

Canadian Academy of the History of Pharmacy

HISTORY OF PHARMACY IN CANADA
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Introduction

Why is the history of pharmacy relevant for pharmacy students?

History defines who we are and influences what we do. Many movies use a theme of a person with amnesia who doesn't know his identity. This is portrayed as a depressing and demoralizing situation; the individual is desperate to find out who he is and where he fits into society. On an international level, various countries remain antagonistic towards or in alliance with each other for historical reasons.

In general, older Canadians have a greater interest in history than younger individuals do. For the most part Canadians do not have a strong knowledge of Canadian history although they do think that it is important that people know their own history. Immigrants to Canada are required to learn some of its history in order to become citizens. It is interesting that although many students state they have little interest in history and resist learning Canadian and pharmacy history, they often go to Europe upon graduating to see all the historical sights!

Students in pharmacy tend to bond with their class to create a sense of unity with a loyalty to the Faculty. When they graduate they become part of provincial and national pharmacy organizations and can influence the direction of the profession. They also become part of the international pharmacy community. In Canada, although efforts to harmonize certain areas (e.g. pharmacist licensing) are being made, there are still inter-provincial differences in practice and legislation. Differences between the practice of pharmacy in Canada and other countries are clearly more obvious. The reasons for these differences are the result of some historical decisions that were made. The decisions are usually reflected in legislation and regulations that govern pharmacy practice. By knowing about these decisions and their impact, pharmacists can better appreciate the social and economic forces that influence pharmacy practice.

We can learn valuable lessons from studying our history. For example, in the period from 1867, when Canada became a country, to 1940s there was little health insurance and patients had to pay for whatever services they needed. Because physician services were relatively expensive many patients came to the pharmacy with their health problems to see if they could be resolved with medication. Pharmacists were the "poor man's doctors" and many pharmacists were referred to as "doc". This close link to the patient and the recommendation of medication was lost in the period from 1950-75 as a result of pharmacists dispensing the new expensive pharmaceutical products and being prevented from giving patients information about them, a practice that evolved for reasons that are not entirely clear. When pharmacists again began to provide more information to the patient it was helpful to have the historical relationship to fall back on rather than appear

to be moving into a new area and competing with the physician. Fortunately, many older people remembered the former role of the pharmacist and were prepared to work closely with their pharmacist.

The historical events that have resulted in our current situation are often still relevant. It is generally true that social and cultural change is slow - much slower than technological or economic change. The way we practice pharmacy today reflects the decisions that were made yesterday and in turn those depend on the decisions made the day before, ad infinitum. There are, however, some momentous events that clearly mark a change in direction or method of practice. For example, on 1 April 2007 the pharmacists in Alberta were given the right to prescribe certain medications. This kind of change is a response to events and attitudes in society and each society will have different priorities and events. However, the initiative in this case stimulated and justified similar action in other provinces.

The aim of this overview is to provide some background to the evolution of pharmacy as a profession and specifically within Canada. References are provided for those who wish to gain more information on a particular topic.

The origins of pharmacy

How did the role of pharmacist evolve?

In primitive times people learned to control many facets of their life but there were many others that they could not influence: disease, weather, availability of food, accidents, etc. People attributed these uncontrollable events to outside forces or spirits. Within their society they designated individuals to assist them in dealing with the supernatural world. These people performed the functions we now designate as priest, medical practitioner and pharmacist. The three roles were combined until society evolved to a more sophisticated level. Even now there are some intermingling elements.

What were some of the early medications?

Herbal mixtures, minerals and animal (and insect) parts were used medicinally early in human history. Primitive societies were regularly faced with food shortages and it is conceivable that during these times individuals experimented with various plants. This learning process introduced them to alternate food supplies and to various plants that had pharmacological effects, usually vomiting and diarrhea. Perhaps some botanicals were used topically for their soothing effects. It is also possible that innate human curiosity led to the use of some plants. In any case humans used a variety of substances as medication when they were ill or injured. It is likely that many plants had properties attributed to them incorrectly but the power of the placebo and the ability of Mother Nature to heal produced positive results often enough that they continued to be used. Some such as opium were found to be consistently and dramatically effective and became widely used.

A surprising number of preparations have been used for thousands of years. In Egypt, pharmaceutical prescriptions have been dated back to 3700 BC and jars with plant-derived ingredients and wine residue dating back to 3150 BC have been found. This would indicate that wine/alcohol was used medicinally in addition to being used as a beverage. Even earlier evidence of alcoholic beverages was found in China (7000 BC).

How was pharmaceutical knowledge passed down?

Much of the pharmacy lexicon has ancient Greek origins, beginning with the term pharmacy - derived from the term Pharmakon, which meant "to mix". Greek contributions to the sciences are substantial and well documented and formed the basis for study in European universities during the following centuries.

A recipe book called the Ebers Papyrus, dated back to 1552 BC, was discovered in Egypt by a German archeologist. It contains invocations for driving away disease as well as recipes that contain over 700 ingredients, some of which are well known to us: vinegar, turpentine, figs, castor oil, mastic, wormwood, aloes, opium, peppermint, cassia, caraway, coriander, anise, fennel, saffron, linseed, henbane, poppy, gentian, colchicum, squill, grapes, onions, etc. These plus other substances were in use for thousands of years as we can see from pharmacopeias of the 16th and 17th centuries.

Other ancient societies such as China, Sumeria, India, and aboriginals in the Americas and Africa had their own formulae. Some of these have been documented and there is a literature on them; for others we can only assume that they existed. All societies have searched for remedies to help them deal with illness. The most reliably effective preparations were those used as laxatives and purgatives.

The 15th and 16th century were characterized by the development of complex compounding procedures for the widening array of herbs, spices, minerals, chemicals and many other, sometimes bizarre, substances finding their way into practice. These formulae were printed in books called formularies. Soon after the printing press was invented, the first pharmacopeia was printed in Florence in 1498 - in Italian rather than Latin - by physicians at the request of the Apothecary Guild. Florence was a major trading site with connections throughout the known world and various practices and medicines were used. The intent behind compiling a pharmacopeia was to simplify and standardize therapy. A number of pharmacopeia, formularies and dispensatoria were developed in Europe over the following two centuries.

In 1618, the Apothecary Guild prepared the London Pharmacopeia, listing the traditional medicinal products, some of which went back to Greek and Roman origin. This project was supported by the physicians. It was written in Latin and this made it useful in several countries. Several editions were published at intervals of 20-30 years. Over the next century or two, many new substances were introduced as being wonderful remedies and were listed. Cinchona - for the treatment of malaria - was introduced from South America. Tea, coffee and chocolate were incorporated into the listing as they became known and used. Various techniques were used for extracting the active ingredients from

botanical sources. Roots, bark and woody stems were broken up and ground to a fine powder in a mortar. Hard inorganic substances were placed in a metal contusion mortar and pounded down to small bits by the apprentice. Infusion - the same process used to make tea - and percolation (in which hot water or other liquid was poured over herbs in a funnel-shaped cone and the liquid percolated through) – the same process used to make coffee – were also employed. Tea and coffee are palatable extracts of caffeine, a drug. The differential solubility of aromatic oils, caffeine and tannins results in the aroma being released first, then the caffeine and, after a longer period, the tannins, which make the beverage more bitter and astringent.

What do we know about the predecessors of the modern pharmacist?

The life of Hippocrates (460-370 BC) is of particular interest as he was a dominant force in ancient science. In the realm of pharmacy, he developed fomentations (warm lotions applied topically often with medication), gargles, poultices (topical semisolid medication applied locally in a fabric container), lozenges (a hard compressed dosage form that releases medication slowly in the mouth and is to be sucked rather than swallowed), suppositories (an anal dosage form that releases medication), pills (a round solid dosage form that contains medication) ointments, cerates (a wax for topical use), collyria (solution for the eye) and inhalations of vaporized liquids.

In Greek mythology Asklepios, the god of healing, had a daughter Hygeia, who was the goddess of health. His other daughter, Panacea, was the goddess of medicine. She is often depicted with a serpent of miraculous powers on her arm and a bowl. The serpent is thought to represent Asklepios as at the time harmless snakes were found inside the temples. These serpents were dormant and appeared to be dead. However, when picked up and dropped, they slithered away. The ancient Greeks thought the snakes were brought back to life by the healing powers of Asklepios. The staff (caduceus) and serpent are now the symbol of medicine while the bowl, often depicted with a serpent on it, is the symbol of pharmacy. This symbol is on many pharmacy signs and is recognized internationally as the symbol of pharmacy, e.g. it is associated with the International Federation of Pharmacy (FIP).

Galen taught pharmacy and medicine in Rome from about 162 AD. He was a physician to gladiators and Roman emperors (Marcus Aurelius, Commodus). His research on plants was the basis for teaching for the next 1500 years. He wrote extensively and his intelligently formulated preparations were in widespread use. Although known for his role in medicine, he also made a major contribution to pharmacy in his study and use of medicinal plants. In pharmacy, medications obtained from plants are known as "galenicals". The study and use of plants as medicine is called pharmacognosy. The identification and characterization of medicinal plants in past pharmacy programs was often referred to by students as "weeds and seeds".

In the third century A.D., the twin brothers Damian and Cosmos practiced medicine in Asia Minor. They were Christians, living in the Roman world. Their advanced level of practice and reports of miraculous cures brought patients from the whole empire. They

are the patron saints of pharmacy and throughout Christian history they are depicted in paintings and there are references to sanctuaries in their name.

During the Dark Ages in Europe the art and practice of science, including pharmacy, was kept alive in the Arabian world. The cosmopolitan cities of Cordoba, Baghdad, and Damascus had huge libraries and schools that collected and studied the writings of Greek, Indian, Persian and Roman scholars. This learning was returned to Europe following the Crusades. The names of Maimonides (Code of Ethics), Avicenna, and Avenzoar are linked to this period. In Europe during the 8th to 10th centuries the monasteries were instrumental in preserving and translating historical knowledge from Greek and Arabic books. They also cultivated and named herbs. For example, rosemary is derived from Rose of St. Mary. In the same period the word "drug", meaning "dry herb", was derived from the Teutonic language. It was almost 500 years later in the 16th century that the term druggist as a seller of drugs came into use. The monasteries provided care to the sick based on good food, rest, and decoctions of simple medications from their gardens. The few hospitals in the cities that existed at the time were places one went to die rather than treatment centres.

What's in a name?

1300s - Apothecary (from Medieval Latin *apothecarius*, from Late Latin, shopkeeper, from Latin *apotheca* storehouse, from Greek *apothēkē*, from *apotithenai* to put away, from *apo-* + *tithenai*)

1500s - Druggist (from the Teutonic word drug meaning dry herb)

1500s - Chemist (New Latin *chimista*, short for Medieval Latin *alchimista*; still used in Britain and Australia)

1800s - Pharmacien in France and Quebec

1800s - Pharmacist

The Oath of Maimonides (Moses Maimonides 1135-1204)

May the love for my art actuate me at all times: may neither avarice nor miserliness, nor thirst for glory, or for a great reputation engage my mind: for the enemies of truth and philanthropy could easily deceive me and make me forgetful of my lofty aim of doing good to our children. May I never see in the patient anything but a fellow creature in pain. May I have the strength, time and opportunity always to correct what I have

acquired, always to extend its domain: for knowledge is immense and the spirit of humanity can extend infinitely to enrich itself daily with new requirements.

Here am I ready for my vocation, and now I turn unto my calling.

In the early 1500s Paracelsus played a major role in disturbing the formal, complex system of healing and prescribing in Europe. He travelled widely to study various ways of healing. This experience led him to use simple, effective methods and drugs, but his style of practice alienated him from the established practitioners. At that time the works of Galen and others were memorized by students and accepted uncritically even when it was clear that they were in conflict with what was observed. Perhaps this uncritical acceptance of knowledge was influenced by the system of teaching in the church. Paracelsus' negative attitude toward physicians and apothecaries constantly landed him in trouble and required that he move frequently. For example, in Basle, he denounced the apothecaries and their drugs, "The apothecaries are my enemies because I will not empty their boxes. My recipes are simple and do not call for forty or fifty ingredients". During his travels he wrote many books and explained the use of chemicals for internal use. Because of the large number of drugs that he used and the influence of his writing, his name is often seen in historical tracts.

During the succeeding centuries there was a complex, active quasi-scientific movement that spread across various disciplines, combining science, religion, alchemy, ancient historical tracts, charlatanism and politics. This gave rise to a flood of ideas that could now be widely circulated due to the invention of the printing press. In this era science was surrounded by myth, religion and superstition. The advances in science were often easier to achieve than overcoming the erroneous beliefs that were firmly held. Many of the old apothecary shops in Europe date from this time and are interesting places to visit. It was in this period that the practice of limiting the number of pharmacies in an area was developed and continues to this day. In England and much of the English-speaking world, this practice was not adopted.

Pharmacists, chemistry and 'pop' culture

During the period from 1600-1800 there were many inventions by pharmacists. Nicolas LeFebvre introduced the use of a thermometer and Antoine Baume introduced hydrometers (1768). Although chemistry began in the 1600s, it hit its stride in the 1800s. It underwent a major transformation as alchemy was discredited. There was a widespread interest in chemistry, with several pharmacists establishing laboratories in their pharmacies. Many pharmacists made great strides in applying science, primarily chemistry, to healing. They discovered elements and chemicals and coined words such as gas and electron that are still in use. The tremendous advances in chemistry enabled scientists to identify many of plant constituents and to search for medicinal properties in plants. (The book Kremers and Urdang's History of Pharmacy contains a substantive description of pharmacists' involvement in chemistry, botany and physiological

discoveries).

In 1718 Guillaume Rouelle solved the problem of the nature of salts, a product of the union of an acid with a base. His student Lavoisier did further research on acids and bases and is credited with the discovery of oxygen. Carl Wilhelm Scheele, a Swedish apothecary, made major contributions in chemistry. He is credited in the period 1771-1775 with the discovery of cream of tartar and tartaric acid, the isolation of phosphoric acid from bones and also many other substances among them hydrofluoric acid, potassium permanganate, manganese dioxide, barium oxide, chlorine, arsenic acid, hydrogen sulphide, and most importantly, oxygen. His discovery of oxygen was independent from that of Priestly and Lavoisier (executed in 1794 by guillotine).

Pharmacists discovered the halogens: chlorine by Scheele (1774), iodine by Courvoisier (1811), bromine by Balard (1826), and fluorine by Moissan (1886), which won him a Nobel prize. Many elements were discovered by pharmacists and pharmacists made a substantial contribution to the development of the periodic table.

In 1830, the German pharmacist Friedrich Moldenhauer was the first to produce chloroform. The correct chemical formula was assigned to it by the Swiss pharmacist J.B.A. Dumas who replaced the designation "formyl chloride" with "chloroform". During this period the most respected chemists were the German pharmacists Klaproth and Marggraf. In addition to their many discoveries that led to a number of chemical industries, they also set the standard for describing their experiments in detail so that others could duplicate their results. This policy eventually curtailed the publication of questionable research. Klaproth did all his research in his pharmacy while continuing as a pharmacy practitioner. Marggraf introduced the use of the microscope into chemistry to examine various crystalline structures. Catalysis was discovered and utilized by Johann W. Döbereiner in 1816. This enabled the hydrogenation of fats to a desired consistency.

Friedrich Wilhelm Sertürner, a German apothecary, is credited with the discovery of alkaloids, the first being morphine (1815). He named the substance morphine from Morpheus, the god of dreams who in mythology was the servant of Somnos, the god of sleep. Following this came quinine, strychnine, brucine (used until recently to denature rubbing alcohol), narceine, veratrine, atropine, nicotine, codeine, and picrotoxin, all discovered by pharmacists. Extensive research in plant chemistry by research groups in Europe identified many substances including cocaine isolated from coca leaves (1855). Caffeine was isolated from coffee bean by F.F. Runge in 1821. Separation and purification was a vital step in understanding the structure and properties of the compounds. Pharmacists made a major contribution to this area and that of analytical analysis.

Marggraf's discovery of sugar in beets was important. During the Napoleonic war, Britain, which had a virtual monopoly on cane sugar, blocked the import of this and all other products from the areas under Napoleon. Sugar from beets became widespread in Europe, not only for the rich, but for all people and the monopoly of Britain was broken.

In 1767 Joseph Priestly, the English scientist and theologian, was intrigued by the gases given off by the brewing process and captured the gas - called fixed air - in water, producing a pleasant sparkling water he termed soda water. The use of baking soda and tartaric acid to produce soda water became widespread. This formula had some laxative properties. In the next decade a Manchester apothecary, Thomas Henry, offered artificially carbonated water as a medicine. He claimed that it had health benefits for "putrid fevers, dysentery, bilious vomiting, etc.". He recommended taking it in combination with lemonade and this is likely the first sweet, artificially fizzy drink. The success of artificial mineral waters led to many commercial products in Europe. In Geneva a mechanic, Nicholas Paul, and a financier, Jacob Schwepes, developed a method for carbonating water. Schwepes took the invention to Britain and it was a commercial success, and by 1802 the drink was widely recommended by physicians. Later, carbon dioxide under pressure was used to make soda water. Seltzer and soda water were considered to be medicinal and became popular, leading in turn to their use as a social drink in Europe and later North America. Soda fountains became trendy in the US and then in Canada at the end of the 18th century and their popularity continued to grow through the 19th century. In America the natural carbonated mineral waters were very popular and led to the development of processes to make artificial soda water. Dispensing systems were developed and adopted by apothecaries so that by 1820 they were in widespread use. Soda fountain equipment was soon available for distribution. Wine was initially used to flavour the drink, now called a spritzer, then fruit syrups (strawberries, raspberries, pineapples, sarsaparilla) replaced wine.

The Eli Lilly Company, founded in 1876, created a market for medicinal products from plants. In this era most medicinal products were of botanical origin that represented a mix of the drug heritage of European immigrants and the first nations. As a result they had a wide range of flavouring agents and used them to create a line of flavoured drinks, many of which contained alcohol. The firm followed the practice of the times and sold a variety of pills. Later they began developing capsules as a dosage form and also sold empty capsules to other firms, a tradition they maintained for over a century. It was at this time that the term « ethical manufacturer' in order to distinguish firms that established quality standards, disclosed ingredients and made claims based on medical practice.

In England, the Burroughs Wellcome firm introduced tablets as a dosage form and under the patent name Tabloid were very successful as they were cheaper to produce and more reliable than pills in terms of drug release.

Upjohn company developed friable pills, dosage form that disintegrated on contact with water or gastric content. In comparison with the pills of the day this was a great step forward. They also coated the pills to make a more elegant product and one which was easily identified.

In 1886, John Pemberton, a pharmacist who was creating patent medicines, made a sweet syrup and then added coca leaves (cocaine had been identified in the leaves in 1855) and kola nuts to make it invigorating (the stimulant property of kola nuts was published in 1864 and shortly thereafter caffeine was identified as the active ingredient,

about 2% by weight. In comparison, coffee has ½-2% caffeine and tea ½-3½% caffeine). Hence CocaCola® was born. The discovery was taken over by others and became a commercial success although the coca (containing cocaine) had to be removed in 1906 with the introduction of narcotic legislation. Other popular drinks: Pepsi-Cola®, A&W Root Beer®, Dr. Pepper's®, and Canada Dry Ginger Ale® were also developed by pharmacists in this era.

How did the regulation of pharmacy and pharmaceuticals develop?

1240 is a key date that pharmacists all over the world recognize and refer to in their history because it was when Emperor Frederick of the Holy Roman Empire enacted 5 Articles that separated medicine and pharmacy as professions. Apprentice physicians usually spent time compounding as part of their training and this made separating the two professions difficult. Notably, much of Canada's legislation in pharmacy came about due to the threat of medical legislation that sought to control pharmacy.

In England in the 16th century, the Faculty of Medicine gave members the right to practice medicine, pharmacy and surgery. The assistants and apprentices of these medical men were called apothecaries and performed minor medical and surgical duties as well as compounding of prescriptions. As these assistants became more skilled they broke away and formed their own organization jointly with the Grocers Guild in 1606. In 1617, they formed an independent guild. King James I is quoted as stating in 1624, "Grocers are but merchants; the business of the apothecary is a mystery; wherefore I think it fitting that they should be a corporation of themselves". The term mystery in this context refers to a profession as the knowledge base was not known to the public. This was an important beginning to the concept of the "art and profession of pharmacy".

In the discovery process some products were found to be highly toxic and became used as poisons. This in turn led to France establishing a poison register in which certain substances could only be sold to known individuals who then had to sign for them and indicate the purpose for which they were going to be used. This procedure was adopted in Britain and its colonies and continued for a long period. In 1557 the "Grocers and Apothecaries Act" came into force in England and it required the apothecary to determine the honesty of the purchaser of a poison and to inquire of its purpose as well as recording the name and time of purchase. Poisoning was a serious offence in England and a person convicted of poisoning someone suffered the punishment of being boiled in oil.

Nicotine, the alkaloid found in tobacco, received its name in 1559 from Jean Nicot, the French ambassador to Portugal. He introduced tobacco to Europe and touted it as a plant with many virtues. Following its identification and extraction, nicotine was listed as a poison for many years. In Canada poisons were used to kill wolves and other carnivores for their pelts and later to kill pests that destroyed crops or farm animals. The requirement for maintaining a poison register in each pharmacy was discontinued only a few decades ago.

In 1815, the apothecaries in Britain joined with the physicians to become general

practitioners (the building housing the British Medical Association is known as Apothecary Hall) and the chemists and druggists took over the role of dispensing medication to the public. Pharmacy practice in various countries began to assume distinctive forms with Germany establishing a limit on the number of pharmacies in an area. This continues to the present day. They also established a high level of professionalism and refused to sell patent medicines, did not sell drugs to the public without a prescription and would only dispense medication for physicians who were listed as qualified practitioners. Nonprescription drugs were sold in other stores called drogerie. In Britain the system was much more open and there was widespread use of various medications, much of it being sold outside pharmacies. France was between these two systems.

How did the term 'patent medicine' arise?

In 1673 the first patent medicine was introduced in England and protected by letters patent, protecting the product from competition. In the 1700s, a 'cure' could be sold to members of the royalty who often, in turn, allowed the products to be sold with financial rewards going to the formula holder. In fact, the patent, or exclusive use of a formula, by the King was a common process for several centuries. For example, LaWall describes Louis XVI purchasing a cure for tapeworm for 18,000 livres from Madame Nouffer who had inherited the formula from her husband, a physician in Switzerland. This was later found to be the well-known taenifuge, male fern, which had been known since the days of Galen. Later the term patent medicine was applied to any product promoted to the public without disclosure of the ingredients. In Canada there was a Proprietary or Patent Medicines Act from 1908 until 1964. Currently, to promote modern research and development of pharmaceuticals, manufacturers are guaranteed exclusive patient protection of a new trade-marked medication for a set number of years.

Comment [PM1]: Confirm this was England. Not specified in original text

The germination of pharmacy in Canada

Because Canada was a British colony it followed British legislation and culture. To all intents and purposes the people living in a colony considered themselves to be living in the home country, but just a little further away. The people higher on the social ladder moved easily from one country to another and looked to the colonies as a place to make their fortune, either through obtaining land or trade grants from the Crown or through serving in a senior capacity and using their position to collect a substantial salary. In the case of healthcare, the legislation for licensing healthcare professionals and for selling goods was British and only after Canada became a self-governing Dominion in 1867 did this slowly change.

Who were the first pharmacists in Canada?

Louis Hebert, an apothecary from Paris, accompanied Pierre du Gua, Sieur du Monts who established a settlement at Port Royal, near Annapolis Royal, in Nova Scotia in 1605.

Later (1617) he went to Quebec City (established in 1608 by Champlain) and played a vital role in its growth, mainly in promoting agriculture. He is now officially the father of agriculture in Canada.

Healthcare in Canada prior to 1759 was primarily hospital care for seriously ill patients, provided by religious orders and by some physicians from France. Perhaps surprisingly, women had a significant role in the early history of pharmacy in Canada. In Quebec City the Nursing Sisters of St. Augustine at Hotel Dieu included some trained in pharmacy. This religious order was established early in the 1600s and the lay missionaries, mostly women, played a crucial role in providing healthcare to the Indians in the area. This was the origin of the Ursuline and Augustinian Hospitaliers. In Montreal Jeanne Mance was a lay-worker who performed the duties of a pharmacist. She was among the initial colonists to found Ville Marie, now Montreal, in 1642. Her dispensary was the first in Canada after Quebec City, and she established the hospital Hotel Dieu in 1642. She was an exceptional person who exemplified bravery in the face of Iroquois attacks and commitment to the colony (a federal government building in Ottawa that houses Health Canada is named after her). As late as 1734 there was still no other dispensary in the colony and the Sisters continued to compound and dispense medication to the sick including the First Nation peoples. Medication at the time consisted of relatively few substances of varying quality and availability. Their use was based more on hope than effectiveness. The majority of the population at that time were First Nations and they had their own traditional methods of healthcare although they looked to missionaries and traders for care and medicine when available.

In early Canada it was the normal situation to have physicians operate dispensaries to sell drugs. Only after there was a larger population and trained pharmacists did pharmacists become the main owners of pharmacies. When Canada was founded in 1867 almost one-quarter of all pharmacies were owned by physicians.

Jean Baptiste McLoughlin (later known as John) was a doctor/apothecary who studied with Dr. James Fisher, the father of medical legislation, in Lower Canada. His maternal uncles were Alexander, explorer, and Dr. Simon Fraser, who served in the Black Watch during the Napoleonic wars. John McLoughlin became qualified to practice in 1803 and worked for the fur company at Fort William and later in life was stationed for many years at Fort Vancouver (just outside Portland, OR) on the Columbia River. Because of his activities in that period he is popularly referred to as the "Father of Oregon".

Pharmacies were established early in Nova Scotia. The earliest apothecary in Nova Scotia was established in 1778 by a Dr. Philips who came from England and then returned a few years later. Several other dispensaries were then opened by physicians in the Halifax area. Dr. James Avery opened an apothecary shop in Halifax in 1824. Dr. John Naylor engaged exclusively in the drug trade and created remedies to sell, such as the very popular Naylor's Pectoral Balsam.

In 1828 JDB Fraser advertised: drugs, medicines, patent medicines, perfumery, spices, dye stuffs, etc. in the Pictou, Nova Scotia, newspaper. There is a record of him ordering: turpentine, saltpetre, alum, linseed oil, lard, sugar, castor oil, snuff, berries, and four gallons of rum along with other sundry supplies from Walker and McCrea, Saint John

Merchants. He was very successful and sold products to Prince Edward Island and the northern area of Nova Scotia. In 1848 he was selling chloroform that he had made to physicians - a product that had only just been used as an anaesthetic in Scotland in 1847. An amputation of a thumb was the first Canadian surgical operation performed with chloroform used to anesthetize the patient. This then led to more extensive use. Fraser's wife used chloroform when she gave birth to their seventh child. Initially there was some religious opposition to the use of anaesthetics at childbirth and it did not become accepted until 1853 when used by Queen Victoria. In addition to selling medication Fraser also sold surgical supplies such as abdominal supporters, lancets, male catheters, bladder and water pipes, and injection bags to the Board of Health. To support the pharmacy it was necessary to sell other products such as vegetable seeds, ketchup, minor hardware items, coffee, varnish, spices, candles, and gunpowder. As a side line he pulled teeth. Fraser was a businessman, healthcare professional, and community leader and is recognized as a leading citizen and pharmacist of Nova Scotia. The sparse population in the Canadian colonies required that pharmacists sell a wide array of products in order to exist and this situation continued, especially in rural areas, until fairly recent times. This is in contrast to Europe where pharmacies were able to confine their scope to health products and still be profitable.

Charles Tupper, who graduated in Medicine from Edinburgh, opened a pharmacy in Amherst, Nova Scotia, in 1843. His brother Nathan then operated the pharmacy when Tupper entered politics and had a distinguished career serving as Premier in 1864 and Prime Minister of Canada in 1896. He played an influential role in Confederation.

The first pharmacist in Newfoundland was Thomas McMurdo, who arrived from Scotland to establish a pharmacy in 1823. He and his son in law John McNeil educated pharmacists in their pharmacy for several decades and their firm remained a major force in pharmacy for over a century.

Leonard Tilley, later Sir Leonard Tilley, operated a pharmacy in St. John, New Brunswick in 1853 and advertised a range of products that he had just imported from London, England. He served as Governor of New Brunswick, was a father of Confederation, and a Finance Minister of Canada.

Advances in medicine and pharmacy

During the period 1759-1815 in Canada the majority of people lived a demanding life, working hard for long hours, and injury and disease were always prevalent. Discomfort and pain were part of life and not seen as something that required treatment or bed rest. Few people were educated and even fewer had knowledge of medication. More highly educated people often served in several roles in communities. In rural areas and small towns, priests were usually the most educated individuals and they were often the ones who dispensed medication. It was at this time that widespread literacy was developing and more people began reading the newspapers that were appearing and books on self care became popular.. Various remedies were concocted at home and people who could afford to imported medications from Britain. There were relatively few products and the

physician could easily carry them in a bag when he went to visit a patient. The few medications used had little efficacy in today's context but were seen as being very valuable to those who became sick or injured and needed some form of therapy, particularly for children or during incapacitating illness.

Top Treatments

1795: opium, senna, aloes, tartar, cinchona, licorice, mercurial, jalap, blistering agents

1880 : cupping, opium, tartar emetic, chloroform, bromide/ergot, aconite, chloral hydrate, enemas, and milk

2014 : lipid-lowering agents, ACE-inhibitors, proton pump inhibitors, anti-depressants; opioids

The 18th century was a dynamic period for new pharmaceutical formulae. Some remedies were based on ancient knowledge while others reflected the discoveries made in science. It also marked the transition from exotic remedies such as viper's blood and extract of the castor (castor is the Latin name for beaver) gland. The beaver gland product called castoreum was harvested in the West along with the beaver pelts and exported to Europe (since beavers had become extinct in Europe). Pharmacists also made use of the more widely known botanic and mineral substances.

There were a large number of Pharmacopoeia and Dispensatoria in this century with a wide range of formulae. The first American pharmacopeia was published in 1778 by William Brown in the United States.

In the field of medical science there were developments in the study of anatomy, physiology and pathology. Early in the 19th century the advent of physical diagnosis was based on advances in anatomy and clinical medicine. Diseases could be linked to anatomical changes and clinical terminology became more scientific. Early in the 19th century studies on the symptoms and mortality of various diseases were conducted to better understand the disease process and the success rates of treatment, a forerunner to evidence-based medicine. Digitalis was introduced to medical practice in 1789 as a diuretic for the treatment of cardiac disease and its properties and usefulness were studied and improved over the next two centuries. Jenner published the results of his work on smallpox vaccination in 1798 but vaccination uptake was uneven. The vaccination process did not use vials of sterile product but exudate from infected tissue that was collected and rubbed into a cut in the skin. While most of the affluent English-speaking population was vaccinated, there were some groups that opposed vaccination and

smallpox outbreaks continued to occur, with an outbreak in Montreal that killed over 3000 people.

In the period 1812-14 the main diseases encountered in Canada were: typhus/typhoid; ague (shaking caused by fever, often malaria); dysentery; malaria; measles; mumps; tuberculosis; and wound infections. Infectious disease was the major health problem in society until anti-infectives were introduced in the late 1930s. Despite the relative paucity of effective remedies, the availability of medication was seen as important. One example of this was demonstrated during the 1812-14 war. When the British evacuated Fort George at Niagara they buried some medicine nearby. Later, when the Americans were occupying the fort, the British required more medicine so they initiated an assault on Fort George to divert the American troops while a work party dug up the buried medicine and took it away.

Tea, coffee, tobacco and soda water were hailed as wonderful medicines or, in some cases, prohibited. Many of the original drugs - antimony, mercury, strychnine, arsenic - are now thought of as poisons but their pharmacologic activity led to their use in a variety of diseases. In the early part of the century drugs were classified by their action. If they induced urination they were a diuretic, irrespective of their therapeutic use. There were ongoing efforts to use the purest available form of drug, especially in France, as it was seen as being more modern and scientific. Hence, morphine was used instead of opium. This trend has continued until today with research to identify the active ingredients of many medicinal plants.

There were few apothecary shops or drug stores and those that did exist carried a wide variety of products, mainly non drug. The medication stocked consisted of chemicals, crude drugs, spices and patent medicines. Some of the medications in use at this time were opium, purgatives (jalap, rhubarb root, senna, castor oil) as well as salts such as Glauber's Salts and Epsom salts, emetics (ipecac and tartar emetic), blistering plasters (cantharides, known as Spanish Fly that were used for topical diseases and deeper pain), camphor for the treatment of venereal disease along with arsenic, potassium nitrate for fevers and delirium, and mercury for the external treatment of wounds. A popular patent remedy at this time was Turlington's Balsam of Life. This was compound infusion of several botanicals used on wounds and officially known in pharmacopeia as Traumatic Balsam. It was effective and had a long shelf-life and was sold in a small angular bottle that only held a tablespoonful of ingredient. A patent for this product was received in 1744. It arrived in America in 1746 and was widely distributed. Hudson Bay traders carried it into the interior of the country and it remained popular for many years. There were even reports of it being used in the American Civil War a century later. Generally, these English patent medicines were popular in Canada and New England and they were sold in various outlets including post offices in New England. Some apothecaries refilled the containers. Many products were named after their inventors: Plummer's Pills, Matthew's Pills, Starkey's Pills, etc. Over time many of these received a patent and their formulae were disclosed. Some became official in the compendia.

Single-entity Medication

Advances in chemistry had an impact on medical practice. Rather than administering

crude extracts, isolated active ingredients could be used. This gave greater precision to dosage and more consistency in patient response. Up to this point the description of drugs was based on their physiological properties. Both opium and nightshade (atropine) were classed as sleep-inducing narcotics. Willow bark (salicylic acid) was an astringent. Substances that caused vomiting were emetics. Sudorifics made people sweat. Stimulants woke them up. Digitalis was first described as a diuretic as it increased urine flow but we now know that the effect was on the heart not the kidney. Many of the drugs used into the 19th century as medications are now recognized as poisons. These drugs in large doses cause catharsis, vomiting, sleep, or stimulation and were used in conjunction with restrictive diets, potent enemas or clysters, bleeding, leeches, and cupping. These were known as heroic measures and were used when people were not responding to less dramatic therapy. Heroic was an appropriate term not only because of the large doses of drugs involved but also because they were often combined with a patient placed in a hot room under blankets while being bled, given large doses of laxatives and emetics for several days. With more knowledge about drugs and the introduction of surgery with anesthesia, heroic therapy began to fade. Pharmaceutical firms began to prepare more scientific medication about this time and provided a more acceptable alternative.

Growth of Pharmacy in Canada

During the the Industrial Revolution, 1815-40, in Europe, but especially Britain, cities grew with kilns, mines, foundries and factories, which polluted the atmosphere, land, and water. The homes of the worker were crowded slums between the industrial sites. Public health initiatives were begun with examination of the health of the laboring class and the incidence of disease and death. One of the methods of coping was alcohol. In England it was gin and it was said that 'drink was the curse of the working class', more recently this has been turned to 'work, the curse of the drinking class. It was noted that lifespan was short and that most workers were not in good health. The average age of death for the working class was under 20 with most deaths before one year of age. Skilled workers and gentry had significantly higher average age for deaths but they were usually under 45 years.

Infectious diseases were prevalent and exacerbated by the crowded living conditions. The main diseases were consumption (tuberculosis), typhus, smallpox, and cholera epidemics. Bloodletting and cupping were common practices. It was thought to be useful to draw blood from patients and often up to 30 ounces would be removed, a large quantity even for a healthy donor. Cupping was the process of drawing blood to the surface of the skin by burning alcohol in a jar to remove the oxygen and make it warm then placing this on the skin. The vacuum created as it cooled would pull the tissue into the cup. This was then either left as a protruding mass (the poison had been drawn out) or cut to release the blood (wet cupping). This procedure continued in folk medicine well into the 1900s and is being revived by some practitioners today.

What system of measurement was used?

The Apothecary system of weights was used in early Canada. It was based on the ancient system of weights and measures used in Europe for centuries. The basic unit was the grain.

$$1 \text{ grain} = 65 \text{ mg}$$

$$20 \text{ grains} = 1 \text{ scruple} = 1.3 \text{ Grams}$$

$$3 \text{ scruples} = 1 \text{ drachm} = 3.9 \text{ Grams}$$

$$8 \text{ drachms} = 1 \text{ ounce} = 31.1 \text{ grams}$$

The Apothecary ounce contains 480 grains. The Avoirdupois ounce used in commerce today has 437.5 grains. Notably, the number of Apothecary ounces to a pound is 12 while the Avoirdupois system has 16 ounces to a pound.

In measuring precious metals, the grain, ounce, and pound are the same as the Apothecary system. What weighs more a pound of gold or a pound of feathers?

An ounce of gold is 480 grains and there are 12 in a pound.

An ounce of feathers has 437.5 grains in an ounce and 16 ounces in a pound.

So the pound of feathers is heavier than a pound of gold.

The Imperial system based on the minim as the smallest unit was used for measuring liquids. The minim is roughly one drop and prescription instructions written as minims were given to the patient as "drops". For example, 'Put 3 drops in a glass of water and take before meals'.

$$1 \text{ minim (one drop)} = 0.06 \text{ millilitres}$$

$$60 \text{ minims} = 1 \text{ fluid drachm} = 3.55 \text{ millilitres}$$

$$8 \text{ fluid drachms} = 1 \text{ fluid ounce} = 28.4 \text{ millilitres}$$

$$20 \text{ fluid ounces} = 1 \text{ pint} = 0.57 \text{ litres}$$

$$2 \text{ pints} = 1 \text{ quart} = 1.14 \text{ litres}$$

$$4 \text{ quarts} = 1 \text{ gallon} = 4.55 \text{ litres}$$

One Imperial liquid ounce of water has a mass of 437.5 grains.

The Apothecary system was used in compounding prescriptions until the Second World War. Afterwards, the metric system replaced it. The new medications being developed

and marketed always measured the drug dosage in metric and the containers were increasingly metric. This shift to modern medication also reflected the demise of compounding as a generally applied skill of pharmacists. Physicians trained in the use of the new medication no longer knew the Apothecary system and the old compounding favorites.

How did dosage forms evolve in early Canada? Powders, pills, and fashion

Many of the medical ingredients for prescriptions were brought to Canada in crude form. Bottles of herbal and chemical ingredients were carefully packed and brought in wooden cases. Powders and pills were the two main types of solid dosage forms. The powders were usually composed of two or more ingredients that were combined and triturated in a mortar until they were a fine uniformly mixed powder. The powder was then poured onto a dispensing slab and carefully divided into equal portions. Each portion was then folded into a square sheet of paper in a specific manner so that it would fit into a powder box. Usually there were about 12 to 15 powder papers in a box. To use the powder, it was poured into a glass of water, mixed and drunk.

Pills were prepared by mixing the active ingredients with a liquid binding agent or with a solid binder and a suitable liquid additive. This mixture was kneaded into a dough-like mass that was rolled out onto a tile and cut into single dose using a pill cutter or a spatula. Each dose was then rounded into a ball using a pill roller, a round piece of wood that had a recessed centre, or it could be rolled in the palms of the hand. (Hence the reason pharmacists were referred to as 'pill rollers'). The pills were then allowed to dry. To protect them and make them more stable, they could be coated. In Europe the popular custom was to coat them with precious ingredients but this is unlikely to have occurred in Canada. Pills were dispensed in a pillbox, usually a small round paper box. Similar types of plastic or metal containers are again being used to carry capsules or tablets. Interestingly, a round, defence structure for ground troops was termed a pillbox by the British army during World War I (http://en.wikipedia.org/wiki/Pillbox_hat accessed October 9, 2014). Military hats that were round and flat on top, without a brim and often with a chin strap, were called pillbox hats. Pillbox hats are still a part of some military ceremonial dress, particularly for Commonwealth nations, and indeed the Royal Military College of Canada dress uniform includes a pillbox hat. Like other military fashions, pillbox hats were appropriated for civilian wear and were especially popular in women's fashion from the 1930-60s.

Liquids were also prepared and were popular, more so in urban areas than in smaller centres. Preparation usually required concentrated fluid extracts that were imported from Britain. In some areas the local medicinal plants, based on Indian tradition, were used to prepare medication. A tea made from spruce needles was used early on to treat scurvy. Juniper was used for stomach aches and colds. Seneca or arrowroot steeped in tea, was an Indian medicine used as a tonic. Tobacco was often used topically or orally as a medicine.

Counter-irritants to mask or diminish pain were prepared as a liquid and then placed on a piece of cloth, a plaster consisting of a semi-solid mixture spread on paper or in some cases bread, or as an ointment. These products were either purchased in bulk from Britain or prepared locally. Topical products as solutions, suspensions or lotions were used for skin conditions, a common problem in early Canada. They were applied without friction and usually covered with a bandage made of cloth.

For the most part the population and healthcare professionals used what was available and this varied from place to place and from time to time. Often people just used household remedies that had been passed down in the family. To this was added local native remedies.

The Evolution of Legislation

The first Canadian legislation following the Conquest, 1759, was the Medical Act in Quebec (1788) which set out requirements for the practice of medicine, surgery, pharmacy and for apothecaries. Each was a separate registration. After the creation of Upper Canada, legislation to regulate the practice of medicine and surgery was passed in 1795. This act was later repealed and new legislation appeared in 1815 but it did not mention drugs or vendors of drugs. The regulations were focused on having physicians obtain a good knowledge of drugs (*materia medica*) and compounding. In forming the medical school in Toronto during the 1820s and 1830s (the first secular university in Canada), there was a requirement that one of the six professors be in *materia medica* and pharmacy. This was the beginning of medical legislation that attempted to control pharmacy up to Confederation.

The Opium and Narcotic Drug Act of 1920 was a major achievement for government and the profession. Pharmacists had long advocated having legislation of this kind and after some provinces initiated legislation the federal government followed suit. Pharmacists were pleased at the outcome of this endeavor and their role in making it a reality. One aspect, however, caused some problems. Pharmacists recommended that codeine not be listed as a narcotic due to its low potential for abuse. The government accepted this but in the United States it remained a narcotic and exports needed to meet the requirements for narcotics. The requirement was for the Government of Canada to issue a certificate to import the narcotic but the Government would not do so as it was not a narcotic. This difference continues to have an impact today with American tourists often keen to purchase non-prescription codeine-containing products when visiting Canada.

How did drug wholesale companies arise?

Pharmacists experienced difficulty in obtaining medication due to irregular shipments from Europe. Boats would often be held up for months or be lost at sea. Some manufacturers and wholesalers in Britain would send out trunks full of assorted medication to pharmacies in Canada on speculation. These were welcome and pharmacies would immediately accept them and use the contents. Usually there was an excess to current needs and the medication could then be shared with other pharmacies.

This could lead to an arrangement in which the local pharmacy would place larger orders in Britain and then distribute the goods on arrival, in effect becoming a wholesaler. They could also become a wholesaler by manufacturing larger quantities of some items and selling them to other pharmacies or physicians.

In 1853 the earliest recorded wholesale in Canada was begun in Toronto when Eliot and Thornton in Dundas joined with Lymans of Montreal to form Lyman, Eliot and Company in Toronto. This firm lasted until 1870. In St. John N.B. Mr. Barker joined his pharmacy with that of Leonard Tilly (later Governor of New Brunswick) in 1860. Silas McDairmid was also operating a pharmacy at this time and in 1902 began a wholesale known as McDairmid Drug Co. The Baird Company in New Brunswick established itself as one of the early drug wholesale companies. The drug wholesalers Estey and Curtis were established at the end of the 19th century in St. John and Fredericton, New Brunswick.

In B.C. Arthur Langley, an English pharmacist started in Nova Scotia, moved to San Francisco and later came to Victoria to open a wholesale in 1858 as Langley and company. They became Langley and Henderson and later as Henderson Brothers with a branch in Vancouver.

(National Drug and Chemical Company of Canada Ltd, 1906-1956, pp.6-7)

In 1800 Lymans Ltd. (Wadsworth and Lyman) began in Montreal and had their head office at Place d'Youville near the site of the first dispensary in Montreal. Lymans was later acquired by the National Drug and Chemical Company. Dr James Avery's Apothecary became the first wholesale firm in Nova Scotia, operating as Avery, Brown and Company.

There was a rapid increase in population and wealth, which created a dynamic marketplace for the individual pharmacists and small wholesalers that was characterized by an explosion of patent medicines and growing demand for traditional medications, cosmetics and toiletries, health supplies of various sorts, and some of the new pharmaceuticals based on medical sciences. Over the century the population growth and demand for medication resulted in the drug wholesale firms becoming full-time wholesale operations with no retail component. In the period 1820 to 1900, especially in the latter period, there were a large number of wholesale firms established across Canada, such as Kerry, Watson and Co. (Montreal), 1815; Evans and Sons (Montreal), 1820; Brown and Webb (Halifax), 1824; and J. Winer & Co. (Hamilton), 1830. Over the next 50 years a large number of wholesalers appeared in cities across Canada. Winnipeg was the distribution hub for the West and drug wholesales were established early. The first record of a wholesale firm was 1873 when J.F. Caldwell opened a wholesale and retail operation in Winnipeg. This was followed by Langridge and Wilson in 1882 and Martin, Rosser and Company in 1884.

The most interesting initiative, however, was that of David Bole who came to Winnipeg after operating a retail and wholesale firm in Regina. Business opportunities were limited in the territories so he moved to Winnipeg in 1895 and entered a drug wholesale business there. It was very successful but he was a very ambitious person. Wholesale pharmacies

at that time were small retail-wholesale operations that made many of the standard drug products used in pharmacies. As a result the quality and consistency varied considerably.

It was Chas. W. Tinling, president of Dominion Drug Company in Hamilton originated the idea of an amalgamation. With Bole and Theo. H. Wardelsworth of Evans, Sons and Mason in Montreal they visited companies throughout Canada and obtained agreement. All the major wholesalers in Canada joined in a grand merger which combined 18 companies into the National Drug and Chemical Company of Canada in 1905 with David Bole as president. This was not only the pre-eminent drug wholesale in Canada, it was also the largest drug manufacturer of pharmaceuticals and patent medicines as well as cosmetics. It maintained a leading position as a drug wholesale for many years. Bole retired in 1922 as the leader of the firm. In addition to this accomplishment he also served in many civic organizations in Winnipeg and as a Member of Parliament.

These regional wholesale firms found it difficult to maintain a stock of the expanded product lines and to deal with the growing national manufacturing firms. There was a sense that major changes were needed if they were to remain in business and compete. A major burden was the need to manufacture standard products for pharmacies. The wholesale firms did not have the staff, equipment, facilities, or packaging/labeling requirements for the growing demand. The products distributed tended to vary substantially from firm to firm and the quality standards were criticized by the federal government analysts. For example, laudanum was to contain between 0.7 and 0.8% morphine but samples tested ranged from 0.19 to 1.48%! This was the impetus for combining to form a single national wholesale firm to produce high-quality products for distribution to pharmacists across Canada. This was a late development compared to the United States, where large regional wholesale/manufacturing plants were established as early as 1807 in Philadelphia giving their home remedies (patent medicines) trade names. This marked the beginning of trade names for pharmaceuticals in North America.

How did research-based pharmaceutical companies develop?

In 1872 a young pharmacist in Philadelphia, Henry K. Wampole, opened a business to manufacture and sell pharmaceuticals. He opened a plant in Toronto in 1893 to serve the Canadian market and was very successful with several expansions of the plant. The plant was later moved to Perth Ontario where it remained for many years until the firm was purchased by Aventis. Charles E Frosst was the pharmacist hired in Philadelphia to open the plant and run the Canadian operation. In 1899 Frosst moved to Montreal and established his own firm, Charles E. Frosst & Co. William S. Ayerst, Frank W. Horner, Gerald Dillon, and Samuel Thompson were hired as associates. Both Ayerst and Horner later established pharmaceutical firms in competition with Frosst. Frosst built his business on excellence, affordability, and reliability. He stressed the fact that the firm was Canadian. It had a major influence on Canadian pharmacy and held a leadership position until a fire destroyed its research laboratory. Frosst were pursuing research into the use of medical isotopes at the time. The company was purchased by Merck in 1964 and existed as Merck-Frosst until 2009 when the name was shortened to Merck.

Research-based pharmaceutical firms began in the US, with those such as Eli Lilly hiring a chemist and botanist before 1880 and having a separate research building in 1911. J.K. Lilly, son of the founder Eli Lilly, graduated in pharmacy from the Philadelphia College of Pharmacy in 1880. At the time, Joseph P. Remington was teaching there and many of his graduates moved into the pharmaceutical industry with a focus on producing high-quality products. In Europe, the Swiss and German firms were developing research departments and developing new drugs such as Salvarsan (1910) with assistance from the University of Toronto.

Canadian branches of foreign firms in chronological order in parenthesis along with firm establishment :

Wyeth 1860 (1883)

Dow Chemicals (as Shuttleworth) 1879

Parke Davis 1866 (1887)

Allen and Hanbury (Glaxo) 1715 (1902)

Burroughs and Wellcome 1880 (1906)

Cooper Laboratories 1970 (Zonite 1918) (Chemway 1950)

Cutter 1897 (1920)

Rhone Poulenc (1920)

Ciba (1922)

Mead Johnson 1900 (1923)

E.R. Squibb 1860 (1925)

Schering (1926)

Sandoz (1927)

Abbott 1888 (1929)

Merck 1911 (1929 Merck Sharpe and Dohme) (1961 Merck Frosst)

Hoffman LaRoche (1931)

Cyanamid (Lederle) 1907 (1934)

Upjohn 1885 (1935)

Miles Laboratory (1936)

R.P. Scherer 1933 (1936)

Baxter Travenol 1931 (1937)

Eli Lilly 1876 (1938)
Organon 1923 (1938)
Ortho (1941)
Norwich Eaton (1944)
Geigy (1945)
Merrell 1905 (1947)
Bristol (1948)
Riker 1949 (1950) as part of Rexall
A.H. Robins 1866 (1949)
Smith Kline and French 1841 (1950)
Penwalt (1951 as Strasenburg)
Pfizer 1849 (1951)
Searle 1888 (1951)
Endo (1953)
Hoffman LaRoche (1953)
USV (1953)
Purdue Fredrick 1892 (1956)
Stiefel 1846 (1956)
Hoechst (1957)
Pitman Moore (1957)
Roussel (1957)
Fisons (1958)
Alcon 1945 (1959)
McNeil Laboratories (1959) part of Johnson and Johnson
Syntex 1944 (1962)
Allergan 1948 (1964)
Pharmacia 1911 (1965)

Rorer 1910 (1968)

Boehringer Ingelheim 1885 (1972)

ICI Pharmaceuticals (1977)

Servier Canada (1978)

The American firms established branch plants in Canada during this era : (parentheses represent Canadian operation): E.R. Squibb 1860? (1925), Parke Davis 1866 (1887), Abbott Laboratories 1888 (1929), Smith Kline and French 1841 (1950), Warner Chilcott, 1856, Alcon 1945 (1959), Allergan 1948 (1964), A.H. Robins 1866 (1949), Baxter Travenol 1931, (1937), Cooper Laboratories 1970 (Zonite 1918)(Chemway 1950), Cutter 1897 (1920), Cyanamid, now Lederle 1907 (1934) Eli Lilly 1876 (1938), Endo (1953), McNeil Laboratories (1959) part of Johnson and Johnson, Searle Pharmaceuticals 1888 (1951), Purdue Fredrick 1892 (1956), Wyeth 1860 (1883), Cutter 1903 (1920)), Cyanamid 1903 (1934), Mead Johnson (1923), Merck, then Merck, Sharpe and Dohme 1911, (1929) (Merck Frosst 1961), Merrell 1905 (1947), Miles Laboratories (1936), Norwich – Eaton (1944), Pfizer 1849 (1951), Penwalt (1951 as Strassenburg), Purdue Frederick 1892 (1956), Ortho (part of Johnson and Johnson) (1951), Riker 1949 (1950 as part of Rexall), Rorer 1910 (1968), Mead Johnson 1900 (1923), Scherer 1933 (1936 as Gelatin products), Schering (1926), Stiefel 1846 (1956) Syntex 1944 (1962) and Upjohn 1885 (1935), USV (1953).

British firms also established Canadian operations: Ristol (1948), Burroughs and Wellcome 1880 (1906), Fisons(1958), and Glaxo, which began as Allen and Hanbury in 1715 (1902), ICI Pharmaceuticals (1977), .

European firms were important in Canada; Boehringer Ingelhiem 1885 (1972), Ciba-Geigy 1971 (Ciba 1922) (Geigy 1945), Hoechst (1957), Hoffman-LaRoche (1953), Organon 1923 (1938), Rhone Poulenc (1920), Roussel (1957), Sandoz (1927),

In this period the Canadian firms of E.B. Shuttleworth (1879), became Pitman Moore (1975) and later Dow Pharmaceuticals 1960 ; Anca,(1944) formerly Anglo-Canadian Drugs 1935 acquired by Wander Co.; Bell Craig acquired by Denver Labs; Canada Duphar acquired by Bristol Laboratories; Eri Pharmaceuticals acquired by International Chemical an Nuclear Corp (ICN); Intra Medical Products acquired by Penick; Canada Pharmacal, Analco, and Octo acquired by Marion Labs; Charles E. Frosst (1899) acquired by Merck, Sharpe and Dohme; Diamond Laboratories acquired by Syntex; Elliott-Marion acquired by American Home Products; Frank W. Horner acquired by Carter Wallace; Gelatine Capsules acquired by R.P. Sherer; J.F. Hartz acquired by Wander Co; J.M. Marsan acquired by ICN Corp; Microchemicals acquired by Generics Corp; Neo Drug acquired by Knoll; Pentagone 1960 acquired by Knoll AG; Sharpe and Dohme (1911) acqured by Merck; Mowatt & Moore (1920) became Beecham in 1978; Sabex 1980 established; Sabra Pharmaceuticals acquired by ICN; Sands Pharmaceuticals

acquired by Jerram Pharmaceuticals; S and U Pharmaceuticals acquired by ICN; Steri-lab Corp acquired by Damon Inc which was acquired by Novopharm; Servier 1978; Winthrop laboratories, later Winthrop-Stearns (1919); Winlely Morris acquired by ICN; Rougier Desbergers and Ayerst, McKenna and Harrison (1925) were established; Connaught Laboratories, part of the University of Toronto, produced immunizing agents for public health but also operated a research laboratory that developed insulin in 1923, purchased by Canada Development Corporation in the 1970s.

Aspirin – still going strong

Aspirin was successfully marketed by the Bayer company of Germany prior to World War I. Before the United States entered the war, the Bayer Company in the United States purposely bought up carbolic acid to make Aspirin, thereby preventing it from going to Canada to be made into explosives. When the United States did enter the war, Bayer's assets were seized and sold to Sterling Drug, which advertised it heavily and insisted on maintaining patent protection. It continued to do well and recently celebrated 100 years on the market.

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The birth of pharmacy organizations and national pharmacy publications

Pharmacy licensing bodies were organized in response to the growth of towns and cities from the flood of immigrants. This reflected the increased number of pharmacies and the desire of the pharmacists to have some regulatory control so that the quacks and untrained people would not be providing a service. This was to protect the public and also to protect the livelihood of the pharmacists. Later the organizations would split into two separate organizations, one to protect the public and one to represent the interests of the pharmacists (or pharmacy owners).

In Quebec prior to 1864, compounding and dispensing were performed and controlled by physicians. Pharmacists in Montreal formed the Montreal Chemists Association in 1864 and they held meetings in 1868 following Confederation to create the Quebec College of Pharmacy. The physicians were opposed to the use of this name so the Quebec Pharmaceutical Association was created in 1870 to regulate pharmacy practice. Examinations began the next year with 11 candidates.

In Ontario, the Toronto Druggists Association fought against medical control in 1867 and expanded their organization to become the national Canadian Pharmaceutical Society. The Canadian Pharmaceutical Society attempted to have legislation enacted similar to that in Britain for the regulation and unification of pharmacy (Federal Pharmacy Act) but were not successful. After several attempts to obtain provincial legislation, a Pharmacy Act was passed in 1871. It established the Ontario College of Pharmacy and dissolved the Canadian Pharmaceutical Society, which had been involved in pharmacy education. Education was mainly apprenticeship and more than 20 years would pass before a 2-year course under the direction of the Ontario College of Pharmacy was established.

During this period pharmacists were active in lobbying the federal and provincial

governments to avoid unfair taxes and unnecessary regulations. The high cost of alcohol due to taxes was to be a major issue for pharmacists for many decades. Pharmacists were upset at the unfairness of manufacturers paying only half the tax that they had to pay.

The Nova Scotia Pharmaceutical Society was formed in 1875 and a Pharmacy Act was passed in 1876. Pharmacists were required to pass an examination in order to practice but there was no requirement for a person to be a pharmacist in order to operate a pharmacy (this was changed in 1892). The first examination was held in 1878. In 1879 physicians were allowed to become members if they were operating a pharmacy.

In 1878 the Manitoba Pharmaceutical Association was formed. In order to educate pharmacists the Manitoba College of Pharmacists was created in 1899 in a building built for that purpose and which also housed the Association.

Although the New Brunswick Pharmaceutical Society was formed in 1873, it did not officially become the regulatory body until 1884. Licensure required 5 years of practice of which 2 years in dispensing were mandatory. The first examinations in 1885 had six candidates. The Society did not engage in pharmacy education.

The Northwest Pharmaceutical Association was formed in 1892 and was located in Regina. In the territories, pharmacists from Ontario had migrated along with the settlers. A notable pharmacist was David Bole who was born in Ontario and graduated from the Ontario College of Pharmacy in 1880. He opened a pharmacy in Ontario but decided to head west and took the train to Regina in 1882 where he began one of the first pharmacies in the Northwest Territories. With his brother-in-law he established the Dawson, Bole Company which was both a retail and wholesale company. He also developed a number of patent medicines, the most successful being Gin Pills. He then moved to Winnipeg where he was very successful and this provided the base to his future consolidation of the wholesale industry in Canada as National Drugs.

Alberta and Saskatchewan formed associations in 1911 and were removed from the jurisdiction of the Northwest Pharmaceutical Act of 1892. (British Columbia had a Pharmacy Act in 1891). British Columbia later found a way of funding its professional association by negotiating a 9 cent per prescription check-off system. This generated enough funds to provide services to their members and initiate new programs. Unfortunately, the provincial government discontinued the program in 1989 with little notice and the association was reduced to requesting funding from pharmacists to stay afloat.

The Newfoundland Pharmaceutical Association was formed in 1910.

The Canadian Pharmaceutical Association (CPhA) was resurrected in 1907. It came about due to lack of representation of important issues such as tax legislation that pharmacists found oppressive. To create a way of lobbying government a progressive group of pharmacists from across Canada under the leadership of G.A. Burbidge, Dean of Pharmacy, of Nova Scotia and George Gibbard, editor of the Canadian Pharmaceutical Journal, the founding members. George Gibbard was the first president. At the first annual conference held in Toronto, 1908, the CPhA formed five committees to deal with

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issues. One committee was to study educational standards amongst provinces with a view to adopting a uniform standard and establishing a national Board of Examiners (it was about 1970-80 that common academic standards were reached; the Pharmacy Examining Board of Canada [PEBC] legislation was passed in 1963). At the time the CPhA was founded, the major concerns of pharmacists were : 25% of pharmacies were owned by physicians, Sunday closing of pharmacies, prevalence of quack remedies, replacement of compounded products by proprietary medicines, and worst of all, the threat of cut rate pricing policies. While there was some cost cutting in Canada, the profession was stimulated to take action by the situation in the US. Pharmacies in the US were seen to be virtually small department stores stressing the sale of patent medicines and having only a small dispensary with a pharmacist. To some extent this situation has now come to pass in Canada.

There were some early successes. The CPhA was responsible for recommending changes to the Patent Medicine Bill in 1908 and making it more practical from a pharmacy perspective. The Association was a major influence in establishing the Anti-Cocaine Bill in Ontario that restricted the sale of cocaine to pharmacies. This legislation was then enacted in other provinces and incorporated into federal legislation. In the discussions of the association, the conflict between commercial and professional interests was identified and attempts made to clarify the role of the pharmacist in society.

The second national conference was held in Banff in 1909. It dealt with price-cutting, education, and the Canadian Formulary (a standardized list of formulae that the pharmacist would prepare on prescription and which physicians were encouraged to prescribe). For many years, until the early 1950s, the Canadian Formulary was an important project for the CPhA as it set out standardized formulae that were pharmaceutically stable, elegant, and therapeutically accepted. In maintaining this formulary the association engaged the staff of the pharmacy schools. The last edition of the Canadian Formulary was issued in 1949.

The following year J.P. Remington of the Philadelphia College of Pharmacy, a leader in pharmacy education in the United States, addressed the CPhA conference on "Pharmacy Today" as part of the continuing endeavor to improve professional activities and public perception. There was a resolution passed to tighten narcotic regulations. Pharmacy practice was guided for many years by the book Remington's Pharmacy Practice which was prepared by the Philadelphia College of Pharmacy and Science.

At the 1912 conference it was recommended that the association publish a magazine and that the association manufacture and control a line of medicinal and toiletry items as in Britain. This led to a decision to endorse the products of Drug Trading (DT) Co. At the time DT was owned by some 200 pharmacists in Ontario. Under the agreement, the election of members to the DT Board was subject to approval of the CPhA.

There were no meetings of the CPhA during the Great War. The justification for this was given by the editor of the Journal, "Patriotism justifies postponement. The social features of the convention are not a minor factor, and with the Old Motherland fighting for the integrity of empire...social functions and entertainment should find no place in our community or fraternal life."

After the War, the 1919 national pharmacy conference was held in Winnipeg. The long gap of 5 years since the previous meeting meant that there were many issues to be dealt with. A Committee of Commercial Interests formed. The role of the CPhA in lobbying the federal government was confirmed. In this they were successful in obtaining a reduction in the Excise tax on alcohol used in dispensing. As this was quite a large tax it represented a substantial saving to pharmacists. They also agreed to a national pricing code - PHARMOCIST, representing the numbers 1 to 0. This was used on prescriptions with the price charged on the prescription in code. In this case a prescription selling at \$2.95 would have the code HSM. In the 1950s the use of this code was proscribed by the federal government (Restrictive Trade Practices Commission).

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The CPhA conference in 1920 described the sale of liquor through pharmacies as being a major problem for the profession. However, most of the physicians and pharmacists opposed prohibition and were willing to supply their patients with a quart (40 oz) of whiskey with little regard to the health aspects. In 1917 there were 180,000 prescriptions for alcoholic beverages in Vancouver alone. Regulations continued to be enacted to regulate the flow of whisky through this channel so that prescriptions became restricted to 26 and 12 oz bottles instead of 40 oz bottles. Over time these quantities also shrunk. There were many patent medicine tonics at this time that contained alcohol and which were very popular both with prohibitionists and boozers. Rexall's Rheumatic Remedy had 9% alcohol and Hamlin's Wizard Oil contained 32.5%. Although the end of prohibition resulted in the sale of liquor through government stores, restrictions on public drinking places continued in some places for a long time (1961 in New Brunswick). In small towns some provinces allowed pharmacies to sell liquor.

Also at the 1920 Conference, the Education Committee headed by George A. Burbidge (subsequently Dean of the Maritime College of Pharmacy, 1925-43) recommended that there be equivalence among the provinces rather than uniformity. To achieve this they recommended a uniform matriculation standard for entry, a minimum of a 2-year program with 1,000 hours of instruction, and a committee to set out the syllabus for the 2-year program. There was also a restatement of the need for preceptors of apprentices to be diligent in their teaching of the application of scientific material learned in class. A commercial course in the curriculum was seen as essential (this issue continued for many years as pharmacy schools believed that the commercial aspects should be taught in the pharmacy). These recommendations of the Education Committee followed from three earlier meetings of pharmacy educators beginning in 1917 (Halley Hamilton Gaetz – Alberta; Alexander Campbell – Saskatchewan; and Henry E. Belcher – Manitoba). The educators did not meet again until 1937.

In 1921 a new office was built for CPhA on Church Street in Toronto. The Secretary was finally given a wage and a budget of \$5000 - \$6000. Previously these expenses were out of Mr. Gibbard's own pocket.

In 1924 the CPhA conference was held in Calgary. It was recommended that apprentices be obliged to sign a code of ethics. Of more significance was the decision to invite Sir Wm. Glyn-Jones from Britain to explain the British Patented Articles Trade Association (PATA) with a view to establishing a similar organization in Canada to establish a "fair price" regimen. This endeavor was a high profile issue that galvanized the profession and

Glyn-Jones was seen as a savior. Unfortunately he died in Vancouver while helping Canadian pharmacists. The fight for resale price maintenance lasted several decades and consumed a lot of money and time only to fall afoul of the Combines Investigation Act. The profession has had the dilemma of price competition since its origin in Canada. Those who sell at a low price are seen as lowering the image of the profession and in many cases lowering the level of service to the public. (An excellent review of the history of resale price maintenance in pharmacies is in *Store Wars*, David Monod, University of Toronto Press, 1996.)

Patient safety was an issue that the professional association addressed by recommending that qualified pharmacists be employed in pharmaceutical manufacturing and in hospital dispensaries. This was a requirement in France.

One resolution of the CPhA conference in 1929 was that a licensed pharmacist must show proof of British nationality. In Canada citizens were British subjects rather than Canadians until the 1950's.

Communication = publications

To improve communication the Canadian Pharmaceutical Journal was inaugurated in 1868, with E.B. Shuttleworth - a visionary for pharmacy - as editor. He was later the Dean of the Ontario College of Pharmacy and then a drug manufacturer. The journal became an important form of communication among pharmacists in a period when transportation was slow and there were few forms of communication other than publications. It reprinted relevant material from British and American publications and advocated for reform of pharmacy practice in Canada.

In 1923 after the death of its editor G. E. Gibbard, the Canadian Pharmaceutical Journal was acquired by the CPhA. In addition to conference news and information on provincial affairs, and some legislation, the journal also presented scientific tidbits and humor that would be of interest to pharmacists. For example, in September 1923 it described the use of scopolamine in convicts to get them to tell the truth about their crimes. (It was used successfully on three convicts in San Quentin Prison in California.) There were also jokes, market reports on crude and chemical drugs, poems, business advice, and letters to the editor.

The Canadian Pharmaceutical Journal was renamed the Canadian Pharmacists Journal (CPJ) in 1985 and it is the oldest continuously published periodical in Canada. Early issues can be viewed on line at http://eco.canadiana.ca/view/oocihm.8_05106 while the current journal can be found at <http://cph.sagepub.com>. CPJ has been indexed on Pubmed since 2012. With the current mission 'to attract, disseminate and discuss research and contemporary healthcare issues and link knowledge to practice' it continues to be a relevant way for Canadian pharmacists to communicate with and learn from each other.

The Canadian Society of Hospital Pharmacists (CSHP) had its first meeting in 1947, set up a constitution and bylaws in 1948, and was incorporated by Letters Patent and given a Charter in 1950. The web site has an overview of the history of the CHSP (http://www.cshp.ca/aboutUs/history_e.asp). In 1940 the CPJ included a monthly column

pertaining to hospital pharmacy. It became necessary to have a separate publication and the Canadian Journal of Hospital Pharmacy (CJHP) was established. It has been indexed on PubMed since 1975 and is available on-line at <http://www.cjhp-online.ca/index.php/cjhp/index>.

How did formal pharmacy education emerge in North America?

Pharmacy education as a formal process based in educational institutions, rather than an apprenticeship augmented by lectures, was initiated early in a few locations thereby setting an example to be followed by other sites. Pharmacy colleges were established by pharmacists in the United States beginning with the Philadelphia College of Pharmacy (1821), Massachusetts College of Pharmacy (1823), and Maryland College of Pharmacy (1841). The move to universities was later. The first pharmacy department established in a university was at the University of Michigan in 1868, the second at Wisconsin in 1883. Wm. Proctor in at the Philadelphia College of Pharmacy published the first pharmacy textbook - *Practical Pharmacy* - which described the techniques of making various dosage forms and the equipment to be employed. In the UK the Pharmaceutical Society of Great Britain was founded in 1841. The American Pharmaceutical Association began in 1852. In Canada, university programs in pharmacy did not begin until 1905 in Montreal.

Once a province was formed and it began to implement legislation, the pharmacists began to press for legislation to control the profession. In most cases this was modeled on British legislation. Because of the close connection between pharmacy and medicine – indeed physicians learned to compound as part of their education and also served as pharmacists in small communities where there was no pharmacy (there continue to be dispensing physicians) – medical legislation often attempted to cover pharmacy practice. In any case, once pharmacy legislation was in place, pharmacists began to lobby for educational programs that would qualify apprentices to pass a licensing exam.

Ontario

The Ontario College of Pharmacy required a four-year apprenticeship as of 1889, with compulsory attendance at some lectures for one year. A two-year program was not a requirement until 1927. The Ontario College of Pharmacy had a building of Gerrard Street in Toronto and it was expanded in 1891 to accommodate more students. This building was used into the 1940s. Dean Heebner was appointed in 1892 and served on staff for a period of 45 years having a strong influence on pharmacy education. One of his first acts was to obtain an affiliation with the University of Toronto. He then instituted a Phm.B. degree program, which required university courses and was examined with oral, written, and practical examinations.

Quebec

Laval University in Quebec City operated a branch in Montreal that provided a pharmacy program taught in French from 1906-1920 when the University of Montreal was organized as an independent university. It continued the pharmacy program, which is the

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oldest continuing university pharmacy program in Canada. The Montreal College of Pharmacy, which was operating independently and providing education in English, offered instruction from 1864 to 1918 when the program was transferred to McGill University. Unfortunately, in 1925 the program at McGill was discontinued due to financial problems. In 1924, Laval University in Quebec City began a pharmacy program.

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Nova Scotia

In Nova Scotia a night class course for drug clerks was initiated at the Halifax Technical College in 1908. There had been joint meetings of pharmacists in Nova Scotia and New Brunswick and agreement that one educational institution, the Maritime College of Pharmacy be formed. But when Nova Scotia wanted to go ahead neither New Brunswick or PEI were prepared to join with them. As a result the Nova Scotia Pharmaceutical Society initiated the establishment of a College of Pharmacy in 1911 in conjunction with Dalhousie University. The link with Dalhousie pushed the one year program to two years to meet educational standards leading to a Bachelor of Pharmacy degree. Students from all provinces were welcome to enroll and some came from New Brunswick and Prince Edward Island. Additional sponsorship from the New Brunswick Pharmaceutical Society in 1917 resulted in the transfer of the Nova Scotia College of Pharmacy which was transformed into the Maritime College of Pharmacy in Halifax with both pharmacy organizations contributing to its operation. (Dispensing Knowledge :One Hundred Years of the College of Pharmacy, 1911-2011. Mary E. McCara)

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Manitoba

From the early 1870s, there was an apprenticeship system. The Pharmacy Association was teaching students in its new building from 1899 onwards. The University of Manitoba offered a one-year Bachelor of Pharmacy program from 1905 onwards. This lasted until 1914 when a University Department of Pharmacy was established to take responsibility for pharmacy education. The program became a two-year University Diploma in Pharmacy with university lectures accompanied by professional practice education provided by the College of Pharmacy. A Bachelor of Science in Pharmacy was initiated in 1920 with the College still participating in providing professional instruction until 1932.

Saskatchewan

The School of Pharmacy began in 1913 as part of the College of Arts and Science. Classes started in January 1914 with 22 students under the direction of Alexander Campbell, a Saskatoon pharmacist. In 1921 the School became a College (a Faculty) with Campbell as Dean. It offered a 1-year Certificate course, increased to 2 years in 1924. A 4-year degree course was available on a voluntary basis with one graduate in 1923. In 1920 there was a surge of student apprentices back from the war with 66 enrolled in the program. It is interesting in that the number of pharmacists registered in Saskatchewan in 1920 consisted of 40 by examination, 47 physicians, 13 graduates of OCP, one graduate of New Brunswick, and 2 graduates of the Northwest Territories (this region later became Saskatchewan and Alberta).

Alberta

The pharmacy program at the University of Alberta began in 1913. Entrance requirements consisted of three years of apprenticeship and Grade 10 for students who were at least 14 years of age. Students could enter into a 1-year Diploma or a 2-year Phm.B. By 1917 students were required to be at least 15 years of age and complete a 2-year diploma. A 4-year Bachelor of Science degree in Pharmacy was also implemented and saw the first graduation class of three students in 1921, the first 4-year degree program in the British Empire. One of the graduates, A. Whitney Matthews, played a strong leadership role in pharmacy for the next 60 years.

British Columbia

British Columbia continued their apprenticeship program with a certificate as Certified Clerk after two years and as a Licentiate in Pharmacy after two more years. Articles were published in the B.C. Pharmaceutical Record to broaden the education of apprentices. To assist pharmacists returning from the war, examination after one year of apprenticeship was allowed. A private school began in 1920 with instruction by pharmacists twice weekly in botany, pharmacy, chemistry, and material medica. Two additional private schools and a pharmacy program by the Victoria School Board, which offered night courses, were initiated soon afterward. The University of British Columbia offered courses through its Extension Department and later established a Pharmacy Program in 1946 under Dean E.L. Woods. This came about only when substantial funding was offered by G.T. Cunningham, owner of a chain of pharmacies, and by the BC Pharmaceutical Association.

The move to transparency

The pharmacy conference in 1924 passed a resolution that the entry level for pharmacy be the same as that for university entrance. It also recommended a degree program in pharmacy must be 4 years in length. The 4-year degree definition caused some problems later on when the PEBC adopted this same requirement. After 1940 all pharmacy schools were committed to a 4-year degree program. The Canadian Conference of Pharmaceutical Faculties (CCPF) began in 1944 and later changed its name to the Association of Faculties of Pharmacy of Canada (the initials AFPC served both the English and French name of the Association). Its goal is to discuss educational issues, establish uniform standard, and undertake activities that improve pharmacy education. The faculties had decided that as of 1940 all pharmacy programs must be degree programs. With almost 500 pharmacy apprentices serving in the armed forces, these people would be continuing their studies on discharge. In addition, many servicemen and women would want to enter pharmacy with their studies paid by the government. Pharmacy schools were not prepared for the deluge of incoming students after the war, with classes several times larger than normal. Alberta had a 3-year degree program and when PEBC demanded a 4-year program they then moved to a four-year program. Newfoundland also had a 3-year program but it was a college program with a 10-month academic year containing as many hours of instruction and was not recognized. This led to a long controversy as Newfoundland pharmacists were unable to practice in other provinces since they could not write the PEBC examination. To practice outside the province many pharmacists

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sought employment in the federal government as the provinces extended professional recognition to federal employees (armed forces, narcotic control, drug laboratory).

Pharm D Programs

Canada followed the US in establishing Pharm D programs but as post graduate two year programs at the University of Toronto and the University of British Columbia. The Pharm D program began initially in California in 1953 as an entry level program. All US pharmacy programs became entry level Pharm D programs in 2000.

Several universities across Canada are now moving to a the Pharm D as the only pharmacist stream. This will almost certainly affect patterns of practice and business models. Entry level Pharm D programs were first adopted in Quebec then Ontario with the other programs to follow suit by 2020.

Current Roles and Future Opportunities

While it is possible to trace the history of pharmacy in Canada, it is more difficult to predict the future of the profession. At present the primary activity of the pharmacist is to ensure appropriate therapy and outcomes. This entails discussing the prescribed medication with the patient to ensure that the intent of the prescriber is clear and that the patient's benefits are understood. It also encompasses an evaluation of the therapy to ensure that the risk to the patient is minimized. To perform this function well the pharmacist requires a strong background in pharmacology and therapeutics among other sciences and have excellent communication skills. She must also develop skills from her practice that enable ascertainment and resolution of drug-related problems. These problems may involve allergies or sensitivities to certain drugs; appropriate dosage; adherence issues including: taste, dosage regimen, or ease of administration, and affordability; drug interactions and interference with laboratory tests. Taking these factors into account, the pharmacist works with the patient to set out a treatment plan that will achieve specific treatment goals. This process is recorded and the outcomes are monitored.

What will the pharmaceutical care of the 1990s and 2000s transition to? Certainly pharmacists will need to continue to move away from a product-oriented approach to a patient-centred and service-oriented model. Many pharmacists are embracing new skills such as administering immunizations, conducting travel medicine clinics, becoming certified educators in diabetes and asthma, and obtaining advanced prescribing authority. We will need be skilled at evaluating literature to sift through the evidence and separate it from the anecdotes to help patients interpret the ever-broader array of digital information. Pharmacogenomics will play a greater role as the genetic basis of more diseases is teased out and sophisticated pharmacotherapy with narrower therapeutic targets will evolve.

The population of Canada is changing. The average age of Canadians is increasing and many elderly individuals have a high medication burden, including some medications that may not have been specifically studied in their age group, they metabolize medication differently than younger adults, and may have difficulty manipulating drug delivery

devices. It is known that there are not going to be enough trained geriatricians to help manage this demographic. Ongoing immigration presents interesting challenges (e.g. immunization catch-up for some refugees, increased risk of diabetes in southeast Asian individuals). There is ever increasing pressure on healthcare budgets at all levels and pharmacists can help fill in gaps if they seize the opportunity. Billing for consulting services is needed and measures of outcome (clinical, functional, mental index, quality of life, etc.), especially for complex patients, are needed. Educators, legislators, and pharmacists will have to be proactive and innovative to meet the healthcare-related needs of Canadians.

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