflect the difference between the two groups. We contrast this to a RR that is calculated at the end of the trial and does not apply anytime during the trial.

-Key concepts to emphasize:

1) The proportional hazards assumption: To calculate HR the relative difference in occurrence of events between the two study arms must be constant. We ask the learner about examples where this assumption does not hold true and HR is, therefore, inappropriate. This is often correctly answered by learners and they usually come up with extreme examples such as tPA for ischemic stroke or an urgent surgery where patients may suffer early death due to adverse effects of the intervention but subsequently will have improved survival. It is helpful here to have learners draw 2 survival lines that cross each other when the assumption is not satisfied.

2) Using the outcome of survival, HR of 2 does not mean that patients will live twice as long. Therefore, we advise to always review the median survival in each group to determine the absolute difference in natural time units. The analogy used here is that HR informs you of the odds of winning a race but not of the margin of victory.[1]

References:
1. Spruance SL, Reid JE, Grace M, Samore M. Hazard ratio in clinical trials. Antimicrobial agents and chemotherapy. Aug 2004;48(8):2787-2792.

Online Learning Modules: Promoting the Use of Knowledge and Research Evidence

Jennifer Yost, Maureen Dobbins, Donna Ciliska, Pamela Forsyth, Jeannie Mackintosh, Sunita Chera

The National Collaborating Centre for Methods and Tools (NCCMT), one of six National Collaborating Centres for Public Health in Canada, aims to support evidence-informed public health decision making (EIDM). For several years, the NCCMT has offered traditional in-person workshops and other training events across Canada to build capacity for EIDM. However, results from an environmental scan, online surveys, and evaluation reports on current products and services suggested that public health professionals in Canada are interested in online educational products to develop knowledge and skill for EIDM. To address this need, the NCCMT has developed free online learning modules as a learning opportunity to support EIDM in public health.

As of June, 2013 all of the online learning modules are held within an online learning management system referred to as the "Learning Centre" on the NCCMT website. These modules include: *Introduction to Evidence-Informed Decision Making, Searching for Research Evidence in Public Health, Quantitative Research Designs 101: Addressing Practice-Based Issues in Public Health*, *Critical Appraisal of Intervention Studies,* and *Critical Appraisal of Systematic Reviews.* The modules provide the opportunity for users to complete the modules at their own pace, assess their change in self-efficacy and knowledge and skills for EIDM from before to after completing the module, and achieve a certificate of completion upon scoring >75% on the post-test. The learning management system also provides users the ability to maintain a personalized report that can be used for performance appraisal, college requirements, and/or continuing education and allows for the collection of evaluation measures.

From May, 2010 through February, 2013 approximately 3,000 users in public health and other health disciplines from more than 70 countries completed one or more of the first three modules that were launched. These users had varying years of experience and education.
Among these users there was a high level of satisfaction, with the majority indicating that they intend to complete additional modules and recommend the modules to their colleagues. In addition to this positive feedback, users also demonstrated significant improvements in self-efficacy and knowledge and skills for EIDM measured after completion of the modules. For example, among those completing the *Quantitative Research Designs 101* module, knowledge and skills relating to this module increased by 22% from 66% at pre-test to 88% post-test, 95% CI (18.5% to 25%, $p < 0.001$). NCCMT will continue to evaluate the usability and effectiveness of their online modules.

The NCCMT online learning modules are available at:
http://www.nccmt.ca/learningcentre/index.php#main.html

Making Sense of a Study Using Regression Analysis: analogy from Third Grade Math

Khalid Benkhadra, Noor Asi, Qusay Haydour, M. Hassan Murad

Regression analysis is commonly used in observational studies and in some randomized trials. However, the words "regression" or "model" are often intimidating to beginner level evidence-based clinical practice (EBCP) learners. In addition, although a framework for appraising observational studies has been presented in the *User's Guide to the Medical Literature,*[(1)] we found that learners often have difficulty appraising evidence derived from studies that used regression. Particularly, when they try to answer the question: *What are the*

results? It is difficult to answer this question when the outcome is not presented in a 2x2 table or as a difference in means.

Here, we present a simplified approach for explaining what regression analysis is, and subsequent questions that can help learners apply the Guide's appraisal framework.

Example:
A 35 years old man presents to review the results of laboratory tests done for qualification for life insurance. The only abnormality noted is elevated fasting total cholesterol. He asks if his high cholesterol might be due to high alcohol consumption. The resident working with you finds a study that evaluated this association.[2] The methods section of the study describes using simple regression analysis and reports the results as regression coefficients. For alcohol consumption, a coefficient of 0.298 is reported with a p value <0.05 (no confidence interval reported). The resident is unclear about the meaning of this statistic and how to appraise the study.

Explaining regression analysis:
We use analogy to a common third grade math exercise called Input/Output tables (Table 1). In these tables, students need to come up with a rule that "fits" the available data and solve the table.

Table 1 Input/Output math exercise

Input	Output	Rule
3	8	
4	10	
5		
6		

Students are expected to look at the data provided and determine that the rule (analogous to a regression equation) is output=input X 2 + 2. Students then fill the output column for the last two rows using the equation.

Table 2 Solved Input/Output math exercise

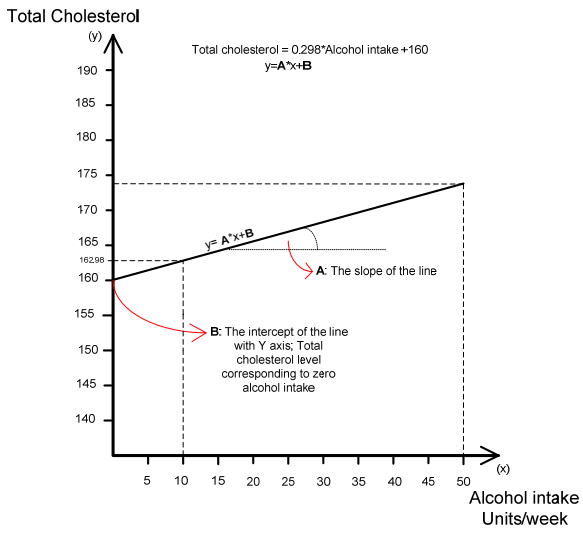
Input	Output	Rule
3	8	output=input X 2 + 2
4	10	
5	12	
6	14	

Once the analogy is described, an EBCP teacher can hand draw a simple linear regression (FIGURE) plotting fictitious data for cholesterol level and alcohol consumption of several individuals and explain that (y= A*x + B) represents a line that fits the data points or is "as close as possible to data points". Solving the opening clinical sanrio, would be: cholesterol=160+0.298 X alcohol units consumed per week.

Then, we recommend 1) testing the regression line with an example (10 units per week consumption correspons to cholesterol of 163), 2) explaining the concept of the intercept (cholesterol of 160 when alcohol intake is zero), and 3) explaining the concept of the slope (how much cholesterol increases for every additional unit of alcohol consumed per week).
Once simple linear regression is explained, one can explain the case of 2 independent variables included in the model by moving from the 2-dimensional graph to a 3-dimentional graph (as we described in a teaching point in a previous newsletter).[3] More complex models (adjustment for >2 variables), which are not uncommon in the literature, are not amenable to this visual explanation.

Depending on the availability of time for this teaching opportunity, one can expand to explain the magnitude (the coefficient), direction (both variables increase in the same direction) and statistical significance of the association (when no confidence interval is provided, as in this case). These questions will help to answer the Guide's question: What are the results? Asking about other possible explanations of the observed association will help to answer the Guide's question: Are the results valid? Discussing the difference between causality and association, and the clinical significance of the results will help to answer the Guide's question: How can I apply the result to patient care?

Lastly, it is also possible to discuss that when the outcome is binary (logistic regression), the rule for the input/output table becomes complicated and not linear (S shaped) and the outcome is reported as odds ratio. It remains nevertheless, an input/output table.



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A Simplified '3 x 3'Scheme to Assess Validity of a Randomized Control Trial

Kameshwar Prasad

There are three main questions that should be considered when assessing the validity of a randomized control trial: did the trial start well, run well, and finish well.

i) Start: Did the authors start with 'balanced' groups?
ii) Run: Was the initial balance left undisturbed till the end?
In other words, did they maintain the balance during care?
iii) Finish: Did the study end well? All subjects were followed up, their outcome was assessed properly and analysis was proper.

Let us deal with them individually.

Did the authors start with 'balanced' groups (i.e. at baseline)?

For this, authors need to **plan** for it, **do** it properly, and **check** the results.

Here we need to know how balanced groups were formed. An effective and popular method is 'coin-tossing'. We decide that as soon as an eligible patient is enrolled, we will toss a coin – if it comes up heads – the patient will be allocated to Group A and if it comes up tails – they will be allocated to Group B. If we repeat this process with a 'fair coin and fair tossing', you will find that the two groups do become similar or 'balanced' with respect to all prognostic factors if there are sufficient number of patients. Allocating patients to one group or another in this way is one method of 'concealed allocation'.

Another method for creating balanced groups is to use a computer-generated random number list, and to allocate participants with central adjudication (e.g. an automated telephone allocation system).

Allocation is not concealed if the investigator knows the group to which the patient under consideration is going to go. For example, if in a trial of surgical vs. medical treatment the investigator used sealed envelopes that could be read unopened when held up to the light. The investigator would then be able to systematically allocate sicker patients to one group over the other. Thus, even though process of random number sequence generation may have been rigorous, his two groups would not turn out to be 'balanced',because allocation was not concealed.

> Allocation is called 'concealed' if the group to which the next patient will be assigned remains undisclosed (concealed) from the recruiting physician

Even after planning (randomised control design) and doing (concealed allocation) everything properly, we cannot be 100% sure that the resulting groups are balanced. We need to check the results. This means we need to check whether the percentage of patients with the various prognostic factors is similar in the two groups. In other words, are the groups prognostically similar at baseline? This can be done by first recollecting the prognostic factors of the condition and then checking the table of baseline characteristics whether the percent of patients in the two groups are similar.

> Randomization is not an absolute guarantee that the resulting groups will be similar. You need to check the comparability of the groups at baseline.

There are three Cs here – (1) control group; (2) concealed allocation; (3) comparability of groups.

In treatment studies, imbalance may arise as a result of unequal care, or crossovers from one group to another or losses to follow-up, or from biased measurement. So, you need to ask:

1) Were patients in the two groups treated equally with respect to non-study interventions (e.g. co-interventions)?
2) Were the crossovers nil or minimum?
3) Was there adequate compliance?

Again, there are 3 Cs here: Co-intervention, crossovers (also called contamination), and compliance.

Good finish means all patients are followed-up (complete follow-up); their outcomes are measured correctly (with reliable and valid instruments and without bias); and the analysis is credible (so that it does not introduce bias).

Again there are three Cs at finish:

- Complete follow-up
- Correct outcome measurement
- Credible analysis

To summarise, the questions to assess the validity of randomized controlled trial of therapy are shown in the Box.

> Start well: 3 Cs
> - Control group
> - Concealed allocation
> - Comparability of groups at baseline
>
> Run well: 3 Cs
> - Co-intervention minimal or nil
> - Contamination minimal or nil
> - Compliance maximal or adequate

The Challenge of Teaching Evidence Based Clinical Practice (EBCP): Customizing Content to Accommodate Learners' Needs

Suzana Alves da Silva, Maria Elisa Pazos, Peter Wyer

The EBCP Workshop series in Rio de Janeiro started in 2006, and was designed to follow the McMaster EBCP Workshop approach of small group activities interposed with didactic lectures. The Workshop has been led by non-Portuguese faculty augmented by Brazilian tutors trained in Rio, the New York Academy of Medicine and the McMaster EBCP workshop. While the McMaster Workshop largely enrolls clinical educators from North American residency programs, ours has mostly appealed to decision makers and medical department chiefs, health technology assessors, policy makers and health managers in both public and private sectors of Brazil. Until 2012 participants were allocated into groups of 10 to 12 participants according to organizers' perception of their professional role and profile, as well as by participant's responses to a questionnaire completed during registration. The Rio de Janeiro Workshop has been primarily focused on critical appraisal of studies provided by participants. We observed that groups were highly heterogeneous in terms of participants' background and learning interests. In order to attend to learners'

expectations and to ensure groups were homogenous in terms of leaning interests, we decided to divide the most recent workshop into 4 streams based on the roadmap framework [1,2] and on our perception of the relevant learning objectives for the participants: (1) critical appraisal; (2) interpreting results of research for decision making; (3) implementation of evidence in clinical practice and (4) GRADE. Participants chose their track at the point of registration based on a short description of the content focus (Table 1). Table 1 shows participants distribution across the 4 streams according to their primary role at their home institution. Health managers mostly choose the applicability of study results and implementation stream, while health technology assessors choose the critical appraisal stream. Level of satisfaction was high across all tracks. Issues of economic assessment were part of all tracks except GRADE. It seems, based on these results, that learning interests can be better reached for this audience if the EBM training program is divided into content blocks that may be chosen by the participants at the point of registration.

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1. Silva SA, Wyer PC. The Roadmap: a blueprint for evidence literacy within a Scientifically Informed Medical Practice and Learning Model. *European Journal of Person Centered Healthcare.* 2013;3(1):53-68. Downloadable open access at http://ubplj.org/index.php/ejpch/article/view/635/678
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Table 1: Participants distribution across the 4 streams embedded in the 2013 Rio de Janeiro Workshop according to their primary professional role

Stream	Target Audience	N	HM	HTA	PM	IC
Critical appraisal Critical appraisal of the validity of individual studies and systematic reviews	Participants focussed on HTA	11	0	8	1	2
Interpretation of results and applicability of study results for decision making	Health managers, HTA and guideline developers	9	5	2	0	2
Implementation Critical appraisal of the validity of guidelines and strategies for implementation of recommendations	Head of medical departments, health managers	6	3	0	1	2
GRADE The GRADE approach for assessing confidence in evidence and developing recommendations	Guideline and HTA developers	9	4	1	0	4

HM: Health Management; HTA: Health Technology Assessment; PM: Policy Making; IC: Individualized Care

Teaching Preclinical Evidence Based Medicine in a Flipped Classroom

Rahul Patwari, Elizabeth Lynch, Viju John

Last year, evidence based medicine (EBM) was taught to second year medical students at Rush Medical College in a course with 10 lectures and 7 small groups. Students learned the material, but evaluations suggested two major limitations. First, students came to the class with varying levels of experience with biostatistics and epidemiology so the lectures were too easy for some and too difficult for others. Second, students did not perceive the material to be relevant to clinical practice. To address those limitations, we adopted an inverted classroom approach where the epidemiology/ biostatistics content is taught in short ten minute videos accompanied by problem sets (available at theEBMproject.wordpress.com), and classroom time is spent applying EBM concepts to specific clinical scenarios.

The short videos allow for asynchronous learning. Students can watch them whenever they like and review more difficult content as often as needed. Moreover, in subsequent years, students and faculty can review specific topics whenever necessary. Also, peer-to-peer learning is promoted by allowing students to communicate on the site about problem sets and videos.

Classroom time is spent applying epidemiology and/ or biostatistics content to clinical cases. This is done by integrating EBM concepts into the existing case-based Pathophysiology curriculum. Students enjoy the pathophysiology course because it is interactive and clearly relevant to clinical practice. We hope that incorporation of EBM concepts into the pathophysiology cases will allow students to appreciate the integral role of evidence in clinical decision-making.

We will be assessing their acquisition of EBM knowledge and skills using multiple choice exams throughout the second year. We will also evaluate their ability to incorporate evidence in clinical decision making during their third year rotations and at the end of the third year during a formal Clinical Skills Assessment.

Lost Evidence – the Fate of DISCOntinued Trials

Matthias Briel and the DISCO investigators

Evidence-based health care relies on high quality clinical research for optimal clinical decision making. Randomized controlled trials (RCTs) are the method of choice to evaluate preventive or therapeutic interventions. Conducting RCTs with patients, however, is a time-consuming, costly, and complex endeavour with uncertain outcome. Many RCTs are not completed as planned; reasons for premature termination of trials include larger than expected benefit or unexpected harm of an intervention, emerging external evidence, administrative reasons (e.g. strategic decisions by pharmaceutical companies), and insufficient recruitment of patients.

In the DISCO study we empirically examined the actual prevalence of RCT discontinuation for different reasons and their publication history.[1] For this we investigated over 1000 RCT protocols approved between 2000 and 2003 by six research ethics boards (REBs) in Switzerland (Basel, Lausanne, Lucerne, Zurich), Germany (Freiburg), and Canada (Hamilton). We determined the completion status of RCTs by using information from REB files, publications identified by literature search, and by surveying investigators. Preliminary results indicate that about one third of approved RCTs with patients were never started or prematurely discontinued. Insufficient recruitment of patients was the most frequent reason for discontinuation, in particular with investigator-initiated RCTs. While RCTs stopped early for larger than expected benefit or harm are frequently published, trials discontinued due to insufficient recruitment of patients and those stopped for strategic reasons of the sponsor are published in only 40% of cases or less.

This entails ethical problems: Study participants consent on the premise of contributing to the advancement of medical knowledge. Furthering scientific knowledge and helping fellow patients are the primary motivations of trial participants asked about their reasons for participating in trials. Non-publication of discontinued trials may lead to replication of unsuccessful approaches and can

compromise the results of systematic reviews that inform clinical decision making and health care policy. The International Committee of Medical Journal Editors (ICMJE) argues that "patients who volunteer to participate in clinical trials deserve to know that their contribution to improving human health will be available to inform health-care decisions".[2] If trials are stopped, participants should be informed about this decision and the reasons thereof. However, the extent of such practice remains unknown and it seems likely that such information is not always provided. Finally, precious research resources are wasted.

Trial registries could be a means to ensure that trialists report unpublished studies and the reasons underlying this outcome. ClinicalTrials.gov, for instance, recently introduced new fields to their registry database to specifically capture information about RCT termination. As a result, evidence users may now find on ClinicalTrials.gov not only posted summary results of otherwise unpublished trials but also reasons and explanations why the planned sample size or follow-up was not achieved. The DISCO team is currently gearing up to conduct further research using mixed methods (qualitative and quantitative) in order to better understand the complex mechanisms leading to failure in trial recruitment and identify potential lever points for targeted interventions, find ways to meet the associated ethical challenges, and develop guiding principles for involved stakeholders.

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Capacity Matters: Considering the Patient's Ability to Implement Evidence-Based Treatment Strategies

Kasey Boehmer, Aaron Leppin, Juan Pablo Brito Campana, Michael Gionfriddo, Oscar Morey Vargas, Victor Montori

Evidence based healthcare requires incorporation of the body of research evidence, patient values and preferences and the patient's context (Figure 1). The published literature has largely been silent regarding the extent to which patients can execute an evidence-based treatment plan. When considering among treatment options and the need for self-management, particularly in the context of multiple chronic conditions; clinicians, patients, and caregivers must consider treatments that best fit the patient's values and preferences. Yet, even when the most "appropriate" option is chosen, based on evidence and patient preference, the success of the plan will depend on the patient's capacity, which is his or her ability to draw upon all personal and external resources, to enact it. The way in which this "capacity" counterbalances the workload of the treatment regimen is described in the Cumulative Complexity Model (Figure 2). [1] Domains in which patients have "capacity," can be described broadly as the sum of personal, physical, mental, social, environmental, and financial resources. In current practice, to our knowledge, there are no tools to help facilitate clinical conversations that assess a patient's capacity to carry out his or her treatment workload, and little is known about the frequency at which these conversations happen in chronic care.

To better understand the nature of these conversations in our own clinical practice, we conducted a set of observations in the Diabetes Teaching Unit and the Diabetes Education Course in the Division of Endocrinology at Mayo Clinic. In total, we observed 9 patients, 7 encounters, and 1.5 days in the education course.

We discovered that clinical conversations focus primarily around what patients *need* to do, sometimes what they *want* to do, and rarely what they *can* do. For example, patients with diabetes

need to calibrate their insulin dosing in daily life, but in order to do so they must understand complex "rules," and, in some cases, participate in extensive classroom learning. However, the ability to complete these directives may be limited by capacity deficiencies. These might include low health literacy to accurately interpret the rules or a lack of time or support to participate in classroom learning. While we were not able to ascertain specific reasons, in the three-day intensive course we observed, three out of the five patients that were eligible to participate and covered by insurance to do so did not attend.

We did observe instances where patients reached out for capacity support to accomplish a goal, and were deterred. For example, one patient wanted to lose weight and requested to see a dietitian to help in this process. Rather than facilitating the process for a prompt referral, this patient was instructed to monitor sugars every morning, record everything he eats, and go for walks regularly. He was told that, at the next visit, they could discuss a dietician referral. Patients do not always request support to bolster their capacity to enact self-care, but in those cases where they do, clinicians need to be acutely attuned to these requests.

In other cases, treatment regimens were offered that were completely at odds with the patient's capacity, and not modified, despite patient acknowledgement that they were unable to carry out the task(s) as directed. For example, one patient needed and wanted to exercise more regularly for weight loss. He was counseled to regularly go for walks. Yet, when the patient brought up limitations in his environmental capacity to carry out this suggestion -- his country is too hot, his neighborhood too unsafe, there is no nearby gym-- further calibration did not occur. Ideally, the clinician would have provided the patient with techniques that facilitate exercise within home (e.g., jumping rope) or strategies to increase overall activity level by normalizing additional activity into everyday routines (e.g., pedometers).

Finally, in the one encounter where we observed a direct assessment of the patient's ability to enact the treatment regimen, it occurred at the end of the clinical visit. This suggests to us that if the patient were unable to carry out some or all of the treatment plan, there would be little or no time to explore reasons and revise the plan within that visit.

Our observations suggest future trajectories for our research and unique insights for clinicians currently practicing in chronic care, in order to ensure that evidence based healthcare incorporates patient's capacity. First, clinicians should try to ascertain why some patients may struggle to enact treatment regimens; the timing of this step is crucial, where too late may be most problematic. Clinicians must also remain attuned to patient requests to bolster their capacity. By understanding patient's current capacity state, clinicians can recommend less burdensome evidence-based strategies and/or and facilitate referrals to resources that can help augment capacity. Future research that aims to strengthen the body of evidence regarding which activities are most likely to increase patient capacity would help clinicians even further to select amongst available resources. Finally, to incorporate these communication strategies into routine care, we see the need for tools that can facilitate conversations about patient capacity. We intend to include such development in our future research agenda.

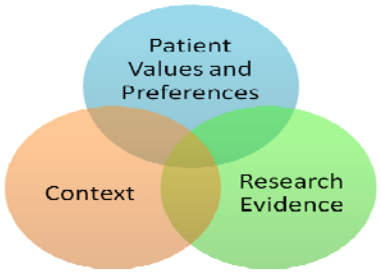

Figure 1. Evidence based healthcare should incorporate (i) the body of evidence (ii) patient values and preferences and (iii) patient context.

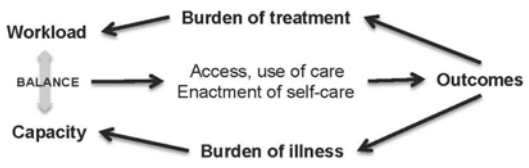

Figure 2. The Cumulative Complexity Model.

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Technology Assisted Evidence Evaluation in Resuscitation

Russell Griffin, Bill Montgomery, Michael Sayre, Eddy Lang

Many organisations face a daunting task in creating the systematic reviews and recommendations for practice that their constituencies avidly seek. The International Liaison Committee On Resuscitation (ILCOR) is one such body. ILCOR has seven task forces that are reviewing the available science: advanced and basic life support as well as pediatrics, neonates, acute coronary syndromes, first aid, and education and implementation around resuscitation. ILCOR has committed to updating its Consensus on Science and Treatment Recommendations (CoSTR) every five years and continuously thereafter. These CoSTRs are the scientific base for the development of guidelines by the resuscitation councils all over the globe. For the 2015 CoSTR ILCOR is leveraging technological innovations, with the support of science specialists at the American Heart Association, to create scientific statements and recommendations that adhere to United States Institute of Medicine standards using the GRADE methodology.

An online platform known as the Scientific Evaluation and Evidence Review System (SEERS) has been developed to guide the taskforces and their individual evidence reviewers through the formulation of prioritised questions written in a standardized Population, Intervention, Comparator, and Outcomes (PICO) format. For each PICO question, relevant outcomes are selected from a menu and then their importance rated for their impact on clinical decision-making. For each question, the information science team at St. Michael's Hospital in Toronto conducts comprehensive structured searches on the published literature. Titles and then abstracts are selected by two reviewers using consensus methodology and the risk of bias for included studies is evaluated using online applications of the Cochrane risk of bias tool, QUADAS 2 and the GRADE framework for assessing limitations in observational research. These assessments are archived and can be used again when the question is revisited in a few years. The totality of evidence across outcomes is combined using another platform, where the elements of the GRADE quality assessment framework are applied to generate the evidence profiles that will be used by the taskforces for the formulation of recommendations. One key feature of the SEERS system is the ability to open all components of the process to the public for comments and suggestions.

The project components remain incompletely tested by all relevant stakeholders but it is planed that over 100 PICO questions will be transformed into GRADE-formulated recommendations for practice and published in the journals of Circulation and Resuscitation in 2015.
All interested parties are invited to participate in the process. The site is available now at www.ilcor.org/seers.

Prophylaxis of Deep Venous Thrombosis

Samuel Berkman

Several years ago I was summoned to the emergency department at my hospital in Los Angeles to see a patient with a blood clot extending from his right ankle to his groin. He'd been advised that he didn't need anticoagulation by his doctor in Washington DC who had diagnosed him with a tibial vein thrombosis and who had just read an article in the Annals of Internal Medicine which reported that clots below the knee did not require anticoagulation and could equally well be managed with serial duplex scans. The Washington doctor didn't consider that his patient had a preexisting thrombophilic condition, a myeloproliferative disease, Polycythemia Vera and dispatched this 50-year-old executive on a five-hour flight to Los Angeles with an acute calf clot with no anticoagulation therapy.

I was shaken by that experience which taught me that if one wishes to implement recommendations from the literature, one must read more than the abstract and the summary. If the Washington doctor had done so, he would have realized that his patient would have been excluded from the study on the basis of pre-existing thrombophilia, and the precarious circumstances under which I met him would have been prevented.

The case taught me that if I was to apply findings from a trial to my patients , it was necessary to peruse table 1 which compared the patients in both arms of the study to rule out bias and review exclusions and inclusions, as well as patient drop out. It was also essential to review the primary endpoint and safety data.

Most doctors in the United States today are so overwhelmed by paperwork and other bureaucratic impediments they don't have time to read the literature at all let alone carefully. Consequently, mistakes like this are made frequently.

My next lesson in evidence based medicine relating to the management of deep venous thrombosis concerned the issue of prophylaxis in medical as opposed to surgical patients. This used to be a simple subject because it is intuitive that this problem is common, preventable and failure to implement it can lead to serious and even lethal thrombotic complications. Furthermore the use of prophylactic dose anticoagulation does not prolong the usual coagulation tests such as prothrombin time (PT) and partial thromboplastin time (PTT). Therefore it would seem logical that the benefit of using these drugs in as many patents as possible would outweigh any risks.

However the fact is that DVT prophylaxis is both underutilized due to physician ignorance and apathy, and overutilized based on inappropriate interpretations of studies done during the 1990s which relied on surrogate endpoints. Therefore careful assessment of the relevant literature is needed to resolve this still confusing subject.

Three studies done during the 1990s including, Medenox, Artemis and Prevent[(1)] demonstrated between a 40% and 60% reduction in deep venous thrombosis (DVT) in medical patients hospitalized with limited mobility and conditions such as cancer or COPD. However, despite the marked decrease in DVT achieved with low molecular weight heparin or fondaparinux in these trials, there was no difference in fatal pulmonary embolism or even pulmonary embolism at all in these studies.

These trials identified blood clots by ultrasound or venographic screening of asymptomatic patients, and the prophylactic dose anticoagulation increased bleeding even though it did not prolong routine coagulation tests. Therefore the assumption that all hospitalized medical patients should receive anticoagulation prophylactically was challenged by critics who questioned the validity of the surrogate outcome. Nonetheless based on these trials, many hospitals instituted programs where patients were automatically placed on anticoagulation when admitted to the hospital unless their doctor decided to opt out.

A subsequent study, the Lifenox trial, enrolled patients acknowledged to be at high risk for venous thromboembolism and measured efficacy of prophylactic anticoagulation by comparing death from all causes at 14,30 and 90 days. The patients who received an average of 10 days of prophylactic anticoagulation and were all at high risk with cancer COPD etc. had 14, 30 and 90 day mortality which were identical in both groups. This surprising finding could have been interpreted that perhaps we don't know how to identify a truly high risk patient and questions the notion of anticoagulation in any medical patients, high risk or otherwise. However this study was clouded by another form of indirectness than surrogate endpoints, that of lack of generalizability.

The Lifenox patients were recruited from China, India, Korea, Malaysia, Mexico, and the Philippines. People from the countries involved have lower incidence of 5 Leiden mutations and prothrombin 2021OA mutation, the average BMI was 23 and a much lower incidence of previous blood clots. Consequently the placebo group had a much lower incidence of thrombosis than one would expect in North America.[(2)]

So today how does one approach prophylaxis of hospitalized medical patients? The study emphasized by the American College of Chest Physicians 2012 consensus conference was that of

the Padua prediction score, a prospective cohort observational trial which divided people into high risk and low risk groups based on a risk assessment score and showed a significant difference of venous thromboembolic disease between the 2 groups.(3) Those patients classified as low risk by the risk assessment model had an incidence of DVT of 0.3% versus 11.2% in high-risk patients. High risk patients who received thromboprophylaxis showed a reduced DVT incidence of 2.2%. This study diagnosed thromboembolism in symptomatic patients rather than by asymptomatic screening for DVTs in Medenox, Artemis and Prevent.

However the Padua study while certainly offering the best available guidelines for thromboprophylaxis in medical patients today, wasn't perfect either. First, it wasn't a randomized trial and wasn't highly powered. To illustrate this point, the authors reported that those patients who scored at least 4 points on the risk assessment model and were left without thrombprophylaxis were found to have a rate of thromboembolic complications 32 times as high as those patients who scored less than 4. However this hazard ratio was associated with a "four lane highway" of a confidence interval of 4.1- 251.0, which raises concern about the precision of this data based on small sample and event numbers. Furthermore the point scale itself could be questioned on the grounds that all types of thrombophilia were allotted the same number of points and it is known that a lupus anticoagulant is a much more thrombogenic predisposition to thrombosis than a factor 5 Leiden or a prothrombin 2021OA mutation.

So where are we now in the prophylaxis of DVT? Surrogate endpoints and other measures of indirectness such as lack of generalizability have influenced physician and hospital behavior in one direction and apathy and ignorance in the other. What is now viewed as the best data still is limited by lack of power and lack of randomization and still uses surrogate endpoints. Progress has been made in improving the evidence base for directing treatment of DVT with prophylactic anticoagulation but when it comes to straightforwardness, much of the available evidence is still a bit of a wolf in sheep's clothing.

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Evidence Based Medicine and the Elderly-Very Elderly Patient: Can we Design Studies and Apply the Results as in Younger Patients?

Ramon Puchades

Theories to inform the process of aging have drawn from both basic science and clinical practice. Life expectancy is increasing in high- and low-income countries and, consequently, the number of elderly-very elderly people is increasing.

The elderly population is heterogeneous: one 85 year old may be frail and disabled, another still vigorous and productive. Faced with this heterogeneity, and focused on patients in their 80´s and 90´s (and now, not infrequently, centenarians) in the ambulatory or inhospital setting, we need to make daily decisions regarding healthcare.

Where is the evidence for these patients?. Three years ago, a review of this topic[1] by Drs. Scott and Guyatt provided cautionary tales in the interpretation of clinical research involving patients ≥65 years of age. Clinical practice guidelines, when they have specifically dealt with the elderly have often treated them as a subgroup[2], sometimes offering specific recommendations. These recommendations are useful tips for day-to-day clinical practice, but are limited because they analyse older patients like a homogeneous group.

Syntheses of literature used to direct care for the elderly often find that the quality of evidence is variable, clear guidance is challenging, and care of patients must be individualized. These conclusions come from the advice of experts and their associated consensus statements.

One important consideration is that the differences between individual elderly-very elderly patients are greater than among younger patients. For example, two eighty five years-old women with hypertension, chronic ischemic heart disease and gout, probably have more differences (psychological, biological and social) than two forty five years-old women with obesity, diabetes mellitus and abdominal aneurysm. The design and interpretation of studies in elderly and very elderly patients seldom takes into account this heterogeneity.

How to deal with this situation is a challenge. At this point, we should consider optimal study designs to answer clinical questions in elderly-very elderly patients. One option would be to stratify patients according to important prognostic variables.

Another option is N of 1 trials [3], and ideally an international registry of N of 1 trials. In this way, perhaps we could refocus clinical research in elderly patients.

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Guideline Development: the Example of Acute Care Toxicology

Maude St-Onge

Canadian hospitals report 121-331 poisonings/100,000 person-years to the Poison Control Centres(1,2,3) (PCCs). Unfortunately, current PCCs recommendations are not based on an evidence informed decision-making process. Chuang and Heard (4) reviewed toxicology textbooks written by toxicologists working in PCCs and found that 14% of statements were not referenced, and most common citations types were case reports (28%) or animal studies (18%). Some of those recommendations can have a major impact for patients, notably when invasive treatments such as dialysis and extracorporeal life-support are considered. Following the EIDM process Algorithm(5) current practice, the quality of evidence and the local context (costs, values and preferences) should be considered when developing guidelines to inform PCC recommendations. Fortunately, interesting progress has been made recently with the contribution of new evidence-based clinical practice guidelines workgroups.

The EXTRIP group (EXtracorporeal TReatments In Poisoning) published a first guideline methodology manuscript(6) in 2012 following the GRADE methodology(7) and the AGREE instrument(8). However, the workgroup had to face a decision-making process where the level of evidence was likely to be poor. Therefore, they decided to include all study types and used the RAND/UCLA Appropriateness Method with a rigorous voting procedure to ensure transparency and reproducibility(9). However, they did not provide a detailed description of how the risk of bias of observational studies, case series or animal studies would be assessed and reported. Also, costs were considered based on a survey of clinicians' perceptions regarding the expenses involved without a proper economic evaluation.

A second group of representatives from international associations in toxicology, critical care and emergency medicine was created to build an evidence-based clinical practice guideline for the treatment of one of the most severe poisonings:

calcium channel blocker (CCB) overdose (50% morbidity, 6% mortality)(10). The current practice was detailed by a retrospective study(11) and the quality of evidence for existing therapeutic options was acquired through a systematic review(11) following the same methodology as EXTRIP. However, a more detailed risk of bias assessment was applied. The STROBE checklist(12) and the Thomas' tool(13) were used for observational studies, the Institute of Health Economics' tool(14) was used for case series, and the ARRIVE guidelines(15) and modified NRCNA checklist were used for animal studies(16). The inter-rater agreement was excellent (kappa 0.80 or higher).

Moreover, the workgroup building the treatment guidelines for CCB poisoning is currently completing a formal cost-effectiveness analysis for the use of extracorporeal life-support in these types of overdose cases. As the EXTRIP workgroup did, the CCB poisoning treatment guideline development group considered the values and preferences of decision makers and knowledge users by using the RAND/UCLA Appropriateness Method, but did not involve patient representatives on the panel.

In conclusion, significant progress is being made regarding evidence based guideline development to inform acute care toxicology decision-making. Most notably by incorporating structured methodology for assessing risk of bias, including potential costs, building recommendations even in situations where randomized controlled trials are rare, and allowing for the prioritization of research questions where there is an urgent need for higher quality evidence. In the future, guideline developers should endeavor to incorporate patients' values and preferences – possibly through the use of public consultations or qualitative research.

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Superfilters Website: A Literature Searching Tool for Clinicians and Review Authors

Nancy L Wilczynski, N Hobson, C Cotoi, R Brian Haynes

Background: Clinicians and reviewers could benefit from more efficient study retrieval tools than currently exist. Having an online, *1-stop* federated search facility providing empirically derived and validated search filters and filtering aids to retrieve and collate all pertinent studies would help.

Objectives: To develop a *superfilters* website that provides clinicians and review authors with the opportunity to search across several electronic databases simultaneously with empirically derived, high performance, search filters. To add "capture-mark-recapture" (CMR) statistical modeling to the review authors' superfilter site to help those searching for all available evidence to determine whether to continue or stop searching, for example, when conducting systematic reviews.

Methods & Results: We designed a website that has federated search capabilities, enabling users to select from a host of search filters and search in large, bibliographic databases including PubMed, Ovid Medline, Ovid Embase, Ovid PsycINFO, EBSCO, CINAHL and MacPLUS. These filters retrieve articles of higher methodological rigour from various disciplines of medicine, and do so according to the study design used. The user can turn search filters on or off when performing a single search across multiple bibliographic databases simultaneously. Searches can be limited by type of article (e.g., treatment, diagnosis), age of study participants (e.g., adult, geriatric), and date of publication. Searches include options for breadth: broad (highly sensitive), balanced or narrow (highly specific). Further enhancements to the review authors' superfilters site will allow for the collation of citations with duplicates removed. Additionally, in the process of identifying duplicate citations, CMR statistical modeling will be performed and an estimate of the total theoretical size of a collection of literature will be provided. This automated statistical technique can provide searchers with evidence that their searching can stop or should continue.

Conclusion: We have developed a superfilters website that can aid clinicians and researchers when conducting targeted and comprehensive searches of the medical literature.

Request: We require beta-testers, clinicians and review authors, for the superfilters site. Please contact Nancy Wilczynski at wilczyn@mcmaster.ca if you are interested.

Uses of WINPEPI in Evidence Based Practice

Joseph Abramson

WinPepi is a package of statistical programs, now available in version 11.38. It comprises seven programs that together contain 124 modules (each providing a number of statistical procedures), accompanied by detailed manuals (with formulae and references). Because of its versatility, it has been likened to a "Swiss army knife" of utilities for epidemiological and biomedical researchers**.** A portal (on the computer desktop) provides access to a detailed index and all the modules and manuals (Abramson 2011).

Menus, on-screen instructions, error messages, help screens and other features facilitate use of the programs. After data have been entered, the rest is done by "pointing and clicking", with no need to enter instructions. All displayed results are automatically saved and copied to the Windows clipboard for pasting, and can be printed. The package is free, readily available, and easy to install or uninstall, and the programs are portable. These features make WinPepi a handy resource. Its main limitation is that it does not provide data management facilities, so that some other software must be used if the data require editing, sorting, counting, or tabulation. Another drawback of most WinPepi programs is that data must be entered by typing, either in the program itself, or in a text file or spreadsheet (for copying-and-pasting into the program), and this can be tiresome. For some users, WinPepi's versatility too is a drawback. They find the large number of procedures offered, the large number of results on the output screen, and the provision of alternative tests and measures, confusing. However, most users very rapidly learn to find the module they need, and to focus only on the procedures and results that they want.

Most of WinPepi's procedures are aids to the planning and analysis of observational studies, trials, and meta-analyses. Despite its rich content, WinPepi is far from being a complete compendium of the statistical procedures used by epidemiologists. But it is a handy source of many procedures, including some that are not very commonly used or easily found.
Some of its features have specific relevance for the practitioner of evidence-based medicine or evidence-based public health.

For example, a number of modules deal in detail with the appraisal and comparison of screening and diagnostic tests. WinPepi can estimate prevalence from screening test results, and it provides an opyion for the computation of post-test probabilities and the gain in certainty, for use by clinicians who know a test's likelihood ratio and wish to decide whether the test is likely to improve the certainty of diagnosis enough to warrant its performance. WinPepi can compare the validity of different screening or diagnostic tests, and estimate their relative usefulness, taking account of the relative importance attached to false negatives and false positives. One module deals with the meta-analysis of studies of screening and diagnostic tests.

For the practitioner wishing to make a critical appraisal of published results, Winpepi's offerings include procedures for appraising the effect of misclassification, revealing (for example) that if the sensitivity and specificity of a test are 90%, an observed prevalence of 12% in a population of 1000 points to a true prevalence of only 2.5% (95% confidence interval 0.2 to 5.2%). With a sensitivity of 70% and a specificity of 100%, the observed prevalence of 12% points to a true prevalence of 17% (95% confidence interval 14 to 20%). Winpepi also shows to what extent an odds ratio is overestimated or underestimated by the test's sensitivity and specificity. One module estimates the possible effect of hypothetical unmeasured confounders on the findings of an observational study or trial,, using different assumptions about the strength and prevalence of the confounder.

Several procedures are offered for the appraisal of P values. For example, P values can be adjusted to take account of possibly misleading results arising from the performance of multiple tests.
Confidence intervals can be deduced (if unpublished) from a P value. For the practitioner who questions the usefulness of significance tests (Ioannidis 2005), there are several procedures that use Bayesian methods to assess a finding's credibility and the probability that it will be replicated in other studies.

WinPepi's offerings include a calculator that can store formulae as well as constants and other numbers.
WinPepi can be downloaded free from
www.brixtonhealth.com.

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What the McMaster Evidence Based Clinical Practice Workshop meant to me…

Alexandra Halalau

I am an Internist working as Faculty for the Residency Program in the Outpatient setting. I first attended the McMaster EBCP Workshop in June 2012. At that time, I thought I was practicing evidence-based medicine (EBM) and I only needed to learn how to teach it. Therefore I chose the 'How to teach stream' and I left home for a week of training in Canada. Once I got there, I started having one of the most traumatizing experiences of my life. It was so HARD…By barely understanding what was going on, and having to stay up until early morning to prepare for the next day, I realized that I was far away from knowing how to practice or teach Evidence-Based Medicine. In the end, I went home feeling that I had worked and learnt a lot, but not enough, and for a while, my EBM experience stopped there as it seemed too hard to continue.

Everything started again 10 months later when I volunteered to teach EBM for the medical students. I was very excited by the opportunity and willing to invest the time and effort. During that time I realized that EBM should be away of life for physicians. Medicine is not mathematics. If in math one plus one will always equal two, in medicine, it might equal three for you and only one for me. For example, applying the same treatment to different patients will not lead to the same results every time. People are the biggest variables. I think that knowing how to write and present the equation that applies to each individual patient is absolutely necessary for providing quality of care to our patients.

Having gone to the McMaster EBCP Workshop for the second time was a great inspiration to me. I had outstanding tutors that helped me understand and grow to actually practice EBM. I also brought four other Faculty / physicians from my Institution to attend the 2013 Workshop.

We are now the EBM core Faculty for our residency program. We have developed an entire longitudinal EBM curriculum that consists of: EBM Journal club, EBM senior morning report and EBM chief rounds. We also have an entire week of EBM lectures every month that are led by the residents, for the residents and medical students. The feedback we have been getting is excellent. The medical residents are very enthusiastic and are getting more confident with their EBM skills. And we will not stop here!

Thank you to the McMaster EBCP Workshop for providing such an outstanding experience. I hope that I will be able to bring more physicians each year and grow the number of our EBM Faculty. I am confident that by adding this great experience to our current practice will ultimately help us train better doctors and significantly improve our patient care.

SOURCE Evidence Based Surgery Program Update

Achilles Thoma, Manraj Kaur

The Surgical Outcomes Research Centre (SOURCE, McMaster University), Department of Surgery, Evidence-based Surgery (EBS) Working group continues to develop its "Users' Guides to the Surgical Literature" article series that is being published in the Canadian Journal of Surgery (CJS). Each article is prefaced with a surgical scenario, and the series is intended to educate surgeons and residents regarding how to find, assess and incorporate evidence from the surgical literature. Currently 14 articles in this series have been published in CJS and 1 has been submitted for publication (visit www.cma.ca/cjs to obtain a free article copy).

EBS Workshops for McMaster Faculty- *Hamilton, ON, Canada*
SOURCE has also developed an interactive EBS Workshop based on the article series. The workshop consists of small group tutorials led by trained surgeon tutors addressing the various topics covered in the EBS articles (tutors: Dr. Achilles Thoma, Dr. Luis Braga, Dr. Michelle Ghert, and Dr. Forough Farrokhyar). The most recent workshop was in February 2013 addressing the topic of surveys in surgery. This half-day workshop

was accredited by The Royal College of Physicians and Surgeons of Canada and attended by over 20 surgeon faculty.

2nd Annual EBS Workshop for Surgeons- *King Faisal Specialists Hospital & Research Center, Jeddah, Saudi Arabia*

SOURCE was invited for the second time to organize a 3-day workshop (April 15-17, 2013) on Evidence Based Surgery (EBS) principles, attracting over 50 surgeons and research students from across Middle East. This second annual unique event was conducted in collaboration with King Faisal Specialist Hospital and Research Centre (KFSH&RC) in Jeddah, Saudi Arabia. The workshop was led by Dr. Achilleas Thoma, Director of SOURCE and co-tutored by Dr. Forough Farrokhyar, Dr. Charles Goldsmith and Dr. Luis Braga.

The topics for the 3-day workshop included randomized controlled trials, power & sample size, systematic review & meta-analysis, diagnosis, surveys & case-series. The 3-days were divided into morning and afternoon sessions where the tutors facilitated small groups encouraging an interactive, problem based learning format.

Upcoming SOURCE workshops

- EBS workshop for McMaster Faculty on Clinical Practice Guidelines will be held on February 12, 2014 at St. Joseph's HealthCare, Hamilton, ON
- The 3rd Annual EBS workshop at the King Faisal Specialist Hospital & Research Centre will be held on April 22-24, 2014.

For more information about SOURCE and the EBS workshops, visit their website:
www.fhs.mcmaster.ca/source/
or email Manraj Kaur at **kaurmn@mcmaster.ca.**

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Evidence-based clinical practice (EBCP) is an approach to health-care practice that explicitly acknowledges the evidence that bears on each patient management decision, the strength of that evidence, the benefits and risk of alternative management strategies, and the role of patients' values and preferences in trading off those benefits and risks.

WHY ARE EVIDENCE AND VALUES OR PREFERENCES IMPORTANT?

Clinicians are confronted daily with questions about the interpretation of diagnostic tests, the harm associated with exposure to an agent, the prognosis of a disease in a specific patient, the effectiveness of a preventive or therapeutic intervention, and the relative costs and benefits associated with these decisions. Both clinicians and policy makers need to know whether the conclusions of a primary study or a systematic review are valid, and whether recommendations in clinical practice guidelines are sound.

Members of the Department of Clinical Epidemiology and Biostatistics at McMaster University, in collaboration with other colleagues trained in both medicine and in clinical epidemiology, have developed a set of common sense strategies to assist in the critical appraisal of evidence. They have also developed approaches to explicitly considering values and preferences in clinical decision-making, thereby encouraging the practice of EBCP.

WORKSHOP OBJECTIVES

- Both streams: To help participants advance their skills in critically appraising the literature, and their skills in acknowledging and incorporating values and preferences in clinical decision making
- **Improve your practice stream:** To aquire an understanding of common epidemiological concepts (e.g. interpreting hazard ratios, confidence intervals, critical appraisals of a systematic review) and advance their skills in using the literature for quality assurance, improving practice, and judging comparative effectiveness of health care interventions.
- **Teaching stream:** To help participants learn how to teach EBCP using a variety of educational models in different settings, with different types of learners.

WORKSHOP FORMAT

The workshop is offered as a one-week intensive course.

Participants will be learning in interactive small groups led by clinical epidemiologists and

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practitioners from McMaster and other institutions. The workshop will consist of small and large group sessions, individual study time and, for the teaching stream, opportunities for workshop participants to lead teaching sessions using their own ideas, materials, and reflecting their own experiences.

WORKSHOP MATERIALS

Prior to and at the workshop, participants will have access on-line to educational materials that include literature on critical appraisal and EBCP, the small group learning format, a set of clinical problems, JAMAevidence, and a variety of other EBCP aids.

WHY COME TO MCMASTER UNIVERSITY?

McMaster University is not only the birthplace of evidence-based medicine, and has produced the definitive evidence-based health care texts. We also continue to lead the world in innovation and advances in EBHC practice and teaching. McMaster's workshop, running for more than 25 years, has provided the model for EBHC workshops throughout the world. Over this time, we have developed a cadre of the best EBHC educators in North America who return to the workshop year after year because of the intensely stimulating and educational environment. Come to experience the best in EBHC education!

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McMaster Evidence-Based Practice Workshops | June 9-13, 2014 | http://ebm.mcmaster.ca
CONTINUING HEALTH SCIENCES EDUCATION PROGRAM

The 2013 program and slides are now viewable at www.ebhc.org

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MAILING LIST

We would like to keep our mailing list as up to date as possible. If you are planning to move, have moved, or know someone who once received the newsletter who has moved, please e-mail maddock@mcmaster.ca or write your new address here and send to Deborah Maddock, CE&B, HSC 2C12, McMaster University Health Sciences Centre, 1280 Main Street West, Hamilton, ON L8S 4K1, Canada. Thank you!

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SIGN UP A COLLEAGUE!

If you would like to encourage a colleague to attend the workshop next year, please e-mail maddock@mcmaster.ca or write the address here and send to Deborah Maddock, CE&B, HSC 2C12, McMaster University Health Sciences Centre, 1280 Main Street West, Hamilton, ON L8S 4K1, Canada. Thank you!

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