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Family physicians are primary health providers and the first point of contact for patients navigating the healthcare system. As such, family medicine is the gateway to medical care for most patients. This field encompasses the widest scope of medical practice of all specialties. Our rationale in choosing family medicine as a theme for this issue was thus based on our desire to highlight the important and unique nature of this medical field.

The broad spectrum of family medicine allowed our contributors to choose from a wide variety of topics of interest, still keeping all articles extremely relevant to the field of family medicine. With a large proportion of medical students choosing family medicine for their career paths, we are excited to present an issue that is intended to foster interest, discussion, and awareness of this fundamental area of medicine.

We anticipate that you will enjoy the articles we have included, ranging from insightful commentaries to interesting case studies to up-to-date guidelines and reviews. We trust that the articles will appeal to all readers, regardless of your specialty interest or field of study.

This year, we have introduced annual new awards to recognize the talent and hard work of our departmental editors, authors and artists. Award winners will be announced in September of each year.

As always we are greatly indebted to the many individuals who made this issue possible. In particular, we would like to thank our departmental editors and contributors, cover artists, faculty advisors, faculty reviewers, the Department of Family Medicine at the University of Western Ontario, CU Advertising, the Hippocratic Council at the University of Western Ontario. Finally, we thank our dedicated readers for supporting this issue and the UWOMJ. We encourage your responses, comments, ideas and questions regarding this issue at uwomj@meds.uwo.ca.

Enjoy the read!

Your editorial staff.

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The University of Western Ontario Medical Journal (UWOMJ) is Canada’s second oldest student run medical journal.

Established in 1930, the UWOMJ provides a forum for original articles based on research or clinical medicine of topic or historical interest. It is a biannual publication with interdisciplinary readership that includes students, faculty members, residents and specialists. At any given time during the academic year, over 40 past and present current medical student Senior and Junior Departmental Editors recruit, write, submit and edit articles.

The UWOMJ has over 20 confirmed physician faculty reviewers for each issue, often affiliated with the University of Western Ontario’s Schulich School of Medicine and Dentistry, as well as hospitals in both London, Ontario and Windsor, Ontario. Our Advisory Board includes both nationally known academic and community physicians.

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Ambulatory Blood Pressure Monitoring: Indications, Usage, and Interpretation

Jaron Chong, Meds 2010

The diagnosis of hypertension has traditionally been limited to office blood pressure readings. The advent of electronic blood pressure monitors has provided additional instruments to better profile a patient’s blood pressure. Ambulatory Blood Pressure Monitoring (ABPM), involving a blood pressure monitor worn continuously by a patient over a 24 to 48 hour period, provides the most comprehensive profile of a patient’s blood pressure. ABPM is indicated in individuals with suspected White-Coat Hypertension or Resistant Hypertension and is a potentially valuable diagnostic modality. It provides high temporal resolution with unbiased reporting of blood pressure to the physician. In addition, it is better able to characterize nocturnal blood pressure, something not possible with office or home/self blood pressure recordings. The Canadian Hypertension Education Program (CHEP) has defined ABPM thresholds of hypertension to be greater than 135/85 mmHg mean awake BP or greater than 130/80 mmHg for mean 24hr BP’s. These thresholds are lower than the traditional office thresholds of 140/90 mmHg. ABPM results can be used to reduce unnecessary anti-hypertensive therapy as well as modify dose scheduling to cover ‘blind spots’ in blood pressure regulation. It can also provide additional diagnostic information regarding the contributing factors to a patient’s resistant hypertension. For the time being, ABPM is only moderately cost-effective under certain clinical indications and thus is unfunded by OHIP. Nonetheless, it remains an additional dimension to hypertension diagnosis that all healthcare professionals should be aware of.

This article has been reviewed by Dr. Louise Moist.

Introduction

Hypertension, as defined by the Canadian Hypertension Education Program (CHEP), is considered as a systolic blood pressure (SBP) of 140mmHg or higher and a diastolic blood pressure (DBP) of 90mmHg or higher. It affects 27% of the Canadian adult population between the ages of 35 and 64. Hypertension is the most important risk factor for stroke as well as the leading preceding condition to heart failure. It is also a noted risk factor for heart attacks, arterial aneurysms, and chronic renal failure.

Blood Pressure Variability

Blood pressure does express some normal variability with research by Millar-Craig et al. establishing the circadian variation of blood-pressure. Blood pressure ordinarily peaks during mid-morning, is lowest at night, and rises before awakening. 25-35% of patients do not express a dip in blood pressure at night and are termed ‘non-dippers’. Patients without this dip have been associated with increased sympathetic activity during sleep, worse prognosis, and elevated risk of end-organ injury such as progressive renal insufficiency.

White-Coat Hypertension

A clinical phenomenon, known as white-coat hypertension (WCHT), exists whereby an individual’s blood pressure rises in response to anxiety brought on by a visit to a physician’s office. A common definition of WCHT is a high blood pressure (BP) in a physician’s office with a normal BP at rest or while ambulatory. This can either be defined in the short-term as BP just before and during a visit or in the long-term as the change between a daily average BP versus BP during a visit. In addition, there should be no end-organ damage in order for WCHT to be diagnosed.

Conventional and Home/Self Blood Pressure Monitoring

Conventional blood pressure monitoring most classically takes on the form of the mercury or aneroid sphygmomanometry performed in the physician’s office. Collectively termed as office blood pressure (OBP)
values or casual blood pressure readings, they provide a snapshot of a patient’s blood pressure as performed by a trained professional.

In recent years, there has been movement towards home blood pressure monitoring or self-blood pressure monitoring to serve as an adjunct to office blood pressure values. Fully automated electronic blood pressure monitors are the most commonly marketed for their ease-of-use and lack of reporting bias from the patient. While effective in some capacities, limitations exist in terms of clinical validation of individual devices as well as variable measurement schedules and number of recordings performed by the patient.

**Ambulatory Blood Pressure Monitoring (ABPM)**

Ambulatory Blood Pressure Monitoring (ABPM) differs from conventional blood pressure monitoring in that an electronic blood pressure monitoring device is worn continuously by a patient with readings taken at regular intervals (Figure 1; Figure 2). ABPM originally came about as a research tool with the first recorded mention of such a device in 1962. The very first study that established the superiority of ambulatory blood pressure readings was performed using a modified version of the 1962 device by Sokolow and colleagues in 1966. Since that time, ABPMs have come into greater clinical use and are now specifically recommended by Canadian and American cardiovascular societies under certain indications.

ABPM devices function by either directly listening to and interpreting Korotkoff sounds using a microphone, not unlike conventional blood pressure monitoring, or through the sensation of vibratory signals while the pressure cuff inflates. Pressure readings are usually collected at 15 to 30 minute intervals and stored on a computer chip for later viewing and interpretation by the physician. This provides the clinician with an unbiased and detailed review of the patient’s blood pressure, usually over a 24 to 48 hour study period.

**Interpretation of ABPM Results**

The interpretation of results from ambulatory blood pressure measurement is slightly different from traditional office blood pressure values. According to the 2007 Canadian Hypertension Education Program (CHEP) guidelines, a diagnosis of hypertension can be made from ambulatory blood pressure monitoring “if the mean awake SBP [Systolic Blood Pressure] is 135 mmHg or higher or the DBP [Diastolic Blood Pressure] is 85 mmHg DBP or higher”. An alternate determination of hypertension can be made if the mean 24 hour blood pressure is “130 mmHg or higher or the DBP is 80mmHg or higher”. (Figure 3) Of note is that these thresholds are slightly lower than the common 140/90 mmHg traditionally set for office blood pressures. This is to be expected given the repeated averaged measurements and the minimization of any potential White-Coat effect.

**Clinical Indications for ABPM**

Given the additional costs incurred in utilizing ABPM, researchers and clinicians have devised specific indications for its utilization. The most often cited indication is suspicion of white-coat hypertension. Individuals with ambiguous hypertension (i.e. normotensive home blood pressure readings and hypertensive office blood pressure readings) can also be better managed with ABPM data. There are estimates that between 20 to 30 percent of individuals found to be hypertensive in a physician’s office are normotensive at other times. By recognizing these individuals as normotensive or pre-hypertensive, a reduction in antihypertensive medications, side effects, and excess costs can be realized.

Another candidate for ABPM is resistant hypertension, when blood pressure control is not achieved despite adequate and sustained anti-hypertensive therapy. This typically presents as elevated office blood pressure, normal home readings, and a lack of apparent target-organ damage. One etiology of resistant hypertension especially suited to 24h ambulatory monitoring is sleep apnea. Hypertensive episodes can occur as a result of apneic spells. On ABPM, this would demonstrate as a lack of a nocturnal blood pressure dip, a finding not as easily obtained with office or home blood pressure monitoring.

Finally, as clinical research progresses and ABPM usage becomes more commonplace, we may see the general usage of ABPM in all hypertensive patients. Already, there is significant evidence that ABPM readings may be a better predictor of end-organ damage, cardiovascular events, and mortality than office blood pressures. As nocturnal blood pressures also appear to play a prognostic role, ABPM is able to record what conventional office blood pressure and casual home blood pressure recordings do not. In addition, the 24h coverage of ABPM can notify a physician of ‘blind spots’ in hypertensive coverage, necessitating a change in anti-hypertensive medications or dose scheduling.
Costs & Availability of ABPM

For an typical physician’s office, purchasing a monitor and associated software can range on average from $4,500 to $5,500 USD. ABPM is not currently funded by OHIP and as such there is a nominal cost associated with its clinical usage. Canadian clinics and hospitals typical charge a user fee of $50 to $75 CDN per ABPM study. In comparison, Medicare and Medicaid in the United States has reimbursed the cost of ABPM for patients with a suspected diagnosis of White-Coat Hypertension.

There have been mixed results regarding the cost-effectiveness of ABPM. The original study recommending Medicare and Medicaid support of ABPM for suspected White-Coat Hypertension patients was based on the avoidance of anti-hypertensive drug adverse effects as well as the better assessment of cardiovascular risk that ABPM would offer for the physician. In support of the cost-effectiveness of ABPM is a study by Krakoff that projects savings for the usage of ABPM where annual treatment costs total a minimum of $300. This conclusion operates on the assumption that a fraction of patients diagnosed with White-Coat Hypertension would discontinue treatment. In another study by Rodriguez-Roca et al., ABPM was found to be only more cost-effective than conventional blood pressure monitoring when the new treatment cost of poorly monitored patients was not included.

Conclusion

Hypertension represents a significant issue in modern healthcare with an aging population and ambulatory blood pressure monitoring remains the most accurate diagnostic modality available. While ideal to use in all patients with suspected hypertension, cost-effectiveness guidelines only seem to support its use in narrow indications. In this regard, Canada is slightly behind the United States in terms of public funding. However, in comparison with many other diagnostic technologies, a single ambulatory blood pressure study is not nearly as prohibitive in cost. For the time being, awareness of this technology and its appropriate indications for use by all healthcare professionals is advised with ambulatory blood pressures adding another valuable dimension to the monitoring of hypertensive patients.

References


**Figures**

**FIGURE 1:** Ambulatory blood pressure monitor and cuff (Model 90207, SpaceLabs Medical, Inc., Issaquah, Wash.)

**FIGURE 2:** Individual wearing an ambulatory blood pressure monitor.

**FIGURE 3:** Threshold guidelines for Ambulatory Blood Pressure Monitoring (ABPM) utilizing averaged blood pressure measurements over the duration of a study; SBP Systolic BP; DBP Diastolic BP. Adapted from the Canadian Hypertension Education Program.
Perspectives from a Community Family Physician: Past, Present and Future

Alysia W. Zhou, Meds 2010

Rural Discovery Week at the University of Western Ontario (UWO) is a week of clinical exposure that provides students with their first insights into community medicine, including family medicine (FM). Dr. Joseph Mai is a family physician in St. Thomas who participated in the 2007 Discovery Week. He graduated with his MD and CCFP at the UWO and is currently a partner at a large family medicine clinic in St. Thomas. Dr. Mai’s interest in FM was not evident until the 4th year of his medical studies, after which his residency experiences further reinforced his enjoyment of FM. Setting up his practice in an underserviced area allowed him to take advantage of various government incentives, as well as the new funding formulas for private practices that have increased the remuneration of family doctors to equal that of specialists in some cases. Additionally, there are many opportunities to individualize one’s FM practice to incorporate more specialized tasks, which is a great attraction of the field for Dr. Mai.

This article has been reviewed by Dr. Joseph Mai.

A group of six students were three days into the University of Western Ontario’s Rural Discovery Week Program in the mid-sized town of St. Thomas, just south of London. This was to be the first taste of community medicine that our class would experience at the end of our first year medical curriculum, and by far the most exciting component of the school year.

I was sitting in the waiting room of a large family medicine clinic that included six family physicians, a business office, and five nurses. The clinic was classified as a Family Health Group, one of several clinic structures created by the government to give family doctors greater flexibility in deciding their clinic and payment structures.

Dr. Joseph Mai is one of the family doctors at this clinic. He joined the team shortly after completing his Family Medicine (FM) residency at the UWO in 2003. Prior to that, he completed his undergraduate training at the University of Calgary, and subsequently pursued his Doctor of Medicine (MD) degree at the UWO. It was during his high school years, however, that Dr. Mai’s aptitude in the sciences, combined with his admiration for his own family physician, helped him decide to pursue a career in medicine. Furthermore, Dr. Mai’s undergraduate research in physiology and in oncology, which were further enriched by his interactions with clinician-scientists, helped to expand his interest in medicine.

His pursuit of medicine brought him to Ontario and specifically the UWO and the London area, where he continues to practice. With the current government incentives for family doctors, I wanted to see why students may or may not be flocking to FM as a career, and Dr. Mai’s experiences in the MD program can provide insights for current students. Dr. Mai did not consider FM until much later in his medical education, which is not surprising as it can be difficult for students to envision what FM encompasses. For instance, it is often easier to imagine the role of a head and neck surgeon (the name certainly provides a clue), a cardiologist, or a neurosurgeon. So why did Dr. Mai decide on FM? I believe his reply below illustrates the importance of keeping an open mind to the various medical specialties:

In my 2nd year of medicine, I became interested in otolaryngology because I thought I wanted to be a surgeon and otolaryngology had a good clinical component that I was interested in. It would have allowed me to work with kids as well as adults and I thought it was diversified enough to keep my interest. In my 3rd year of clerkship, after completing the surgery rotation, I didn’t find it as thrilling as I thought I would, so I started looking at other options. I still wanted to be a specialist at the time because there was a sense in medical schools that family medicine was a default option that was taken if one couldn’t get into a specialty.
I became interested in anesthesia by the end of 3rd year because I liked the lifestyle and was aware of the pending shortage of anesthetists, which would produce great opportunities in the future. After doing electives in anesthesia in 4th year, I found that anesthesia wasn’t what I was interested in because it was fairly narrow in its scope. I also did an elective in family medicine with a great doctor in Calgary in 4th year. This helped me to realize that the interactions that I wanted in medicine were those I would have in family medicine.

On reflecting, the part I enjoyed most in ENT was the clinics that I participated in. I didn’t like the limited patient contact in anesthesia and I didn’t like the lifestyle of surgery. I found that family medicine had the flexibility to allow me to tailor my medical practice the way I wanted.

True to his feelings that FM would combine the enjoyment of patient interactions with the medical component of treating disease, Dr. Mai’s FM residency experience further reinforced his interest. He trained under Dr. Larry Schmidt at St. Joseph’s Family Medical Centre in London, where he gained an even greater appreciation for the opportunities available to family physicians. Additionally, Dr. Schmidt, who had a private practice for many years before entering academic medicine, was able to share insights into the business side of FM with Dr. Mai.

Following residency, Dr. Mai worked in various locums, including the clinic in St. Thomas where he was quickly recruited as a partner. His decision to stay in an underserviced area like St. Thomas was supported by the government at both the provincial and municipal levels:

The government initiatives to help attract more physicians into family practice have been very generous. The remuneration has increased substantially and is equivalent to some specialties. The initiatives also give physicians help to run their practice more efficiently. For instance, the government is paying the salaries for allied health professionals such as nurses and physiotherapists to work directly for us.

I was able to take advantage of the tuition reimbursement as well as the underserviced area grants, which helped me to start my own practice right away with minimal financial investment of my own.

Indeed, there are now huge incentives for graduating medical students and those completing FM residencies to practice in underserviced areas throughout Ontario (www.health.gov.on.ca/english/providers/program/uap/uap_mn.html). Nevertheless, practicing FM in a small or mid-sized community can, in some instances, present its own challenges and difficulties regarding call schedules and access to resources and to specialists:

Depending on the community that you work in, you will have different levels of specialty support. I am fortunate in St. Thomas that I have a good core of specialists that I can quickly refer to. Anything more specialized than that can be referred to London, which is only a short distance away. I also take care of my own patients in the hospital and find that having hospital privileges is very useful when a very ill patient requires more comprehensive care. This is better for the patient as well as giving me the option to treat cases that cannot be treated within my clinic alone. Being part of the hospital does require me to be on call but I haven’t found it to be very onerous.

From Dr. Mai’s experience, it appears that the government has finally started listening to and addressing the needs of family physicians by allowing greater flexibility with respect to the type of practice, the amount of practice time, the location of practice and with whom one decides to practice with. For Dr. Mai, FM provides him with a wide variety of patients to make his practice interesting. Equally important is that FM allows him to be his own boss; no dealing and haggling with hospital administration since knowing all the specialists working at the local hospital allows him to directly contact them when necessary.

“With the new funding models, the remuneration is also very good.” Dr. Mai projects that with the initiatives currently underway, FM will become very attractive and will experience an increase in interest and in recruitment. FM allows one the flexibility to practice medicine in his or her own style and gives the individual
freedom to change his or her interests to incorporate more specialized roles and tasks. Finally, it allows one to have a life outside of medicine while also being well-remunerated.
Clinical Procedures

Botulinum toxin injections for cerebral palsy and post-stroke spasticity: an overview

Brent Mollon, Meds 2010

This article has been reviewed by Dr. Kellie Leitch.

Introduction

Botulinum Toxin Type-A (BTX-A) has received much attention by both medical and non-medical individuals. Clinical preparations of BTX-A such as Botox® (Allergan Inc, Irvine, CA) are available for cosmetic use by family physicians providing additional education is obtained. When injected intramuscularly, this toxin prevents the release of acetylcholine from presynaptic vesicles in the neuromuscular junction, thus temporarily and reversibly blocking muscle fibres. This ultimately leads to weakened muscular contractions. Although commonly associated with cosmetics, BTX-A is becoming an accepted pharmacologic treatment for other conditions, as injections for focal spasticity secondary to upper motor neuron disorders such as cerebral palsy or stroke have been utilized in medicine for some time and have been covered by OHIP since 2003. Nonetheless, the evidenced based support for such treatments does not always extend as far as randomized controlled trials (RCTs). It is the purpose of this article to explore the techniques for administering BTX-A to treat spastic muscular conditions, specifically cerebral palsy or post-stroke, while also exploring the clinical evidence associated with their use.

Muscular Spasticity

Spasticity, one component of the upper motor neuron syndrome, has been previously defined by J.W. Lance as “a motor disorder characterized by a velocity-dependent increase in tonic stretch reflexes with exaggerated tendon jerks resulting in hyper-excitability of the stretch reflex”. Physical trauma to the central nervous system, stroke, multiple sclerosis, cerebral palsy, and hereditary spastic paraparesis are all common causes of spasticity. As noted by O’Brien, spasticity can be viewed as having either ‘negative’ or ‘positive’ symptoms. Negative symptoms, such as loss of dexterity, decreased coordination, or muscle fatigue and weakness can be treated conservatively through physical therapy or living aids. On the other hand, positive symptoms such as hyperactivity, muscle spasm, exaggerated deep tendon reflexes and the persistence of primitive reflexes need to be treated conservatively through physical therapy or living aids. The persistence of primitive reflexes need to be treated with either pharmacotherapy (i.e. oral medication, phenol nerve block, intrathecal or oral baclofen) or surgery (tendon surgery or neuroectomy). Thus, it is by addressing the positive symptoms of spasticity that BTX-A exerts its effects, aiming to reduce exaggerated or spastic muscle activity to help allow for stretching and antagonistic muscle activity. Physically, the aim of these injections is to restore balance to affected joints, while preventing contractures and bony deformities from forming. However, physicians should gauge clinical benefit by evaluating functional improvement, relief of symptoms (i.e. pain), decreasing the burden of care or facilitating other therapies (i.e. postponing surgical intervention in paediatric patients until the skeleton becomes more mature). Nonetheless, it is important to emphasize that pharmacotherapy must be combined with physiotherapy and other forms of conservative management (such as orthoses or casting) to achieve the best improvement of patient outcomes.

As noted above, clinicians must aim to restore functional deficit while mitigating negative side effects such as excessive muscle weakness when administering BTX-A for spasticity. Thus, the muscular target of the injection must be considered, the appropriate dose of toxin must be gauged, and accurate injection of BTX-A must be ensured. Physical exams should reveal the affected muscles, and dosing regimens have been developed to guide toxin use (see O’Brien for adult dosing by muscle). For children, total dose of toxin should be less than 400 units or 12 units/kg of body weight for BOTOX®, although significant heterogeneity exists within the literature regarding the units/kg/muscle used. In terms of localizing the appropriate muscle for injection, anatomic knowledge and palpation is an accepted technique providing the muscle is large and subcutaneous, while the use of electromyographic guidance or electrical stimulation is seen as superior for smaller muscles like those in the forearm or hand due to improved accuracy over anatomic knowledge alone. However, the above techniques may require special training and can be painful to the patient, thus they are of limited use in paediatric populations.
BTX-A injections do not appear to be associated with any major side effects, with only focal weakness or nausea being reported more often in the BTX-A groups when compared to control. However, it is known that some patients (<1%) do not respond to BTX-A while up to 10% of patients may lose their response to therapy, potentially due to the production of neutralizing antibodies. Thus, it is recommended that physicians limit the doses to no more than once every 3 months while using the lowest effective dose possible. In the event a patient develops resistance to therapy, a clinician might consider switching botulinum toxin serotypes (i.e. BTX-A to BTX-B) as they are antigenically distinct.

Clinical Evidence
In adult populations, the majority of research has centered around post-stroke or multiple sclerosis patients. In post stroke populations, it is believed that BTX-A is effective at managing muscular tone. It is less clear if these decreases in tone translate into measurable clinical benefits for the patients. For example, of the six completed RCTs published in peer reviewed journals and listed in the Stroke Trials Registry (www.strokecenter.org), all four studies that gauge the impact of BTX-A injections on muscle tone/spasticity report statistically significant benefits in the intervention relative to the control group, although one study required 1500U doses to achieve significance and another did not report consistent results over time. Only three of the five studies examining functional improvements report significant results, of which two did not report consistent results over time (i.e. significance noted at weeks 1, 4 and 6 but not 8 and 12). Thus, while it appears studies are able to confirm the neurotoxic effect of BTX-A, the functional impact of this therapy is still uncertain.

In paediatric populations, BTX-A injections for spasticity is primarily provided to patients with spastic cerebral palsy, a population where BTX-A’s effects have been used since the early 1990s. The use of BTX-A for lower limb spasticity is generally accepted in the literature. For example, one recent RCT evaluating gastrocnemious BTX-A injections for spasticity noted a statistically significant decrease in spasticity at 8 weeks, an increase in dorsiflexion range and performance goals at 12 weeks, and an maximum voluntary torque and gross motor function at 24 weeks. However, despite measurable gains in performance, patients and their families were not significantly happier about their performance goals when compared to the placebo group. The impact of BTX-A injections on upper-limb spasticity is far less agreed upon, as a recent systematic review found that there is insufficient Level I evidence to support or refute its use to impact spasticity/tone, range of motion, or short to medium functional gains. Thus, it appears that the literature should continue to define the benefits of BTX-A for upper limb spasticity in CP, while also seeking to determine what therapies adjunctive to BTX-A injections will benefit CP outcomes.

Impressions
BTX-A as a pharmacotherapy appears capable of reducing spasticity in post-stroke and cerebral palsy patients. This therapy includes the alleviation of painful muscle spasms, along with postponing surgery in pediatric populations by preventing prolonged contractures which could deform a joint over time. Much heterogeneity exists regarding the muscles selected for injections, the dose of the injections and the means by which muscles are identified, which reflects the patient centered approach of this therapy. While evidence confirms BTX-A is able to reduce muscle tone or spasticity in these populations, the overall functional impact for the patient is still unclear.

References


Medicine and the Internet

Computer-assisted learning in medical education

Jordan Glicksman, Meds 2010
Samuel Krausz, Meds 2009
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Recent advances in technology have resulted in an ever-expanding body of medical literature. While this growth faces physicians and medical trainees with a challenge in keeping up to date, the technologies that have facilitated the expansion may also provide doctors and students with new methods of learning. Computer-assisted learning has the potential to enhance medical teaching.

This article has been reviewed by Dr. Jason Franklin.

Technology and communications have facilitated the tremendous growth of medical literature in recent years. This has left medical professionals with an ever-expanding library of knowledge to be familiar with. While the wealth of new medical information presents challenges for physicians in keeping up with their respective fields, the technologies that have facilitated the recent expansion may also provide an improved means for physicians to learn. Computer-assisted learning (CAL) may hold an important place in the future of medical education in undergraduate, post-graduate and continuing medical training.

In Canada, undergraduate medical education (UME) takes the form of three or four year curricula. In this time, medical students must acquire the knowledge necessary to pursue post-graduate medical training in both general and specialized residency programs. As a result, medical students are forced to acquire vast knowledge in a short timeframe. Time restrictions in medical training are not limited to education at the undergraduate level; post-graduate programs face similar time constraints. Residency training programs range from two years in family medicine to six years for cardiac and neurosurgery. At the end of residency, medical trainees are expected to feel comfortable as physicians, as they move to practicing medicine independently.

The Current Use of CAL in Medical Education

Medical educators already make use of CAL to provide students with increased exposure in their respective fields. For example, the Computer-Assisted Learning in Pediatrics Program (CLIPP) provides medical students with a case based approach to learning in pediatrics. Programs like this are gaining popularity, as they allow students to learn at their own pace. This can allow for students to learn at a time and location that is convenient for them, as long as there is a computer available to work at.

In addition to the implementation of CAL in UME, there has been a shift toward the use of CAL for continuing medical education (CME). By 2003, there were over 11,000 online CME courses available. Practicing physicians are required to obtain 400 CME credits over 5 years. There are six categories of learning that can be used to obtain CME credits. Up to 25% of this requirement may be met through the “Other Learning Activities” category which includes activities such reading simple learning materials like journal articles or using unaccredited online courses. Additionally, accredited CAL modules may be used to obtain credit when they meet the requirements of the “Structured Learning Projects” category, which has no cap for credit hours.

Advantages of CAL

CAL applications are of particular value for highly visual content, such as demonstrations of surgical procedures and technical skills. These skills typically require spatial and visual coordination. While print-based learning materials are mainly limited to text and image based information, CAL can additionally utilize multimedia capabilities. CAL can be designed to incorporate not only text images but also video to enhance student learning. Interactive features of CAL, such as quizzes and learning games, can augment the learning process by providing feedback in a manner that makes students feel comfortable.
Costs of Implementation

While the convenience of CAL is attractive, as with any new technology, cost is often a concern. Nevertheless, widespread use of CAL modules can be very cost-effective. For example, in 2005, the average development cost per CLIPP case session was approximately $6, and this amount will decrease as more students continue to use each case. In addition, replacement of teaching with CAL has the potential to free up the time of medical school lecturers to teach in other capacities, such as small group sessions. Furthermore, CAL has the potential to enhance teaching at distant locations such as satellite campuses, rural settings and in developing nations.

CAL and Other Learning Methods

Adults have been shown to learn optimally when their learning is self-directed. This has resulted in a trend away from traditional lecture and seminar-based teaching and towards the implementation of more self-directed learning in medical curricula. In self-directed learning, the learner identifies the knowledge in which they are deficient and then attempts to learn based on their individual needs. Computers may be able to assist in this process by providing interactive tools such as quizzes and learning games to aid the student in determining what information to pursue.

Currently, there is debate as to the effectiveness of CAL as a teaching modality. There are several studies that have compared the use of CAL to other methods of education. Many of these studies show that there is no significant difference in knowledge and skill retention between those taught didactically or by seminar when compared to those taught by computer teaching modules, but there are some studies suggesting that other forms of teaching (e.g. didactic lecture) are still superior.

The Future of CAL

While research is still ongoing into the effectiveness of CAL for medical education, this new learning modality is a rising form of medical teaching. The Association of American Medical Colleges (AAMC) has established MedEd Portal, a peer-reviewed collection of online teaching tools. This resource contains a database of learning resources that include tutorials, virtual patients and case-based learning among other medical education resources.

Not only does the MedEd Portal provide easy access to CAL modules, but it also provides incentive to academic physicians to create more CAL tools by providing their work with recognition as a peer-reviewed publication. Initiatives such as this will likely increase the production of CAL modules.

The use of computer-based teaching in medicine has the potential to change the way medicine is taught to both current and future generations. Between the conveniences afforded by CAL, enhancements over current learning modalities and increased recognition for publishing CAL modules, there appears to be a bright future for computer-assisted learning.

References

History of Medicine

In the beginning there were apothecaries

A historical perspective on the emergence of general practice, the emergence of family medicine, and the research agenda of family medicine.

Adam Garber, Meds 2010
Raza Naqvi, Meds 2009

The emergence of general practice as an academic discipline can be traced over almost two centuries. Major events include the establishment of the College of General Practice, the identification of a defined body of knowledge, the establishment of criteria for certification, and the change of the college’s name to the College of Family Physicians. Of particular importance as well is the development of research networks and methods that amplify on the unique aspects of family medicine.

This article has been reviewed by Dr. Jeffrey Freeman.

The history of family medicine in North America is a rather new one. Within its history there are periods of particular strength followed by periods fraught with struggle. Despite these natural ebbs and flows, family medicine has advanced medical understanding and practice both in the science and the art. That is, family medicine has advanced the medical understanding of care for the individual while at the same time contributing at a scientific and epidemiological level to the body of medical literature. This essay will outline a brief history of the development of general practice and then family medicine as it emerged from general practice. The essay will also address the history of the research agenda of family practice.

The history of general practice begins similarly in Canada and the United States in the early 19th century as both countries closely followed the British model. There were physicians, surgeons, and apothecaries. Physicians were trained through university course work or apprenticeship and were the progenitors of what we now know as specialists. For the most part, they provided care for the affluent. The surgeons were trained in barber schools and were not permitted to prescribe medications. The apothecaries began as shopkeepers that provided medicines. Interestingly, the apothecaries took on the role of conducting initial clinical investigations. The Apothecaries Act of 1815 advanced both the privileges and the responsibilities of apothecaries. The Act required candidates to complete a pharmaceutical chemistry exam and an exam on the theory of the practice of medicine. As well, candidates were required to complete a five year apprenticeship. These requirements allowed the apothecaries to produce income through the prescription of their medicines as well as through their medical practice. It is from these humble beginnings that the ‘general practitioner’ was born. It is also interesting to note that David Woods, a renowned medical writer and educator, suggests that the general practitioner in North America predates the existence of the general practitioner in Europe due to the dispersed settlements and mobile colonies which necessitated the ability of one person to perform surgery, practice medicine, and prescribe medications. The general practitioner enjoyed a number of years of stability despite some public concerns that due to the lack of a more rigorous application system, some general practitioners were under-educated.

By the end of the 19th century however, as the specialist movement gained momentum, some doubts existed as to the future of general practice. Even Sir William Osler expressed this doubt with respect to general practice in an urban setting. The Flexner Report of 1910 furthered the domination of specialist medicine. The Flexner Report, entitled ‘Medical Education in the United States and Canada’, led to the standardization of the medical curriculum and created a link between medical schools and established universities. As a result most clinical teaching was now taking place in urban teaching hospitals. Gutierrez and Scheid point out that by 1935 hospitals became the centre for teaching and technology, specializing was valued highly and required a residency period, as the practice of medicine became a profession for the wealthy. The hospitals, now as specialist centres, left an uncertain role for the
general practitioners who continued to practice within these very centres to a certain extent. The obsession with scientific and technological advancement that resulted from the World War II placed even more glory on the shoulders of specialists and the number of students entering the field of general practice consequently declined\(^1\).

The College of General Practice of Canada, founded in 1954, published a bill of rights for general practitioners\(^3\). The College was born out of a need to both redefine the role and revitalize the image of the general practitioner. Its initial mission was to improve educational standards and opportunities, certification standards, standards of practice and to help define the general practitioner’s role in the hospital and in the office. Understandably, before implementation of any change, the college struggled with the precise definitions of their ambitious objectives. Two central difficulties proved to be interrelated and took more than a decade to resolve; first, the identification of the body of knowledge that is to be subsumed under the domain of general practice and, second, the issues surrounding the college’s responsibility to certify its members. It was in 1967 that a document entitled *Graduate Training in Family Practice* both specified training requirements but also outlined the body of knowledge that concerns family physicians\(^4\). The committee responsible for this document also enlisted support from Canadian medical schools that year. It is noteworthy that family medicine residence programs at both McMaster University and the University of Western Ontario preceded this document by one year. It was also in 1967 that the college was renamed as the College of Family Physicians\(^4\), a name which the college president, Irwin Bean, opposed but later acknowledged its necessity. Not surprisingly, this flurry of progress and newfound purpose that seemed to be woven into the new name of the college, correlated with the inception of Canadian medicare in the 1960s.

Concurrently, in the United States, the Millis Report, the Folsom Report, and the Willard Report were published independently by the American Medical Association in response to the increasing public disapproval of the fragmented delivery of care, the inaccessibility to service, and the “depersonalization” of care\(^5\). These reports suggested the need for each citizen to possess a personal physician who is sensitive to life context, the impact of illness and the importance of therapeutic options. It is the opinion of some that family medicine was a natural reaction to the counterculture of the 1960s\(^5\). Stephens argues along these lines when he speaks of agrarianism, humanism, utopianism, consumerism, and feminism in relation to the birth of family medicine in North America\(^6\). The discussion surrounding research in family medicine began soon after the emergence of family medicine as a discipline in Canada and the United States\(^6\). As Herbert explains, the research agenda of family medicine was called into question as early as 1966. The initial idea was that research in family medicine would focus on diagnostic testing, interpretation of symptoms, larger epidemiological studies, as well as development and behaviour. However, this notion was expanded during the 1970s to include other areas of study such as health care services, clinical strategies, biomedical sciences, and the social sciences\(^6\). The Study Group on Family Medicine Research which took place in 1982 articulated the areas of research to which family medicine could make unique contributions and highlighted the importance of research elective time for students\(^2\). Perhaps one of the most important shifts in the research agenda of family medicine involved recognition of the importance of each individual’s socio-cultural and environmental context in understanding health and behavior. This idea was highlighted by Nigel Stott in 1987 and by Culpepper in 1991 and required a shift in research methods to account for patient context in the delivery of medical services and the experience of illness\(^6\).

Since the inception of family practice, it was clear that the family physician’s office possessed a remarkable amount of data relating to disease processes and outcomes\(^8\). It is this sort of data, Ryan argued, that could help address central issues like diabetes, back pain, and the common cold and help to “bridge the performance gap” and “answer real-world research questions”. While the potential has always been recognized and the particular areas of benefit have long been debated and refined, it is the “harvesting” of the data that has presented one of the greatest obstacles to research in family medicine. Until the early 1980s, research in family medicine was practice-based and therefore, depending on the demographics of the surrounding community, only certain research questions could be adequately addressed. During the 1980s, a move was made towards practice networks and in 1995 the Federation of Practice-Based Research Networks (FBPRN) was born in the United States with the hope of pooling data, brainpower, and resources\(^8\). Since then practice-based research networks are succeeding in the production of sound research databases. Perhaps the most useful aspect of practice-based research networks is their ability to track many patients for long periods which is conducive to thorough longitudinal studies. Indeed research in family practice has evolved to include large scale longitudinal studies conducted through collaborative research networks\(^9\).
From apothecary to general practitioner to family doctor, the history moves towards increasing organization and increasing academic ambition. Despite the many important definitions and redefinitions, and the advancements of mission and responsibility, a similar vein strings the history together. That is, each step in this progression, including the research endeavours, seem to be guided by the desire to care for the person while cognizant of intricate social contexts.

References
Health Promotion

Trans Fats: Health Risks and Policy Considerations

Jonathan Klein, Meds 2010
Jennifer Clara Tang, Meds 2009

Public attention has recently focused on the use of trans fats in commercial food preparation and efforts to ban them from commercial products. Trans fats have been shown to increase the risk of coronary heart disease more than any other calorie source, including other types of fat. Denmark and The Netherlands have already implemented substantial reductions in trans fat content, though each country achieved this goal through substantially different means. We review the chemistry and health risks of trans fats and discuss possible policy options to reduce trans fat consumption in North America.

This article has been reviewed by Dr. Chris Grant.

Introduction

Many recent media reports have focused on efforts to curb the levels of trans fats in food. The issue has become a hot topic in public discourse with the recent ban on trans fats enacted by New York City. These reports often contain little substantive information instructing readers about what trans fats are, what evidence exists that they pose a health hazard, and what policies have been implemented to attempt to curb their use. In this article, we seek to provide information on these topics and explore existing options for North American society when considering the issue of banning trans fats.

Chemistry and Use in Food

"Fats" is a term used by chemists to describe a chemical structure in which 3 “fatty acids” (long chain carbon molecules with a –COO at one end) are attached to a short chain of 3 carbon atoms called “glycerol”. From a nutritional viewpoint, “fats” are often subdivided into two categories: saturated and unsaturated. Unsaturated fats are made of fatty acid chains which contain at least one double bond, while saturated fats have none. These fats are typically liquid at room temperature, since naturally occurring unsaturated fats typically have their double bond in the cis orientation. This designation indicates that the carbon atoms on either end of the double bond are on the same side of the molecule creating a bent structure preventing the molecules from packing closely to one another and raising the compound’s melting point. Trans fats are unsaturated fats with carbon-containing groups oriented on opposite sides of the double bond (Figure 1). This configuration creates a straight chain of carbon atoms allowing for molecules to pack closely together and causing a solid state at room temperature.

An unsaturated fat is termed “polyunsaturated” if it contains two or more multiple bonds in any one fatty acid; unsaturated fats with only one multiple bond are “monounsaturated.” Polyunsaturated fats are commonly known simply as “unsaturated” fats. Trans fats are also called trans fatty acids (TFAs), since the trans-oriented double bond is located on the fatty acid part of the fat molecule.

![Chemical Structures](image)
Trans fats are produced industrially from the partial hydrogenation of vegetable oils using metal catalysts, eliminating some of the double bonds. The advantage of this process, from the food industry’s perspective, is that elimination of some double bonds makes for vegetable oils that are more solid (“spreadable”) rather than liquid, and which take much longer to go rancid (ie. to have their double bonds oxidized during storage). Being able to spread one’s ‘butter’ with a knife is important to many consumers; and shelf life is very important in the food industry.

Unfortunately, removal of some double bonds takes one back toward saturated fats with their undesirable health consequences; and perhaps worse, the same processes that remove some double bonds also create some trans double bonds in other places in the fats. These fats are often found in spreads such as margarine, pastry dough and other commercially prepared foods. TFAs are found naturally in small amounts in the meat of animals which chew their cud, such as cattle and sheep, but they only account for around 0.5% of total energy intake from these meats2,3.

Evidence Linking Trans Fats to Heart Disease

Fats are an essential part of a balanced diet. Canada’s Food Guide recommends between 30 and 45 mL of fats per day, though it stresses that these should come from (poly)unsaturated fats, while limiting saturated and trans fat intake4. Studies have demonstrated that eating mostly polyunsaturated fats and limiting consumption of saturated and trans fats provides significant protection against heart disease5.

High dietary consumption of trans fats has been linked to increased risk of myocardial infarction and other coronary events. Using data on over 85,000 female nurses from the Nurses Health Study, Willett et al demonstrated that the relative risk of coronary heart disease (CHD) between the population quintiles with the highest and lowest trans fat consumption was 1.50 (1.12-2.00 95% confidence interval)6. Ascherio et al demonstrated a relative risk of 2.44 (1.42-4.19) in a smaller, non-gender-restricted study conducted in Boston7. These results demonstrate substantial increases in CHD related to high trans fat intake. Other studies have examined the impact of trans fats on known risk factors for CHD. TFAs in the diet have been shown to both lower serum HDL and raise LDL cholesterol, both independent risk factors for CHD. These effects on serum lipids are seen in both men and women8.

Despite these data, fats remain a major source of calories for many people. People often find it difficult to completely eliminate a source of calories from their diet; they are more likely to replace a source of calories with other foods that provide similar caloric intake. So, it is instructive to compare the health risk posed by trans fats to those of similar compounds with which they might be replaced.

Replacing TFAs with any other calorie source has been shown to reduce levels of LDL, or “bad cholesterol”2,3. Reduced LDL levels decrease risk for CHD. Studies have also demonstrated that replacing TFAs with other fats increases serum HDL levels. Low HDL levels have also been linked with cerebrovascular and arterial disease, so elimination of TFA from the diet may also reduce the risk of these diseases. In a diet in which TFAs provide 2% of calories, replacing the calories from TFAs with an equal mix of carbohydrates, saturated, mono- and polyunsaturated fats, reduces the incidence of CHD by 3.8%9. If the TFAs are replaced by an equal mixture of mono and polyunsaturated fats, the reduction is 5.4%8.

Epidemiologic studies, however, have suggested a stronger reduction in heart disease if TFAs are eliminated from the diet. Replacement of TFAs by equal parts carbohydrates, saturated, non-TFA mono- and polyunsaturated fats has been estimated epidemiologically to confer a risk reduction of over 25%. It is likely that the true risk reduction falls somewhere in between these estimates, which would indicate a significant risk reduction from elimination of dietary TFAs9.

Some recent calculations suggest that significant reductions in TFA levels in the United States could prevent between 72,000 and 228,000 cases of heart disease a year, or up to 19% of the total annual incidence9. Reduction or elimination of TFAs would go a long way to reducing a very significant cause of morbidity and mortality.

Policy Implementation

Efforts to ban industrially produced TFAs in food have been widely covered in the media. Recent press coverage in North America has focused on the actions of New York City’s municipal government, which instituted a ban on TFAs in 2006. But New York’s effort is only one in a long string of initiatives aimed at curbing people’s intake of trans fats. Similar actions have been undertaken around the world, and have used different techniques to achieve different results.
The most common path to reducing TFA consumption has been through government regulation of the food industry. In response to Willett et al.’s 1993 Lancet paper demonstrating the adverse health effects of TFAs, the Danish Nutrition Council embarked on an extensive mission investigate these effects further. In a series of reports the subject, they demonstrated the wide body of data that had arisen demonstrating the adverse health effects of TFAs, such as increased CHD incidence, and the absence of health benefits. They concluded that TFAs used in industrial and baking processes are responsible for the majority of Danish TFA consumption, and advocated for their elimination from the food supply. The Council led a long campaign against industrial TFAs, in response to which the government of Denmark enacted the world’s first nation-wide TFA regulation in 2003. The Canadian House of Commons considered a similar measure in 2004, but the bill failed when parliament was dissolved prior to the general election of that year. Despite the failure of that bill, the issue continued to make waves at all levels of government in Canada. A 2006 report by the federal Trans Fat Task Force recommended limiting trans fat content to two percent of total fat in spreadable margarines and five percent of total fat in all other foods. At the municipal level, Toronto’s medical officer of health, Dr. David McKeown, is scheduled to issue a report by September 2007 on possible strategies for eliminating trans fats in the city.

Monitors in Denmark have verified that the legislative efforts have succeeded in reducing trans fat intake. As the effort is still fairly recent, no long term studies have yet studied whether the efforts have yielded substantial public health benefit. Continued monitoring and follow up of TFA reduction efforts must be undertaken to determine whether the effort has prevented CHD in the Danish population.

In a parallel success to that seen in Denmark, the food industry in The Netherlands achieved a significant reduction in trans fats in their nation’s food supply, without need for government intervention. A major tipping point came from a 1990 publication by Korver and Katan aided by the Anglo-Dutch food corporation Unilever. The study demonstrated that TFAs lowered HDL and raised LDL levels in the blood. After media reports disseminated this knowledge, Unilever decided in 1994 to remove TFAs from its commercial spreads, such as margarine. Sensing a shift in the market towards healthier products and seeing one of the industry leaders taking such a step, other companies followed Unilever’s lead. Within two years of Unilever’s decision, most retail margarine sold in The Netherlands contained only trace amounts of TFA. In 2004, another industry-led initiative successfully reduced the amount of TFA in frying oils used by chain restaurants. One estimate places the number of myocardial infarctions avoided by the Dutch initiative at 1,750 cases per year.

Lawsuits against corporations have also been used to reduce companies’ use of trans fats. The efforts of a group in California called BanTransFats.com, Inc. led Kraft to eliminate trans fats from Oreo cookies and to reduce or eliminated TFAs from over 600 other products. The group also applied pressure on McDonald’s in 2003, forcing the company to publicize that it had not changed its cooking oil to one lower in trans fats and continues to work to achieve further reductions in commercial TFA use.

Discussion

The Danish and Dutch experiences demonstrate public receptiveness to reductions of TFAs in food. They also illustrate contrasting strategies for achieving this goal. One might, then, consider which approach is more suitable for North America. Katan suggests that the Dutch approach may not be as exportable to other countries as it may initially seem. The Dutch adhere to a traditional method for crafting social solutions without government interference, derived from their collaborative approach to water management. This ethos has translated to other areas of Dutch society; labour conflicts and other issues are typically settled through negotiation, rather than legislation or arbitration.

Though lacking the Dutch collaborative tradition, North America has long used market forces to advance societal change. A market-based solution may well be the best path toward TFA reduction in Canada and the United States. A major driving force in the Dutch experience was the decision by industry leader Unilever to reduce TFAs in their products. Competitors sensed this shift in the market and followed suit, lest Unilever further increase their market share at the expense of the competition. If a major North American corporation were to eliminate TFAs, it could start a similar cascade through the food industry and cause the same result as in The Netherlands without government intervention.

North American corporations have thus far been unwilling to change their practices. A major problem commonly cited by North American manufacturers is that soybean oil, the major edible oil used in North America, contains alpha-linoleic acid, which is unstable and thus must be partially hydrogenated to make it suitable for cooking. Katan points to McDonald’s as emblematic of this resistance; the company has yet to reduce TFA levels in the cooking oil used in their North American franchises, despite the chain’s successfully reducing TFA levels in their Dutch restaurants. Though action from public-interest groups did cause McDonald’s to admit to this resistance and publicize the TFA content of its cooking oil, the activity has not yet caused McDonald’s to adopt ingredients...
lower in trans fats\textsuperscript{17}. Perhaps the public pressure to reduce TFA content in North America has not yet reached the levels seen in The Netherlands in the 1990’s. However, given the recent media coverage given to TFAs, increased scientific knowledge of the risks of TFAs, the Trans Fat Task Force’s recommendations and Dr. McKeown’s forthcoming report, Canadian public support for TFA reduction could be expected to balloon in the near future. A major public outcry could create the market forces necessary for an industry-wide shift similar to the one seen in The Netherlands.

On the other hand, Denmark has achieved similar success to The Netherlands by legislating TFA levels downward. Both the TFA-limiting bill introduced into in the House of Commons and the government of New York City’s recent decree demonstrate that North American policy-makers favour legislating TFA levels, rather than waiting for industry to make a change in their practices that might never happen.

The American Food and Drug Administration has already required that trans fat content be included on food labels, and its Nutrition Subcommittee of the Food Advisory Committee concluded that trans fats are “more adverse” than saturated fats in terms of increased risk of coronary heart disease\textsuperscript{18}. As mentioned previously, the newest edition of Canada’s Food Guide, published in 2007, specifically cautions that trans fats should be avoided as much as possible. These may be seen as first steps towards further regulation of TFA levels in food, though firm legislation on a national level has not been considered since the failed 2004 Commons bill.

Given the lack of industry-driven change seen in North America to date, governments could be persuaded to introduce hard hitting legislation if prompted to by the public. Some success has already been shown by BanTransFat.com, Inc., though widespread reductions of TFAs have not yet been achieved through litigation\textsuperscript{17}. Increased public awareness of TFAs coupled with failure of market forces or legislation might lead to successful lawsuits achieving dramatic reductions in TFA content in the future.

Conclusion

The health risks posed by consumption of trans fats are well documented. Increased levels of serum LDL and lowered HDL increase one’s susceptibility to coronary heart disease and other problems. Replacing trans fat content in food with a combination of other types of fat provides substantial reduction in risk of coronary heart disease, and some studies suggest that up to 19\% of coronary heart disease cases could be prevented through TFA reduction initiatives.

As Canadians become more aware of the risk posed by TFA consumption and the alternatives to eating it, they may demand a reduction in TFA levels in their food. Whether market forces, government legislation or legal action drive this change remains to be seen, but reduction of TFA to levels similar to those seen in Denmark and The Netherlands will likely be a reality in the near future.

References

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A Clinical Perspective on Colorectal Cancer

Amber Menezes, Meds 2009

Case

Mr. P. Smith is a 60 year-old gentleman who presented to his family physician complaining of a six week history of abdominal cramping and stools streaked with blood. He also mentioned that his bowel habits had changed, with increasing constipation.

Upon obtaining a patient history, Mr. Smith’s physician noted a diet high in red meat and 40 years of tobacco use. No family history of large-bowel disease was present. A digital rectal exam was normal, but the fecal occult blood test tested guiac positive. After referral to gastroenterology, a colonoscopy was performed, and a lesion was identified in the distal colon. Pathology revealed an adenocarcinoma of the colon.

This article has been reviewed by Dr. John Howard.

Introduction

Colorectal cancer is the commonest cancer in males and females combined. In the developed world, this disease is second only to lung cancer for new cases that occur each year.\(^1\)\(^{[JMH3]}\) Annually, there are approximately 130,000 cases and 57,000 deaths in the US due to colorectal cancer.\(^1\) The incidence of colorectal cancer ranges between the ages of 40 to 75\(^1\), although it most commonly arises in individuals over the age of 50.\(^2\)

Regardless of etiology, the majority of colorectal cancers are due to transformation of tubular or villous adenomatous polyps (protrusions of tissue above the mucosa).\(^1\)^{2,3} Adenomatous polyps have the potential to be malignant, especially if they are >2cm, sessile (flat-based), and villous (papillary) in nature.\(^2\)^{3} However, <1% of polyps ever develop into cancer.\(^2\)

There are several risk factors that predispose to colorectal cancer. These include age (after age 50), diet, tobacco use, a history of ulcerative colitis and hereditary causes.\(^2\)^{4} Diets high in animal fat and calories, such as found when ingesting red meat and processed meat are implicated in increasing the risk of this disease.\(^2\) Although the exact mechanism is unknown,\(^1\) one possible hypothesis is that eating animal fats leads to greater numbers of anaerobes in the gut, and their subsequent action on bile acids forms carcinogens.\(^2\) Another lifestyle factor linked to development of colorectal cancer is cigarette smoking, particularly after a smoking history of 35 years or more.\(^2\)

There is a definite genetic component. With no close relatives affected, the risk of colorectal cancer is 1 in 50.\(^3\) If an individual has a first degree relative (parents, siblings, children) who has had colorectal cancer, that risk increases to 1 in 17, and then to 1 in 10 with two first degree relatives affected.\(^3\) Hereditary syndromes such as familial adenomatous polyposis (FAP) and hereditary non-polyposis colorectal cancer (HNPCC) also play a role in increasing the risk of cancer. FAP is an autosomal dominant disorder that can produce thousands of polyps in affected individuals, such that the risk of colorectal cancer is close to 100% by age 40.\(^5\) HNPCC involves mutations in genes encoding enzymes involved in DNA surveillance; defective enzymes lead to lack of repair and cancerous mutations.\(^5\) The important point in HNPCC is that cancers tend to arise \textit{de novo} rather than in polyps.

Screening

A variety of screening tests are available, yet screening rates are low. A possible reason is that professional organizations have not yet come to a consensus as to which test is the best or most preferred.\(^6\) However, they all stress the importance of screening of eligible adults (ie. over age 50).\(^6\) According to the American Cancer Society’s Clinical Guidelines for Colorectal Cancer Screening, the strategies recommended are any one of the following: 1) annual fecal occult blood testing (FOBT); 2) flexible sigmoidoscopy every 5 years; 3) annual FOBT and a flexible sigmoidoscopy every 5 years; 4) colonoscopy every 10 years.\(^7\)

\textit{Fecal occult blood tests}
There are several types of FOBTs, but the most commonly used is the Haemoccult test, where guiac filter paper undergoes phenolic oxidation in the presence of hemoglobin in stool. Ideally, a FOBT should consist of three serially obtained samples of stool, completed by the patient at home and then mailed to the physician or laboratory. Utilization of this screening test has been reported to cause a 14-16% reduction in the relative risk of colorectal cancer mortality when performed biennially over 10 years. Furthermore, FOBT can detect 10 mL of blood loss/day in 67% of patients, and 20 mL or more of blood loss/day in 80-90% of patients. The advantages of FOBT are that it is inexpensive and causes the patient only little discomfort. However, a key limitation of the Haemoccult test is that 50% of patients with colorectal cancer test negative, due to the intermittent bleeding pattern of the disease. In addition, the false positive rate increases by 2-10% in older persons when samples are rehydrated (which slightly increases sensitivity).

Flexible sigmoidoscopy
Following a positive FOBT result, a workup of the colon is recommended. Flexible sigmoidoscopy is usually the next step as it is quick, safe, simple, and has high sensitivity and specificity. This test is performed without sedation in a patient that has received a laxative or an enema, and examines the distal 65 cm of the colon. Unfortunately, this does leave the proximal half of the large bowel unexamined, yet this limitation may not be critical. Evidence shows that adenomas of the distal colon are more likely to progress to malignancy than those located in the proximal colon.

Colonoscopy
A trained endoscopist examines the entire colon via this procedure, which requires patients to undergo light sedation and follow a liquid diet with use of laxatives beforehand. Colonoscopy is the colorectal cancer screening test with the highest sensitivity and specificity, but that does not make it the best test. It is extremely expensive (the median charges for colonoscopy in Canada is $606 US dollars), poses a greater risk of perforation (2 per 1000 procedures), versus 1 per 10,000 for sigmoidoscopic procedures) and more risk of complications due to sedative use. But for those patients without risk factors trying to choose between screening options, colonoscopy might seem attractive as it only needs to be performed once or twice in a lifetime, thus maximizing compliance.

As there is no ideal course of action in terms of screening, physicians should discuss the pros and cons of each test in light of patient preference. Importantly, the physician needs to keep in mind that after the age of 50, it is recommended that all patients undergo some form of screening for colorectal cancer.

Clinical Presentation
Signs and symptoms vary depending on the site of the cancer. Cancer of the right colon (cecum, ascending colon, proximal transverse colon) presents with fatigue, weight loss, and hypochromic microcytic anemia. Obstruction or change in bowel habits is rare as the stools are mostly liquid in the area of the right colon. Stools appear normal but occult blood loss can occur due to ulceration of lesions in the right colon. In contrast, the left colon has a smaller lumen and stool has a semisolid consistency in this area. As such, cancer of the distal transverse and descending colon tends to obstruct passage of stool, causing abdominal pain and altered bowel habits (constipation, diarrhea). Perforation occasionally develops, with focal severe pain and tenderness. Stools appear streaked with blood. Lastly, cancer of the rectum presents most commonly as bleeding with defecation. Narrowed stools, pain, and tenesmus (feeling of incomplete evacuation) may also be present.

Diagnosis and Management
Colonoscopy is performed on those individuals with positive FOBTs or with lesions seen on sigmoidoscopy; all lesions are then removed for pathologic examination. If cancer is diagnosed on the basis of histology, further workup includes a thorough physical examination, abdominal CT, chest X-ray, biochemical assessment of liver function, and routine laboratory tests to evaluate metastatic disease, anemia, and overall condition. Tumour recurrence can be predicted by elevation of serum carcinoembryonic antigen (CEA) levels. However, this test is not specific, and elevated levels are found in 70% of patients with colorectal cancer. Prognosis for patients with colorectal cancer is linked to the degree of tumour penetration into the bowel wall (T), the presence of lymph node involvement (N), and the presence or absence of distant metastases (M) (Table 1).
Table 1. Staging of and Prognosis for Colorectal Cancer

<table>
<thead>
<tr>
<th>Stage</th>
<th>Dukes</th>
<th>TNM</th>
<th>Numerical</th>
<th>Pathologic Description</th>
<th>Approximate 5-Year Survival, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>T1N0M0</td>
<td>I</td>
<td>I</td>
<td>Cancer limited to mucosa and submucosa</td>
<td>&gt;90</td>
</tr>
<tr>
<td>B₁</td>
<td>T2N0M0</td>
<td>I</td>
<td>II</td>
<td>Cancer extends into muscularis</td>
<td>85</td>
</tr>
<tr>
<td>B₂</td>
<td>T3N0M0</td>
<td>II</td>
<td>III</td>
<td>Cancer extends into or through serosa</td>
<td>70–80</td>
</tr>
<tr>
<td>C</td>
<td>TxN1M0</td>
<td>III</td>
<td>IV</td>
<td>Cancer involves regional lymph nodes</td>
<td>35–65</td>
</tr>
<tr>
<td>D</td>
<td>TxNxM1</td>
<td>IV</td>
<td>IV</td>
<td>Distant metastases (i.e., liver, lung)</td>
<td>5</td>
</tr>
</tbody>
</table>

Ideally, curative surgery is attempted in 70% of patients without metastatic disease. Depending on the cancer site, surgery can consist of hemicolectomy (right or left colon), sigmoid colectomy (sigmoid colon), anterior resection (low sigmoid or high rectal tumours), and abdomino-perineal (A-P) resection for low tumours in the rectum. After total resection, patients should be followed for 5 years with semiannual physical examinations, yearly blood chemistry measurements, and triennial endoscopic surveillance of the large bowel. In patients with metastatic disease, subsequent resection is sometimes attempted in otherwise healthy patients with single liver metastases located only in one hepatic lobe, no extrahepatic metastases, and have had their primary tumour already resected. Chemotherapy is performed in patients with advanced colorectal cancer. The most commonly used agent is 5-fluorouracil, which is usually administered with leucovorin, a reduced folate. This treatment has been found to reduce tumour size by 50% or more in 20% of patients, and prolongs median survival from 6 months to 11 months. The most common side effects are neutropenia and stomatitis. Chemotherapy also plays a role in palliation of metastatic disease, using newer agents such as irinotecan and oxaliplatin. Radiotherapy is used in rectal cancer, either pre- or post-operatively to decrease the risk of pelvic recurrence by 20-25%. However, it does not appear to prolong survival; at best, it may increase survival by 10%. Radiation therapy has not been found to be effective in treating primary colon cancer.

Conclusion
Colorectal cancer is a cancer that does have effective screening techniques to detect it in early or precancerous stages. A variety of screening options are available, with corresponding advantages and disadvantages. Clinicians need to be aware of the sensitivity and specificity of screening tests when discussing the different options with patients. Once colorectal cancer is diagnosed, management varies depending on the site and stage of the cancer, ranging from surgery to chemotherapy to radiation.

References
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Rare complications of common presentations in family medicine: a review of Metastatic Basal Cell Carcinoma and Hypertension in Pregnancy secondary to Pheochromocytoma

Tiffany Kwok, Meds 2010  
Badrinath Narayan, Meds 2009

The Zebra files section, with a definition of unusual and interesting cases, at the surface seems to contradict this issue’s theme of family medicine. However, it is important for family physicians and generalists to be aware of rare and serious complications of relatively benign and common conditions so they can refer accordingly. In this issue our article will explore two rare complications of two different common presentations in family medicine—metastatic basal cell carcinoma, and endocrine hypertension in pregnancy caused by pheochromocytoma.

This article has been reviewed by Dr. Nithya Ramani.

PART I: METASTATIC BASAL CELL CARCINOMA

Introduction
Basal Cell Carcinoma (BCC) is the most common malignancy worldwide, with a lifetime risk of 30% in Caucasian, North American populations. It is generally an indolent skin tumour with low metastatic potential and high cure rates. However, consequences of metastasis are often deadly and it is important to be aware of this severe complication.

Clinical Presentation
There are 5 main clinical subtypes of BCC:
1) Nodular BCC- the most common variant presents as a firm, translucent papule or nodule with a smooth surface, telangiectasia, and well-defined borders. A cystic variant is uncommon.
2) Ulcerating BCC- also known as rodent ulcer, presents as an ulceration on the skin with a rolled border, translucency, smooth surface, telangiectasia, crusting.
3) Morpheaform/Sclerosing BCC- resembling a superficial scar, white/yellow waxy sclerotic plaque with pepperish pigmentation.
4) Superficial BCC- thin, erythematous plaques with telangiectasia and scaling. Usually multicentric.
5) Pigmented BCC- A rare variant, presents with black or brown macules superimposed on features of nodular BCC.

Most BCC’s occur as an isolated single lesion on the head and neck in light-skinned males over 40. Differential diagnosis of BCC include squamous cell carcinoma, actinic keratosis, sebaceous hyperplasia, dermatofibroma, superficial spreading and nodular melanoma, and melanocytic nevi, depending on its subtype.

Table 1: Predisposing factors for BCC
| Skin phototypes I, II or albino with prolonged sun exposure<sup>1,2</sup> |
| History of heavy sun exposure in childhood<sup>1</sup> |
| X-ray therapy for facial acne<sup>2</sup> |
| Ingestion of arsenic (Superficial multicentric BCC)<sup>1,2</sup> |
| Immunosuppression<sup>5</sup> |
| Positive family history of skin cancer<sup>1</sup> |
| Genetic conditions (albinism, xeroderma pigmentosum, Bazex’s syndrome, Gorlin’s syndrome)<sup>1</sup> |

BCC may be treated surgically or non-surgically. Surgical treatment includes electrodessication and curettage, cryosurgery, excision and Mohs’ micrographic surgery. The latter is reserved for cases in high risk sites
on the face, morphoeic and recurrent tumours. Cure rates for surgical treatments exceed 95%. Non-surgical treatments are less effective and include radiation, photodynamic therapy, and topical fluorouracil or imiquimod.\textsuperscript{1,5}

**Metastasis**

Metastasis is such a rare occurrence that some sources even state that BCC does not metastasize. However, reported rates of metastasis range between 0.0028 to 0.55% of all BCC’s. Metastatic BCC (MBCC) was first described in 1849 by Beadles whose 46-year old male patient had an ulcerating BCC on the face metastasizing to the submaxillary lymph node.\textsuperscript{3} In 1951, Lattes et. al. described criteria for MBCC (Table 2):

<table>
<thead>
<tr>
<th><strong>Table 2: Lattes’ criteria for MBCC</strong>\textsuperscript{3}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary tumour originated from the skin and not from mucous membranes or other glands</td>
</tr>
<tr>
<td>Metastasis occurred to a distant site from the primary tumour and could not result from direct extension</td>
</tr>
<tr>
<td>Both metastatic and primary tumours have identical histopathology</td>
</tr>
</tbody>
</table>

Since 1849, there have since been only over 300 cases of MBCC reported. Many of the predisposing factors for MBCC are similar to those of BCC, commonly presenting in light-skinned individuals, males, and in the head and neck area. BCC’s have been found to metastasize through both hematogenous and lymphatic avenues, lymphatics being more common. Common sites for metastasis (in order of frequency) include lymph nodes, lungs, bones, skin and parotid glands. In von Domarus et. al.’s review of over half of these cases, patients first developed BCC at a median age of 45, and later presented with MBCC at a median age of 59.\textsuperscript{4} This is higher than that of BCC, and possible explanations include inherent aggressiveness of earlier-presenting BCC, or older patients may not survive to metastasis.\textsuperscript{3} Median time from start of BCC to progression to MBCC was found to be 9-11 years, but intervals range from months to decades.\textsuperscript{3} Prognosis of MBCC is poor, with a median survival of 8-14 months after its diagnosis, and a 5-year survival rate of 10%.\textsuperscript{3,4}

<table>
<thead>
<tr>
<th><strong>Table 3: BCC at high risk for metastasis</strong>\textsuperscript{3,4}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Located on head and neck</td>
</tr>
<tr>
<td>Size &gt;10cm</td>
</tr>
<tr>
<td>Deeply penetrating tumours</td>
</tr>
<tr>
<td>Perineural spread</td>
</tr>
<tr>
<td>Invasion of blood vessels</td>
</tr>
<tr>
<td>Multiple recurrences in primary tumour site</td>
</tr>
<tr>
<td>Morpheaform and adenocystic subtypes</td>
</tr>
</tbody>
</table>

Workup for patients with suspected MBCC consists of history and physical examination, concentrating on lymph nodes near the primary BCC. Helpful lab tests include CBC, liver function, bone scan, and CT scan of the chest, abdomen and pelvis.\textsuperscript{4}

Because of the rare nature and poor prognosis of MBCC, there is not much evidence surrounding optimal treatment. In general, treatment is palliative and depends on the location of metastasis as well as the general health and age of the patient. In cases of local spread, surgery provides the best prognosis, whereas radiation therapy and chemotherapy with Cisplatin is best for generalized disease.\textsuperscript{4}

**Conclusion**

Basal cell carcinoma is an extremely common malignancy that is sometimes treated by family physicians due to ease of treatment, however, knowledge of its deadly metastatic potential is crucial to prompt referral, treatment and possibly better prognosis for the patient.

**PART II: HYPERTENSION CAUSED BY A PHEOCHROMOCYTOMA AND IT’S MANIFESTATION IN PREGNANCY**

**Introduction**

Hypertension is a frequent complication of pregnancy and may compromise fetal and maternal outcome. Hypertension may be pregnancy-induced, essential or secondary to endocrine disorders. Most cases of endocrine hypertension are the consequence of adrenal diseases.\textsuperscript{3} In one case in the literature, a pregnant female who has been
suffering from persistent hypertension arrives at her family physician complaining of a headache. The patient is a recent immigrant to Canada and does not speak English very well. The results of the tests made during that visit find that the patient has a constellation of negative signs and symptoms: persistent hypertension, hyperreflexia, edema, proteinuria, oliguria, hyperuricemia and thrombocytopenia. The family doctor suspects preeclampsia. However, in this case the patient was eventually found to have a very rare condition called a pheochromocytoma.¹

The most hazardous form of endocrine hypertension during pregnancy is a pheochromocytoma because it may involve paroxysmal arrhythmia and/or hypertension during labor.² It is therefore important that it be diagnosed early during the pregnancy to reduce mortality and morbidity to the mother and the baby. Diagnosis is difficult however because a pregnant woman can present solely with chronic hypertension and headaches, which can lead one on the path to suspect preeclampsia or essential hypertension. In the case study, as the authors mention, the worsening headaches and labile hypertension could also be attributed to stress, cultural isolation and medication.³

**Natural History**

A pheochromocytoma is rare, found in about .01-.1% of patients with hypertension in the general population. There are only about 200 cases reported of it occurring in pregnancy.⁴ They are catecholamine secreting tumours of the adrenal medulla’s chromaffin cells (of neural crest origin and secreting epinephrine, norepinephrine and dopamine). They can occur at all ages in both sexes, but should especially be suspected in patients presenting with poorly controlled hypertension at less than 40 years of age.

In pregnancy, the maternal mortality rate is 2-4% if tumour is diagnosed in the antenatal period, and 14-25% if diagnosed intrapartum or after delivery.¹ Fatal crises can be caused by various stimuli from anesthesia to the mechanical effects of vigorous fetal movement to the expulsive forces of vaginal delivery.⁴ Fetal mortality is 11-15% antenatally, but 55% if during labour or after delivery.¹

**Pathophysiology**

They are sporadic in 90% of cases and inherited in 10%. They are associated with MEN, MENIIA and MENIIB syndromes.¹ They are often described by the 10% rule: 10% arise in association with familial syndromes, 10% are extra-adrenal, 10% in sporadic cases are bilateral, 10% are multiple and 10% are malignant. Prognostic factors for a pheochromocytoma include stage, age, histology, and various chromosomal markers such as DNA ploidy, n-myc amplification, trk-a expression, 17q gain, 1p loss and telomerase expression.

**Diagnosis**

Diagnosis is made by recognizing the effects of a hormonal milieu caused by excess catecholamine secretion (a sympathetic response) as well as the resulting production of various vasoactive peptides. A patient can present with a combination of hypertension, Headache, Hyperhidrosis (sweating flushing of the skin), Hypomotility of gut (constipation), hyperglycemia and hypermetabolism (tachycardia, anxiety, nausea, palpitations).

Also distinguishing is postural hypotension and hypertension worsening in the supine position.¹ It can be sustained or paroxysmal, and there can be a drop in orthostatic blood pressure. Classical symptoms of pheochromocytoma can be reproduced by an abdominal massage in the postpartum period.¹

A 24 hr urine screen for metabolites of catecholamines (metanephrines, fractionated catecholamines and vanillylmandelic acid) is the common screening test. A plasma screen can also be done for catecholamines or metanephrines. Two normal tests of plasma and urine catecholamines can exclude a diagnosis. Tests for tumor location are limited to ultrasound and magnetic resonance scans in order to avoid maternal and fetal irradiation.³

**Differential**

Other conditions which increase catecholamines include anxiety, pain, bladder distention, trauma and pressure on the tumor. Cardiomyopathy has been reported as a complication of a pheochromoctyoma in pregnancy. CHF can increase plasma and urine metanephrine levels.¹

**Management**

The patient is managed by the family physician in tandem with constant obstetrical monitoring and a prompt endocrinologist referral. While referral to a surgeon for excision of tumour is the definitive cure, clinically it is still controversial as to when it can be safely used¹. Experts do agree however that diagnosis in later pregnancy is best handled with medical stabilization.
Alpha blockade should always be established before before β. If β-adrenergic blockade is attempted first to reduce blood pressure by reducing heart rate and contractility, it will also result in the loss of vasodilation caused by β2 receptors. There will be an increased alpha effect that is unopposed by β2, and will thus have further increased the blood pressure. The alpha blocker of choice is phenoxy-benzamine.³

**Conclusion**

A pheochromocytoma is a rare yet hazardous form of endocrine hypertension during pregnancy which a physician should be vigilant for in patients with poorly controlled hypertension and a constellation of signs and symptoms which point to a adrnergic hormonal milieu. Medical stabilization, prompt referral and consideration of surgery are the components of proper management.

**References**

**PART I**


**PART II**

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Annular papules or plaques are frequently encountered by Family Physicians. Tinea corporis is often the first entity that comes to mind because it is common and it classically presents with this morphology. However, there are other important diagnoses that need to be considered. For example, granuloma annulare is characterized by erythematous or flesh-coloured plaques with smooth borders and no scaling or vesicles. The lesions of nummular dermatitis are coin shaped papules with central vesicles that expand and cause a central clearing. Subacute cutaneous lupus erythematosus can present with bright red annular lesions with central regression and little scaling. Fixed drug eruptions appear as well demarcated plaques that can develop central vesicles or bulla. This article will review these conditions.

Introduction

Examining the morphology of skin lesions is critical when working towards a diagnosis. However, one must be careful not to link a specific morphology with a single entity. Annular papules or plaques are quite distinct, but they can also be very deceptive. These ringed lesions immediately prompt both patients and physicians to think of “ringworm” or more correctly tinea corporis. The term “ringworm” is a misnomer from a time when such raised ringed lesions were believed to be caused by invasive worms. The association between annular lesions and tinea corporis can lead to a delay in the diagnosis and treatment of many of the other lesions that can present as annular papules or plaques (Tables 1 and 2). This article will review tinea corporis, granuloma annulare, nummular dermatitis, subacute cutaneous lupus erythematosus, and fixed drug eruptions.

Differential Diagnosis of Annular Papules or Plaques

<table>
<thead>
<tr>
<th>Infections: Tinea Corporis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflammatory: Granuloma Annulare</td>
</tr>
<tr>
<td>Dermatitis: Nummular</td>
</tr>
<tr>
<td>Drugs: Fixed Drug Eruption</td>
</tr>
<tr>
<td>Autoimmune: Subacute Cutaneous Lupus Erythematosus</td>
</tr>
</tbody>
</table>

Table 1. The Differential Diagnosis of Annual Papules or Plaques.

* note: The differential diagnosis of annular lesions is vast. Only annular papules and plaques were reviewed in this article and even these entities were limited to those deemed suitable for an initial differential diagnosis.

Images

Images for the lesions presented in this article (with the exception of nummular dermatitis) can be viewed at: http://www.atlasdermatologico.com.br/
The picture numbers and names are indicated below:

- Tinea Corporis
  5600. Tinea Corporis2
  5597. Tinea Corporis17

- Granuloma Annulare
  1771. Granuloma Annulare1
Granuloma Annulare
Granuloma Annulare is a common asymptomatic cutaneous condition of unknown etiology. The lesions are erythematous or flesh-colored non-scaly papules.6 The papules group together forming an annular arrangement.6 In contrast to tinea corporis, there are no associated vesicles and the annular border is smooth with no scaling.4 Lesions can be found anywhere on the body, and are most commonly seen on the legs and the dorsum of the hands and feet7 Often the palms, soles, and scalp are spared. The diagnosis of granuloma annulare is clinical.6 A punch biopsy is done if there is any uncertainty about the diagnosis.6 Because granuloma annulare is self limited and resolves spontaneously in more than 50% of patients in two months to two years, no treatment in required.7 However, patients often find the lesions distressing; thus, for cosmetic purposes or in cases where the condition is more chronic, topical glucocorticoids are the first line of therapy.7 Intralesional corticosteroid injections, cryotherapy, and electrodesiccation are other options.6 Little evidence has been accumulated on the efficacy of treatment options for disseminated granuloma annulare. Dapsone, isotretinoin, hydroxychloroquine, and PUVA (psoralen and ultraviolet A) have been used with some success in small uncontrolled studies and case reports, but consultation with a Dermatologist should be sought at this stage.6

Nummular Dermatitis
Nummular dermatitis is a disseminated eczema that is characterized by well demarcated coin-shaped papules and plaques.8 Central vesicles may form, which then expand and cause a central clearing.4 The latter phenomenon results in an annular appearance.1 The lesions can be associated with pruritus, xerosis, and contact sensitization (e.g. nickel, chromate, fragrances, etc.).5,8 Nummular dermatitis commonly affects the extremities and often follows a very chronic course.1,8 The diagnosis is clinical and the treatment is with medium to high potency topical corticosteroids.5

Fixed Drug Eruptions
Fixed Drug Eruptions (FDE) generally occur 1-2 weeks after the first exposure to a drug.5 Subsequently, lesions develop over the course of 24 hours.5 There are case reports that demonstrate FDE with most of the commonly used drugs including sulfonamides, NSAIDs, barbituates, tetracyclines, and carbamazepine.5,9 One or a few round, sharply demarcated, erythematous or pigmented plaques typically appear. They may became edematous or form vesicles or bulla.10 The vesicles or bulla are often central giving the appearance of an annular lesion. In addition, an erosion can develop in the middle of the lesion.5 Lesions can occur anywhere in the body, but often favour the lips, face, hands, feet and genitalia.5,9 They fade over several days often leaving an area of hyperpigmentation.9 There is also a variant of FDE that is non-pigmenting.11 When the causative drug is readministered the lesions reoccur exactly on the same sites, which is a distinguishing feature of FDE.10 Additional
lesions may also appear on readministration. Diagnosis is based on history and patch or provocation testing. Topical application of increasing concentrations of drug will illicit the reaction in many patients. Controlled oral exposure to the drug is attempted if topical testing is negative and the drug is still strongly suspected. The main treatment is elimination of the offending agent.

**Subacute Cutaneous Lupus Erythematosus**

Subacute cutaneous lupus erythematosus (S克莱) presents as either annular or psoriasiform papulosquamous lesions. The annular lesions are bright red with central regression and little scaling. Photosensitivity is a significant component of S克莱. Thus lesions commonly appear on the extensor surface of the arms, dorsal surface of the hands, upper back, the V-neck area of the upper chest, and the shoulders. Lesions resolve with slight atrophy (no scarring) and hypopigmentation. Diagnosis is based on clinical findings and confirmed by histology and immunopathology. Approximately 50% of patients with S克莱 will satisfy four or more of the American Rheumatism Association's criteria for systemic lupus erythematosus. Using immunopathological testing, immunoglobulin and/or complement components can be shown to form a granular band-like array at the dermal-epidermal junction in 60% of S克莱 patients. Furthermore, a distinctive “dust-like” pattern of IgG deposition overlying epidermal basal cells and cells just below the dermal–epidermal junction was reported to be a frequent marker for S克莱 lesions. In terms of serology, 70% of these patient are ANA positive, while 63% have Ro antibodies.

The first step in treatment is avoidance of exposure to sunlight by using sunscreens or physical barriers. Topical or Intraleison corticosteroids, tacrolimus, or pimecrolimus would be the next step. Most patients will go on to require some form of systemic therapy. Approximately 75% of S克莱 patients respond to single agent or combination aminoquinoline therapy (hydroxychloroquine, chloroquine, quinidine) for those who fail antimalarial therapy other options include dapsone, thalidomide, clofazamine, gold formulations, and methotrexate.

**Conclusion**

Formulating a good differential diagnosis of annular papules and plaques is an important step in reducing the tendency to label all annular lesions as “ringworm”. It will help facilitate the appropriate investigations and management of these varied conditions.

**References**

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HÔPITAL RÉGIONAL DE SUDBURY REGIONAL HOSPITAL
Preventive Care Strategies in the Management of Systemic Lupus Erythematosus

Tiffany Kwok, Meds 2010
Stephen Chihrin, Meds 2008

Systemic Lupus Erythematosus (SLE) is one of the most common yet complex autoimmune connective tissue diseases. The clinical picture painted by SLE is broad, affecting musculoskeletal, skin, cardiovascular, renal and central nervous systems, and thus presents a challenge for any physician to manage. One of the most important roles for a family physician in the care of this patient is to focus on preventive measures to minimize complications from SLE thereby improving quality of life. This article aims to review the common presentations and complications arising from SLE and the corresponding possibilities for a preventive care approach.

This article has been reviewed by Dr. George Kim.

Introduction

Systemic lupus erythematosus (SLE) is a complex autoimmune connective tissue disorder not uncommonly encountered in general practice. SLE has a prevalence of nearly 30 per 100,000 patients, and is significant for its frequency in younger females, occurring nearly nine times as often in women, with onset most often during the 2nd to 4th decade of life. A patient with SLE poses numerous long-term challenges to the primary care physician, with potential for acute life threatening multi-system organ disease as well as chronic debilitation resulting directly from the disease itself or secondary to medical management. The predisposing and precipitating factors underlying SLE are not well understood, but are believed to include genetic and environmental triggers resulting in dysregulation of both innate and adaptive immune mechanisms as well as impaired clearance of immunogenic complexes including apoptotic cells. The difficulty in understanding these mechanisms, their interaction, and their own etiologies currently precludes primary prevention. As such, SLE must be aggressively managed following diagnosis to minimize ongoing complication risk. This paper aims to address a number of areas in which preventive medicine can greatly improve the quality of life of individuals with SLE, and potentially reduce long-term morbidity.

Diagnosis

The American College of Rheumatology has established diagnostic criteria, quite familiar to the medical student, as shown in Table 1. Intended for research classification, these criteria provide an overview of potential signs and symptoms but should not be relied upon for individual diagnosis. The complexity of these criteria illustrates the considerable variability of SLE and the difficulty commonly encountered in reaching a diagnosis. In fact, it has been suggested that most patients receive a diagnosis nearly five years following initial onset of symptoms.

The most common initial manifestations include malaise, fatigue, nausea and anorexia. A low grade fever, photosensitive rashes, pleuritic chest pain, complaints of xerostomia or xerophthalmia, hair loss, or sudden and persistent arthralgia may also appear early in the disease and are more commonly the reason for initial presentation to the general practitioner. Select laboratory diagnosis may be initiated prior to specialist referral and can demonstrate positive anti-nuclear antibodies, as well as antibodies to double-stranded DNA. Classically, ESR appears elevated in the absence of an elevated CRP. Additional laboratory investigations completed during initial work up may also reveal anemia or signs of liver or kidney impairment. Additional antibody screens, generally initiated by a rheumatologist, may include anti-ENA, Ro, La, RNP, or Sm.

Principles of Management

Management of SLE is generally initiated by a specialist and then continued cooperatively between specialist and the primary care provider, and in non life-threatening cases consists primarily of symptomatic management. To this purpose, analgesics and antimalarials are frequently employed. Acetaminophen has shown modest effectiveness in controlling pain, while antimalarials such as hydroxychloroquine are successful in reducing inflammation resulting in arthralgia and dermatitis. These therapies have also been associated with significantly lower levels of patient reported fatigue and frequency of disease flares. It should be noted that non-steroidal anti-
inflammatory drugs (NSAIDs) are relatively contraindicated in the treatment of SLE secondary to the numerous complications of SLE that may be exacerbated by NSAID therapy, including accelerated atherosclerosis, nephritis, and aseptic meningitis.2,6

Life threatening flares of SLE, including acute lupus nephritis, often require inpatient initiation of high dose glucocorticoids in combination with immunosuppressive agents including cyclophosphamide or mycophenolate.2 Due to the difficulty in preventing flares pharmacologically, and the significant comorbidities associated with major flares and their treatment, there exists significant potential for reduction in long-term morbidity and mortality through preventive care.

**Preventive Care**

Many complications may arise from a flare of SLE. For the purposes of this article, we will discuss strategies which may prevent or delay the onset of these complications.

**Musculoskeletal**

Joint pain is an extremely common and physically debilitating complication of SLE. Tenderness and inflammation are found in a symmetric, nonerosive polyarthritis commonly presenting in proximal interphalangeal and metacarpophalangeal joints, as well as wrists and knees.6 Care must be taken to minimize stress placed on the joints especially during heavy lifting activities. Minimizing joint stress may also improve fatigue, which has also been postulated to trigger flare-ups of SLE in some. Additionally, exercise may reduce stiffness and increase muscle strength.7

Osteoporosis and osteopenia are reported in as many as 46% of patients. Deficit in bone mineral density is said to be a result of both disease manifestations (fatigue, joint and muscle inflammation and pain can reduce mobility and impair weight bearing activity for a given bone mass) and prolonged corticosteroid use. Corticosteroids are commonly used in the treatment of SLE and increase the risk of osteoporosis by disturbing calcium homeostasis, decreasing bone formation, and decreasing circulation of gonadotrophs.8 Ramsey-Goldman et al. have shown a positive association in women between those with SLE and increased bone fracture risk.9 Fortunately, regular exercise (a minimum of 40 minutes of aerobic activity four times a week) has been shown to be protective of bone mineral density loss.7 Other preventive options include smoking cessation, moderate consumption of alcohol, adequate intake of dietary calcium and vitamin D, and measures to prevent falls in the elderly. Finally, dosing of corticosteroids should be constantly monitored and evaluated to minimize dose whenever possible.8

**Skin**

Photosensitive skin rashes such as discoid lesions and malar rash affect up to 20% of patients with SLE and may be scarring and disfiguring.6 Ultraviolet radiation is postulated to trigger SLE flares by damaging cellular material, most notably nucleic acids, and degrading them into immunogenic complexes.3,4 Patients should be counseled in sun avoidance and sunscreen usage, as this will minimize rashes and potentially reduce the frequency and severity of subsequent flares.1

**Renal**

Lupus nephritis is a serious consequence of SLE, with symptoms ranging from hypertension and proteinuria to renal failure. Although there are no known measures to actively prevent the onset of lupus nephritis, frequent monitoring of creatinine and urine protein and cellular casts can alert the clinician to renal disease earlier in its progression.1 Strict avoidance of NSAIDs and careful consideration prior to use of any other potentially nephrotoxic medication is required in all patients with SLE.1,6

**Cardiovascular**

Cardiovascular complications such as atherosclerosis, thromboembolic events, pulmonary hypertension, pericarditis and systolic murmurs occur at higher rates in SLE patients than the general population.10 Currently, ischemic heart disease is a leading cause of death in SLE patients, with mean age of first myocardial infarction at 49 years (20 years before that for the general population). Additionally, Esdaile et. al. found that young patients with SLE has a 7-10 times greater risk of developing cardiovascular disease than the Framingham risk factor estimate dictates.11 As with the general population, exercise is shown to improve cardiovascular outcomes in SLE patients. Risk factors contributing to development of ischemia such as hypertension, hyperlipidemia, diabetes mellitus and sedentary lifestyle, may all in part be addressed by exercise.7 Other preventive measures such as smoking cessation, nutrition counseling to decrease lipids and cholesterol in the diet, diabetes education, and medications including
low-dose aspirin and a statin may help prevent cardiovascular complications.\textsuperscript{10,12} Additionally, antimalarial agents such as hydroxychloroquine typically used to combat joint and skin manifestations of SLE have also been shown to reduce LDL-cholesterol, triglyceride levels and thromboembolic events, and improve insulin resistance and glycemic control.\textsuperscript{12}

**Central Nervous System**

CNS changes affect 12-59\% of patients with SLE and most commonly present as intractable headaches, memory and reasoning difficulties, seizures and stroke.\textsuperscript{1} No preventive strategies for headaches, memory or cognitive difficulties have yet been reported. However, seizures and stroke due to thromboembolic events may benefit from similar cardiovascular preventive strategies as discussed above.

Fatigue in SLE is also extremely common, affecting up to 80\% of patients, yet is difficult to manage, often persisting despite disease flare remission.\textsuperscript{1,6} Although the mechanism is largely unknown, sleep interruptions are thought to act as a mediator through which SLE increases fatigue. Exercise has been shown to help with both fatigue and sleep disturbances, as it increases capacity of the oxidative metabolic pathway to supply energy. Studies have shown positive association between exercise and higher sleep quality, increased patient reported energy and overall well-being.\textsuperscript{7}

**Pregnancy**

Pregnant women with SLE are at increased risk for early loss of pregnancy, fetal death, pre-eclampsia, preterm delivery, and increased maternal thrombosis.\textsuperscript{1} Regular follow-up with a physician to monitor blood lupus anticoagulant and anticardiolipin antibody levels may minimize risk during pregnancy, especially miscarriage. Furthermore, a recent Cochrane review by Empson et. al. has shown that unfractionated heparin and low-dose aspirin help reduce pregnancy loss by 54\% in those with high levels of lupus anticoagulant and anticardiolipin antibodies.\textsuperscript{13}

<table>
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<tr>
<th><strong>Table 1: Diagnostic Criteria for Systemic Lupus Erythematosus.</strong> A patient demonstrating four or more of the following at any time in their history should be suspected for SLE. Sensitivity 95%, Specificity 75%.\textsuperscript{5}</th>
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<td>Malar Rash</td>
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<td>Discoid Rash</td>
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<td>Photosensitivity</td>
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<tr>
<td>Oral or Nasopharyngeal Ulcers</td>
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<td>Hematologic Disorders – non-iatrogenic leukopenia, lymphopenia, thrombocytopenia</td>
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<td>Serositis – pleuritis or pericarditis</td>
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<td>Arthritis – nonerosive involvement of 2 of more peripheral joints</td>
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<td>Renal Disease – 3+ protein or cellular casts</td>
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<td>Neurologic Disorder – seizure, psychosis</td>
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<td>Antinuclear Antibodies</td>
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<td>Immunologic Disorders – including anti-dsDNA, antiphospholipid Ab, anti-Sm</td>
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**Conclusion**

Systemic lupus erythematosus presents a number of significant management challenges to the general practitioner and rheumatologist alike. The age of onset and potential for considerable morbidity and mortality in a potentially very healthy patient otherwise requires strict vigilance to address preventive care strategies. As SLE presents and continues to develop as a multi-system disease, it is useful to review each system, its complications, and potential for unrealized preventive care at each follow up visit. This, in conjunction with appropriate treatment of complications as they arise, will help to minimize disease burden.

**References**


Feature Article

Patient Centered Approach to Primary Prevention (PCAPP)

Adeel Mahmood, Meds 2009

As Tommy Douglas helped usher in Canada’s Medicare system in 1967, it marked a new era in Canadian health care and one that went onto become one of defining factors of Canadian society. Most Canadians cherish the Public health care system and consider it an extremely important part of Canadian society. However, for as long as the system has been in place there have been questions about the viability of the system and forty years since its inception, we stand at a critical juncture in this seemingly never ending debate. There is no doubt in that we as Canadians must continue to strive towards making our system better so that we can stand firm on the core values of the Canada Health Act. In this essay, I aim going to suggest a People centered approach to primary prevention (PCAPP). This is a group based approach to helping patients be better advocates of their own health. I believe that this program can help improve the quality of patient care and be an economically feasible approach to Primary prevention. This is definitely not a complete solution to the challenges faced by the health care system. However, as the proverb goes: Little drops of water, little drops of sand, make the mighty ocean and the mighty land. This brief essay only proposes a step forward in reaching our goal of being a more patient centered health care system.

This article has been reviewed by Dr. David Rosen.

The Backdrop

Before I go onto discuss my proposal in any great length, a little bit of historical context will be helpful. The topic of health care has been studied extensively and some even go on to say that it has been studied to death. There has been a large investment of money, time and resources to find ways in which our system can be improved. Major reviews such as the Mazankowski report, the Senate report and the Romanow report have made several suggestions to improve the health care system and target issues such as; increasing funding, decreasing wait times, providing limited pharmacare, and a public vs. a private system. These are obviously very critical issues and are being addressed extensively. My essay, however, is just going to focus on an aspect of our health system that I believe can have a great impact on the health of Canadians and the sustainability of our health care system.

The push towards prevention

I propose the idea of a more patient centered approach to Medicine where patients will be empowered by more knowledge about their own health. Although this is by no means a new concept, it is one that is often side lined as we face other challenges in health care today. However, by educating patients about various illnesses and promoting an environment of healthy living we may be able to prevent many diseases and create better outcomes. This will have an even greater impact in the next few years as our population becomes demographically older. The focus on disease prevention can go a long way in making our Health care system better and stronger.

Realizing the fact that we have been reacting to patient illness and diseases, rather than promoting prevention of disease, there has been a recent push to be more proactive in primary prevention and promotion of healthy living. The most important way that this can be accomplished is through patient education. This is an enormous challenge in the ever-changing culture of medicine and becomes even more significant in a multicultural nation like ours. Canadians come from a diverse background of experiences and beliefs about healthy living, therefore, any approach to health promotion must keep this in mind.

Many initiatives have been taken to increase patient awareness regarding common illnesses. The CTFPHC (Canadian Task Force on Preventive Health Care) and the IYH (It’s Your Health) are two such initiatives. It's Your Health (IYH), for example, is a joint publication produced by Health Canada (HC) and the Public Health Agency of Canada (PHAC) that provides information on a wide range of health and safety issues. Other avenues of health promotion have been hundreds of pamphlets available on various topics, waiting room posters and even television...
commercials for the most pressing health issues. Even though these are noble initiatives, the question we must ask is whether these are enough to accomplish the final goal.

The need for a better approach

We are moving towards a culture of “electronic medicine” where people are able to gain a lot of information through online resources. Excellent websites have been created to provide patients with more information regarding common health issues. However, for every good resource, there are several others which provide misinformation. We can also not assume that most people will be exposed to the information online and even if they are, whether it will provide them with the correct and proven advice. Similarly, Health Canada has created many pamphlets and documents to promote healthy living and provide information regarding diseases. However, simply handing them out does not mean that they will be read or even understood by the majority of people. I believe that this is where our first line of defense, the primary care physician, has an extremely important role to play.

Patients are quite receptive to the information provided to them by their Family Physicians and they respect them as medical experts. Primary care physicians also have the unique opportunity of developing strong and trusting relationships with their patients over a period of years. This, coupled with the fact that most people go to their Family Physicians for routine health check-ups, makes them the first and most important line of defense for prevention and early detection of illnesses. There is no doubt that part of the role of a Family Physician is to be a health advocate and an educator for the patients. However, this becomes very difficult knowing the current shortages of Family Physicians and the overwhelming work load being faced by many of them. The shortage of Family Physicians is not limited to rural areas or small cities; it is a problem that spans across many of the major cities of the Country as well. It is certainly unfortunate, but it seems that the focus has turned away from quality towards quantity.

Yet this is not the fault of the primary care physicians, who must be commended for absorbing a big part of this health crisis and taking on the responsibility of minimizing its effects on patients. However, this high demand makes it difficult to educate patients about their health and illnesses. A recent survey by the College of Family Physicians found that when on-call hours were included, family doctors typically work between 70 and 80 hours per week. It is not difficult to imagine that this pressure of time and the quantity of patients has an effect on the amount of time that can be spent talking to patients about common health care topics. A comprehensive list of such topics would be too long, but they include common things such as: Exercise, diet and nutrition, healthy living, Pregnancy, screening exams and their importance, effects of smoking, diabetes, hypertension, risks of STDs, use contraceptives, well-baby care, effects of alcohol abuse and many more. Again, I have just listed a few topics to give an idea of the type of things patients can be given more education about.

A possible solution.... PCAPP

Keeping in mind the limited time and resources in the hands of the family physicians and the enormous task of patient education, I make the suggestion of a group based approach to patient education which I call the People centered approach to primary prevention (PCAPP). The proposal is for small group sessions conducted by a family physician for those people in their practice who may be interested in the topic. This approach allows the physician to provide more detailed information about a particular topic and also answer the questions of the patients in that group. The group can meet for a session of about ½-1 hour and the physician would be allowed to bill for the services he or she provides. This is also economically feasible as a greater number of patients will be targeted in a small amount of time. Let me elaborate on this a little more using the example of hypertension.

Let us assume that Dr. John is a family physician with a busy practice of 1500 patients. There is no doubt that several of his patients will have hypertension (which is the most common reason for visits to a family physician and a disease effecting up to 22% of Canadians). Dr. John may set up a “Living with hypertension” talk for a group of interested patients for an hour on a weekday evening. The talk will target not only those patients who have hypertension, but it can also be geared towards those who have borderline high blood pressure. The patients will be more receptive to a session where they will be getting important information from someone whom they trust and who has been providing them with care.

Dr. John may discuss important issues associated with hypertension, including prevention, management, side effects of medication, and the importance of exercise and diet. The goal will be to provide simplistic, yet valuable information to the patients so that they become more informed about their condition and can learn to better manage it themselves. The patients can also ask any questions they may have about hypertension. It also provides an
avenue for further discussion that the patient can have with Dr. John in a more confidential and one to one setting. This, in brief, is the type of approach that I believe can go a long way in impacting patient health. Dr. John will be remunerated for this talk and it will be billed to the provincial ministry of health. This will be cost effective because in ½-1 hr the physician will be able to target 6-8 patients and greatly influence their knowledge about a health topic.

This was obviously a simplistic explanation of the plan itself and its desired results. Some people may wonder why such a group based approach may help when we already have pamphlets, information documents and other resources available for patients. As I have mentioned previously, these documents most certainly exist, but can be of no substitute for the information provided by Family Physicians. The documents may not be understood, if read at all, because patients often take the word of their doctors in whatever they are being prescribed or told to do. The goal of this proposal to promote a more patient centered approach to prevention and early detection of disease. It may all seem good so far, but I am in no position to claim that there are no challenges with this approach.

The challenges with PCAPP and how they can be overcome

The first challenge I see in the implementation of such a plan is the willingness of Family Physicians to hop on board with such a proposal. After all, they will be front and centre in this small groups approach to patient centered preventative care. As I have mentioned above, physicians already feel they are being overworked due to increased patient load. The question then becomes how they will buy into such an approach. I think the solution to this is two-pronged. First, physicians must be an active part in the development of such a program and secondly, they should feel that their efforts and time will be remunerated well. The better the physicians feel about the program and its outcomes for them and their patients, the greater the possibility of success. The next important issue then becomes that of funding.

The funding for this proposal should come from the ministry of health to which the Family physician’s bill for their services. This will be no different than a patient consult, except that it will be much more thorough, more productive and economically feasible as a greater number of patients will be targeted in a small period of time. The Provincial ministries of health can get the funding for the program from the federal government. Again, funds that are being used in other areas of primary prevention can be used to offset some of the costs of starting up such a program. Again, benefits of this project will certainly outweigh the costs to the system. A greater challenge than this may be that of creating a standardized program.

Although there will be flexibility in how the physicians conduct these group sessions, it will be helpful to have some standardized features. The designing of a standard module would require input from family physicians from a variety of practices. The challenge in this could be co-ordination and collaboration of the many personnel who may be involved with such a large initiative. However, I feel that this issue can be easily resolved by designating a body of respected physicians who can come up with a simple standardized approach to these group sessions, outlining their goals and objectives. It will also be helpful if the ministry of health provides all physicians with the main objectives for a particular topic and any handouts that the patients should receive. This task will not be very difficult as there is a lot of information and resources already created by Health Canada. Reading the proposal so far, one must certainly wonder about the possible investment of time that this project will take.

A major criticism of the project may be that of the amount of resources needed, primarily time and space. However, as I have outlined before, reaching out to a large number of patients in a short period of time is the strength of this project. There is no doubt that the physicians may have some difficulty scheduling a time convenient for themselves and the patients, but I think this is a minor hurdle. Similar to this issue is that of space availability, because 6-8 people will require more space than a standard examining room and since most clinics don’t have a large common room available, the best option seems to be an empty waiting room. The issue of timing and space can be easily resolved if the family physician books a half hour to an hour after a day’s clinic (i.e. the clinic hours can be reduced by one hour to accommodate the patients). The timing will suit most patients and the waiting room will be available to conduct these sessions. Realizing that these sessions will be weekly or bi-weekly and both the patients and the physicians will get rewarded for their time (the patients with valuable information and the physicians with remuneration), this does not seem to present a significant challenge in going ahead with this program.

So far in this essay, I have not discussed in any detail the patient’s perspective in my proposal. The two most important challenges I see from the patient’s perspective are interest and confidentiality. It might initially be a challenge to get enough patient interest in the new program. This issue can be tackled by waiting room posters and recommendations made by the family physicians or other staff members. The participation will be completely voluntary and I think that patients will be pleased to get more information about common health topics and management of diseases. I think patient interest will vary from topic to topic, but in general patients will be
receptive to a group based approach to learning about common health issues. PCAPP will also allow patients to gain greater knowledge as they may get answers to questions they may feel intimidated to ask themselves. The second issue, and in my opinion the biggest challenge to this program, will be that of confidentiality.

Confidentiality is an important aspect of proper medical care and at no point should any patient’s confidentiality and safety be jeopardized. This can be a possible challenge for topics such as cancer or sexually transmitted diseases, where the patients may not want others to make assumptions about them or they may feel intimidated to attend. However, by designing the group sessions around simple and less cultural or socially sensitive topics, this challenge can be easily overcome. Discussions such as healthy living, proper exercising, nutrition, hypertension, pregnancy, well-baby care etc. do not pose a significant challenge in this area. If patients are properly informed about the structure and purpose of the sessions, it will further reduce any issues regarding breach of confidentiality. Finally, the program is 100% voluntary and no patient will be asked to participate without their approval.

Conclusion

It is said that all that glitters may not be gold, but unless we look carefully how can we really know? Therefore, to assess the practicality and benefits from the proposed program can be assessed more thoroughly if a pilot study is done. This is the hope in which the author has written this proposal. The pilot study should involve several willing family physicians, from a varying range of practice types, who will run these 3-4 group sessions to assess the overall effectiveness of this group based approach to preventative care. The aspects that would need to be assessed are: use of time and resources, patient interest, physician’s review of the session and the associated costs. Most of these can be studied quite easily and the patient’s viewpoint can be studied through a questionnaire. A pilot study will really help to gage the strengths and weaknesses of this proposal and if it has any possible role in the future of our health care system.

The CAPCH has done a great job of stimulating thought and bringing out ideas that may potentially help our great health care system. I am a firm believer in the fundamental values that make up the Canadian Health care system, but in our passion we cannot forget that there is still much room for improvement and we, as a people, must find avenues to overcome the challenges facing the system. The People centered approach to primary prevention (PCAPP) is a humble suggestion which may be a building towards a stronger and more viable health care system. By providing patients with information about common health care topics we can empower them to make better choices and promote healthy living. Critical analysis and further investigations about PCAPP may yield greater insight into ways that people can be more informed about their health. I end with the wise words of Tommy Douglas, "My friends, watch out for the little fellow with an idea".
Pharmacologic Considerations in an Elderly Population

Wendy Ng, Meds 2009

Usually, elderly patients have more ongoing health concerns than younger patients. To date, there have been few reviews that examine the benefits and challenges to prescribing common medicines for a geriatric population. Overall, NSAIDs, anticholinergics, neuroleptics and benzodiazepines have serious side effects that are more often manifested in the elderly. Based upon the increased danger of pharmacologic adverse events in the older population, careful consideration of the benefits and risks of these medications is essential. It remains useful for clinicians to consider safer alternatives when writing prescriptions.

In general, elderly patients have both chronic and multiple diseases. Consequently, polypharmacy is a major factor in the prevalence of adverse drug reactions, which increase in incidence with patient age. In addition, elderly patients have poorer homeostatic responses to physiologic challenges. A variable rate of declining organ and tissue function among different elderly individuals further complicates attempts at predicting patient responses to pharmacologic therapy. Finally, with poorer compliance to drug regimens, due to the complexities of timing doses of many drugs with different dosing schedules, sorting out pharmacology for elderly patients can be a challenge.

In both males and females, the proportion of total body weight as fat increases with age. Fat is localized to the middle and upper body regions as we age. In women, there is an additional postmenopausal acceleration of the fat distribution trend. Body fat tends to accumulate within organs. After a plateau in rising fat proportions at approximately the sixth decade of life, a reduction in the amount of body fat follows in even older ages.1

Body water as a percentage of total body weight declines with increasing age. Furthermore, organ function tends to decrease with increasing age. Kidney glomerular filtration decreases, as measured by creatinine clearance. At the same time, serum creatinine concentration may not appear elevated, despite renal impairment, due to the decrease in serum creatinine concentration from lower levels of muscle mass as we age. In addition, liver size as a proportion of body weight decreases, leading to decreased total hepatic blood flow and poorer elimination of many drugs from the body, particularly lipophilic drugs that have a high hepatic extraction ratio. Cardiac output decreases, which may be due to a combination of sedentary lifestyle, progressive tissue degeneration with age, or disease. Blood perfusion of sites of body drug elimination can be inadequate in cardiac failure. With a decreased baroreceptor reflex, as well, older patients are at greater risk of orthostatic hypotension.1

Based on these complex interactions and a multitude of factors, pharmacology for elderly patients requires extra consideration. The benefits and side effects of NSAIDs (non-steroidal anti-inflammatory drugs), anticholinergic drugs, neuroleptics and benzodiazepines merit discussion, as their uses have important implications in this population of older patients.

NSAIDs (Non-steroidal anti-inflammatory drugs)

NSAIDs (non-steroidal anti-inflammatory drugs) act by inhibiting the cyclooxygenase required for conversion of arachidonic acid to endoperoxide intermediates (PGG2 and PGH2). This leads to antipyretic, analgesic and platelet-inhibitory effects. There are also effects on rheumatic, inflammatory and immunological processes, as well as on acute gout. This cyclooxygenase inhibition is either readily or slowly reversible, unlike that of acetylsalicylic acid.2

Side effects of NSAID use include agranulocytosis, which is not seen with salicylate use. As with salicylate use, NSAIDs cause gastric mucosal damage because they are weak organic acids, and inhibit prostaglandin synthesis and accumulate intracellularly due to the acidity of the gastric lumen. This is related to nonselective inhibition of both COX-1 and COX-2 isoenzymes involved in prostaglandin synthesis, where COX-1 generates prostanoids required for the maintenance of gastrointestinal mucosa and platelet aggregation, whereas COX-2 is required for
generating prostaglandins that modify inflammation and pain. Gastric bleeds, anemia, epigastric pain, hematemesis, dyspepsia, ulcerative esophagitis and ulceration and perforation of the gastrointestinal system have all been reported with NSAID use. Peptic ulcer disease is more significant in the elderly due to the higher prevalence of *Helicobacter pylori* and their more common use of NSAIDs, compared to their younger counterparts’ use of NSAIDs.\(^6\)

In addition, the synthesis of thromboxane A2 which is derived from cyclic endoperoxides PGG2 and PGH2 from arachidonic acid by cyclooxygenase is reversibly inhibited, such that platelets may fail to aggregate. Prostacyclin (PGI2), which opposes platelet aggregation, may be inhibited by NSAIDs due to the concentration of cyclooxygenase accumulating in endothelial cells. Interactions with warfarin can cause serious bleeding.\(^2\)

In renal function, prostaglandins are important for increasing glomerular filtration rate, decreasing renal vascular resistance, increasing natriuresis and reducing water reabsorption in the loop of Henle. Prostaglandins may also prevent antidiuretic hormone action on tubular epithelium through negative feedback, to increase water elimination. However, NSAIDs inhibit prostaglandin synthesis, thus allowing excessive water retention and edema formation. The side effects of edema, fluid and electrolyte disturbances, sodium and chloride retention, and plasma dilution can be dangerous.\(^2\)

Other side effects of NSAIDs related to cyclooxygenase inhibition include acute rhinitis, urticaria, bronchoconstriction and hypotension in patients suffering from asthma, chronic obstructive pulmonary disease or other lung ailments. Finally, adverse effects that are likely unrelated to cyclooxygenase inhibition can affect all body systems, ranging from headache, dizziness and rash to myalgia, tinnitus and flatulence.\(^2\)

The long-term prescription of NSAIDs (non-steroidal anti-inflammatory drugs) to treat osteoarthritis for patients with a history of peptic ulcer may cause recurrence of peptic ulcer, due to gastric irritation.\(^3\) Non-drug therapy, or acetaminophen, or NSAID with gastroprotective agent is recommended instead. In patients with chronic renal failure, NSAIDs may worsen renal failure, causing salt and water retention. Again, non-drug therapy, followed by acetaminophen as necessary, is recommended as an alternative. In patients already receiving warfarin, NSAIDs may cause increased bleeding. In patients with a history of hypertension, NSAIDs may cause salt and water retention and exacerbation of hypertension. Thus, acetaminophen is preferable.\(^4\)

### Anticholinergic Drugs

Anticholinergics (muscarnic blockers) can be used to correct the dopamine/acetylcholine imbalance in Parkinson’s disease, by lowering the acetylcholine activity level. Atropine-like drugs such as benztrapine and trihexyphenidyl can be used. However, unpleasant side effects of blurred vision, dry mouth, constipation, urinary retention and ataxia may occur. This is because salivary secretion is impaired, so swallowing also may become difficult. Gastric secretion is diminished, bronchial secretions are suppressed, and sweating is impaired. As such, anticholinergics have not been used as first line agents for Parkinson’s disease since the introduction of L-dopa.\(^5\)

Alzheimer’s disease is the fourth largest cause of death in people over the age of 65, and is the most common form of dementia.\(^6\) Cholinesterase inhibitors are commonly used in the treatment of Alzheimer’s disease related dementia. Donepezil, galantamine or rivastigmine are often prescribed.\(^7\) While cholinesterase inhibitors have not been conclusively shown to reverse or slow down mild cognitive impairment, there are numerous randomized clinical trials that show that cholinesterase inhibitors slow the progression of Alzheimer’s dementia. This has been suggested to be due to the role of muscarinic receptors in neurotrophic regeneration, and acetylcholinesterase inhibitors’ role in restoration of nicotine receptor activity. It has also been shown that cholinesterase inhibitors can inhibit beta-amyloid plaque formation by impacting secretion of the amyloid precursor protein (APP).\(^8\) These drugs do not stop the process of neurodegeneration. Newer strategies of combating Alzheimer’s disease includes memantine, a NMDA-receptor antagonist that has been reported to be effective therapeutically in Alzheimer’s disease, and may be a better alternative.\(^6\)

In contrast, due to its possible opposition of beneficial effects of cholinesterase inhibitors, anticholinergic medications are notorious for worsening cognitive function in susceptible patients. Patients with dementia and urge incontinence who might benefit from both an anticholinergic medication and a cholinesterase inhibitor present a challenge to the clinician, as it seems that the two drugs theoretically work against one another. While the drug combination is possible, it can be an imperfect means of treatment, but no randomized control trials for such cases have yet been reported.\(^9\)

The prescription of anticholinergic drugs to treat irritable bowel syndrome for patients with dementia may worsen cognitive and behavioural function. Instead, nondrug and diet therapy, and a calcium channel blocker to treat diarrhea, are recommended. The prescription of anticholinergic drugs to prevent extrapyramidal effects of
antipsychotic drugs may cause agitation, delirium, and impaired cognition. Instead, decreased dosages of antipsychotic drugs or the reassessment of need for these drugs is recommended.4

Neuroleptic Drugs (Antipsychotic Drugs)

Neuroleptics are types of antipsychotic medications. Antipsychotics can be used to treat psychosis that may be encountered in patients with severe dementia, depression or severe metabolic disturbances from liver failure or kidney failure. When given to patients, these drugs produce decreases in bizarre behaviour, delusions, and hallucinations. They also decrease anxiety, and promote sleepiness or sedation. In the early 1950’s, Laborit, a surgeon in Paris, noted that various antihistamine drugs such as promethazine had a calming effect on postoperative patients. In 1950, Charpentier synthesized chlorpromazine, a related compound, which reduced both the need for surgical anaesthetic and patients’ anxiety. As such, psychiatrists began to use the drug for treating psychosis.10

Most antipsychotics act selectively on dopamine receptors, blocking dopamine receptors due to their similar structures to the dopamine molecule, such as chlorpromazine (a phenothiazine) and haloperidol (a butyrophenone). Antipsychotic action seems to be more closely linked to D2 than to D1 antagonism. Antipsychotics can also block the actions of L-dopa, apomorphine, and bromocriptine, which are all dopamine agonists. In addition, the chemoreceptor trigger zone outside of the blood-brain barrier in the reticular formation of the medulla oblongata, which stimulates nausea and vomiting, is rich in D2 receptors. Thus, antipsychotics also have an effect of reducing nausea. As such, antipsychotics can reduce nausea produced by other drugs, pregnancy, radiation sickness, and cancer.10

Most side effects of antipsychotics arise from their cholinergic, adrenergic and histaminergic receptor actions, because their antipsychotic effects originate from their antidopaminergic actions. Peripheral side effects include hypotension, constipation and tachycardia.10 Other side effects include antipsychotic-induced parkinsonism from effects on the nigrostriatal pathways, dyskinesias and dystonias, and akathisia, and later tardive dyskinesia over months or years. In a study of 56 older psychiatric patients, even after controlling for spontaneous extrapyramidal signs at baseline and for natural fluctuations, there was a substantial risk of neuroleptic-induced parkinsonism in patients treated with very low doses of neuroleptics.11 In another group of over 3500 patients aged 65 to 99 enrolled in a Medicaid program in Massachusetts, patients were found to be 5.4 times more likely to require antiparkinsonian medication if they were taking neuroleptics, as compared to non-users. Neuroleptic use is well-known and common cause of extrapyramidal dysfunction in the elderly.12

Neuroleptic malignant syndrome is a rare but severe side effect, which includes extreme rigidity, fever, marked autonomic disturbances and muscle destruction. Unwanted sedation can be due to a complex interaction of antihistaminergic, antiadrenergic and anticholinergic actions. Orthostatic hypotension occurs because antipsychotics depress blood pressure by dilating the arterioles through directly acting on alpha-adrenoceptors responsible for vasoconstriction. There may also be a direct effect on the vasomotor centre, contributing further to hypotension. Anticholinergic effects can lead to mydriasis and weakened ciliary muscles, causing mydriasis. Decreased tear secretion can lead to dry eyes, and mydriasis may decrease aqueous humor outflow and precipitate glaucoma in certain patients. Dry mouth, constipation, and urinary hesitancy may also result from anticholinergic effects. Pseudopregnancy, due to dopamine’s actions on the pituitary to inhibit mamnotroph cell prolactin release, and blockage of follicle stimulating hormone and luteinizing hormone may lead to anovulation, lack of menstruation and hyperprolactinemia, swollen breasts and galactorrhea. In patients predisposed to seizures, antipsychotics can produce seizures, most prominently with low-potency agents. More rarely, phenothiazine-induced jaundice and dermatitis and photosensitivity may occur with antipsychotics.10

The prescription of chlorpromazine to treat psychosis for patients with a history of postural hypotension may worsen postural hypotension and cause falls. Alternatively, high-potency neuroleptic such as haloperidol with blood pressure monitoring is recommended.4

Benzodiazepines

Chlordiazepoxide was the first benzodiazepine marketed in 1960, followed by diazepam in 1963 and oxazepam in 1965. All benzodiazepines are variations upon the 5-aryl-1,4-benzodiazepine nucleus. Diazepam and many other benzodiazepines are metabolized to the active metabolite N-desmethyl Diazepam, also known as nordiazepam. In 1977, specific receptors for benzodiazepines were discovered in the nervous system. Type I receptors are abundant in the cerebellum, cerebral cortical layer IV, and the substantia nigra. In contrast, Type II receptors are located in the hippocampus, superior colliculus and cerebral cortical layers I-III. It is believed that both
anxiolytic and sedative effects are mediated through the Type I receptors, whereas anticonvulsant and muscle relaxation effects are mediated through the Type II receptors. The benzodiazepine receptors may also be linked cooperatively with GABA receptors, since GABA and GABA agonists have been shown to enhance benzodiazepine receptor binding abilities.\textsuperscript{13}

Benzodiazepines have an antianxiety action. Most benzodiazepines have been approved for use in acute anxiety disorders. Since efficacy decreases a bit after a few weeks, the drugs are less useful in the treatment of chronic anxiety. Benzodiazepines also have anticonvulsant activity, but tolerance to the anticonvulsant effect can develop with long-term use. Most benzodiazepines are useful in alcohol withdrawal syndrome treatment. Benzodiazepines are also useful for their muscle relaxant effects, such as in treating neuromuscular disorders like cerebral palsy and tetanus. Furthermore, benzodiazepines are useful for achieving amnesia with sedation. Finally, benzodiazepines can treat the symptom of insomnia. Since elderly patients are more sensitive to the effects of such drugs, initial doses in patients over age 60 should be 50\% of the listed dose requirements for insomnia. The most common side effect is a feeling of sedation or mental “fuzziness” in the morning. Patients must also be reminded that no hypnotic drugs should be taken with alcohol, which can be a fatal combination.\textsuperscript{13}

Common side effects of drowsiness, ataxia, lethargy and rarely coma occur in less than 10\% of hospitalized patients that receive oral benzodiazepines.\textsuperscript{13} Delirium, oversedation, and hypotension are other major side effects. Lorazepam has been found to be associated with the more serious side effects of ataxia and delirium, which could result in potentially debilitating accidents, including falls and fractures.\textsuperscript{14} Other side effects include: interference with memory and recall, and anterograde amnesia. With intravenous administration of benzodiazepines, important but uncommon side effects include: respiratory or cardiac arrest, hypotension, and phlebitis at the injection site.\textsuperscript{13}

The long-term prescription of long half-life benzodiazepines to treat insomnia or anxiety may cause falls, fractures, confusion, dependence and withdrawal. Alternatives include non-drug therapy or the usage of short half-life benzodiazepines. Similarly, the long-term prescription of a long half-life benzodiazepine to treat agitation in dementia may be replaced by loxapine or haloperidol, or a short half-life benzodiazepine.\textsuperscript{4}

**Summary**

Overall, NSAIDs, anticholinergics, neuroleptics and benzodiazepines have both important and serious side effects that are more pronounced in the elderly. Based on the susceptibility of older patients to adverse events from pharmacologic effects, careful consideration of the advantages and disadvantages of these medications remains valuable. Before prescribing these medications, it is useful for clinicians to first consider safer alternatives for their elderly patients.

**References**