Whelan AM, Thebeau JP, Jurgens TM, Hurst E. Bioidentical hormone therapy: Nova Scotia pharmacists' knowledge and beliefs. Pharmacy Practice (Internet) 2012 Jul-Sep;10(3):159-167.

Original Research

Bioidentical hormone therapy: Nova Scotia pharmacists' knowledge and beliefs

Anne Marie WHELAN, Jean-Pierre THEBEAU, Tannis M. JURGENS, Eileen HURST.

Received (first version): 27-Feb-2012 Accepted: 13-Sep-2012

ABSTRACT[*]

Objectives: To investigate Nova Scotia (NS) pharmacists' knowledge and beliefs regarding the use of bioidentical hormones (BHs) for the management of menopause related symptoms.

Methods: Using Dillman's tailored design methodology, an invitation to complete the web-based questionnaire was emailed to pharmacists in NS as part of the Dalhousie College of Pharmacy Continuing Pharmacy Education Department's (CPE) weekly email update. Data was analyzed using descriptive statistics.

Results: Of approximately 1300 e-mails sent, 113 pharmacists completed the questionnaire (response rate 8.7%). The majority of respondents (94%) knew that BHs were not free from adverse drug reactions. More than 50% were aware that conjugated equine estrogens and medroxyprogesterone acetate were not examples of BHs. For seven of eleven knowledge questions, 33-45% indicated that they did not know the answer. When asked about their beliefs regarding BHs, many believed that BHs were similar in efficacy (49%) or more effective (21%) than conventional hormone therapy (CHT) for vasomotor symptoms. Most respondents also believed that both BHs and CHT had similar safety profiles. Additionally, responding pharmacists indicated that more education would be helpful, especially in the area of safety and efficacy of BHTs compared to CHT.

Conclusion: NS pharmacists knew BHs were not free of adverse effects, however knowledge was lacking in other areas. This may reflect the level of coverage of this topic in pharmacy school curriculums and in the pharmacy literature. Results indicate a need for additional education of NS pharmacists with respect to BHs, which could be accomplished through modification of undergraduate pharmacy programs and supplementary CPE.

Keywords: Pharmacists. Health Knowledge, Attitudes, Practice. Estradiol Congeners. Menopause. Canada.

TRATAMIENTO HORMONAL BIOIDÉNTICO: CONOCIMIENTOS Y CREENCIAS DE LOS FARMACÉUTICOS DE NUEVA ESCOCIA

RESUMEN

Objetivos: Investigar los conocimientos y creencias de los farmacéuticos de Nueva Escocia (NS) sobre el uso de hormonas bioidénticas (BH) para el manejo de los síntomas relacionados con la menopausia.

Métodos: Utilizando el diseño metodológico de Dillman, se envió por email a los farmacéuticos de NS una invitación a completar un cuestionario online como parte de las actualizaciones semanales del Departamento de Formación Continua de la Facultad de Farmacia de la Universidad de Dalhousie. Los datos se analizaron con estadística descriptiva.

Resultados: De los aproximadamente 1300 emails enviados, 113 farmacéuticos completaron el cuestionario (tasa de respuesta 8,7%). La mayoría de los respondientes (94%) sabían que las BH no estaban libres de reacciones adversas. Más del 50% conocían que los estrógenos conjugados equinos y la medroxiprogesterona acetato no eran ejemplos de BH. Para 7 de las 11 preguntas, del 33-45% indicó que no conocía la respuesta. Cuando se les preguntó sobre sus creencias sobre las BH, muchos creían que las BH eran similares en eficacia (49%) o más eficaces (21%) que la terapia hormonal convencional (CHT) para los síntomas vasomotores. La mayoría de los respondientes también creían que las BH y las CHT tenían perfiles de seguridad similares. Además, los farmacéuticos respondientes indicaron que sería útil más educación, especialmente en el área de seguridad y eficacia de las BH comparadas con las CHT.

Conclusión: Los farmacéuticos de NS sabían que las BH no estaban libres de efectos adversos, sin embargo carecían de conocimientos en otras áreas. Esto puede reflejar la cobertura de este asunto en los currículos de las facultades de farmacia y en la literatura farmacéutica. Los resultados indican una necesidad de educación adicional de los farmacéuticos de NS en relación a las BH, lo que podría conseguirse mediante la modificación de los programas de pregrado y la formación continua suplementaria.

[*] **Anne Marie WHELAN**. PharmD, FCSHP. Professor, College of Pharmacy, Dalhousie University; & Pharmacy Consultant, Department of Family Medicine, Dalhousie University. Halifax, Nova Scotia (Canada).

Jean-Pierre THEBEAU. at the time of the study was an undergraduate student in the BSc (Pharm) program, College of Pharmacy, Dalhousie University. Halifax, Nova Scotia (Canada).

Tannis M. JURGENS. PhD. Associate Professor. College of Pharmacy, Dalhousie University. Halifax, Nova Scotia (Canada).

Eileen HURST. BSc Pharm. Department of Community Health and Epidemiology, Dalhousie University. Halifax, Nova Scotia (Canada).

Palabras clave: Farmacéuticos. Conocimientos, Actitudes y Práctica en Salud. Congéneres del Estradiol. Menopausia. Canadá.

INTRODUCTION

Conventional hormone therapy (CHT), consisting of an estrogen with or without a progestogen (depending on uterus status), has been shown to be effective for the treatment of menopause related vasomotor and urogenital symptoms, and the prevention of bone loss.[1-6] However, after the publication of results from large trials[6-9] linking CHT to serious health risks such as an increase in cardiovascular events or breast cancer, the use of CHT decreased significantly.[10-12] As a result, women suffering from menopause related symptoms began looking for treatment options that would help alleviate their symptoms without having the same potential health risks seen with CHT.[13-16]

Bioidentical hormones (BHs) are considered by some as a "natural" treatment option to conventional hormones.[15] Bioidentical hormones have received increasing publicity for the treatment of menopausal symptoms due to claims of bioidentical hormone therapy (BHT) being as effective, yet safer than CHT, and for being useful for managing more than menopausal symptoms, even being called a "fountain of youth".[17,18] For example, bioidentical progesterone has been said to improve quality of life and to produce a favorable lipid profile, as compared to non-bioidentical progestogens such as medroxyprogesterone.[19-21] Likewise, bioidentical estrogens have been claimed to be effective in treating menopausal symptoms while being safer than non-bioidentical estrogens such as equine estrogens and synthetic estrogens.[17,20,22] These claims should be viewed cautiously as reviews of the literature have found little evidence in terms of well-designed clinical trials to support claims of improved safety and/or efficacy with BHT as compared to CHT.[18,23-30]

Although the terms "bioidentical hormones" and "bioidentical hormone therapy" are widely used in the medical and public communities, there is much confusion and controversy over what exactly is meant by these terms. The FDA states that "bioidentical hormone (replacement) therapy" is a marketing term that they do not recognize, and that there is little rigorous evidence to support claims of safety and efficacy.[31] A recent review of the literature identified 55 different ways of defining BHs, thus demonstrating the lack of consensus and agreement on the meaning of the term.[32] This same review examined these definitions and synthesized the following operational definition of BHs: "chemical substances that are identical in molecular structure to human hormones" in an attempt to lead to a common understanding of the term and limit confusion.[32] However, other experts suggest that term should not be used at all as they consider it inappropriate and misleading.[33] Finally, although many people often associate BHs with the preparations compounded for a specific patient, they are also available in many commercial products.[34] In this paper we shall use the operational definition developed by Whelan *et al*.[32]

Despite the confusion surrounding the definition, availability, and claims of efficacy and safety of BHs, women are interested in having an alternative to CHT and consequently seek information from health care professionals about BHT as a potential option for treatment of their menopausal symptoms.[15,35-37] It is therefore important for health care professionals to have the proper knowledge to discuss the available evidence as well as potential misconceptions about BHs with their patients. This is particularly important for pharmacists because they are often referred to as drug experts and are one of the primary providers for compounded BHT.

Canadian pharmacists dispense commercial and compounded product containing BHs; however, there is no current data on the knowledge and beliefs of Canadian pharmacists in general or of Nova Scotia (NS) pharmacists in particular regarding BHs. The objective of this study was to determine what pharmacists of NS know and believe about the safety and efficacy of BHs in the treatment of menopause related symptoms. The data generated by this research may be used to address any educational needs by developing educational sessions for practicing pharmacists, and to help modify the curriculum for future pharmacists.

METHODS

Questionnaire development: A web-based questionnaire was constructed, based on a questionnaire originally developed and pilot tested in Alberta (AB), Canada.[38] Refinement of the questionnaire for use in NS was done by the investigators, utilizing literature review and informal feedback from pharmacists.[15,35] Further modifications were made according to expert feedback from two volunteer reviewers: (1) an academic pharmacist who was not part of the study population and 2) a non-pharmacist with experience in survey design who reviewed the questionnaire for content and face validity. The final questionnaire consisted of twenty items divided into seven sections: 1) Conventional Estrogen/Progesterone Hormone Therapy for Menopausal Symptoms: Pharmacist Services; 2) Knowledge of Bioidentical Hormones; 3) Comparison of Beliefs about Bioidentical Hormone Therapy (BHT) and Conventional Hormone Therapy (CHT): Safety and Efficacy; 4) Beliefs about Compounded Progesterone Cream; 5) Beliefs about Bioidentical Hormone Therapy and Saliva Testing; 6) Education and Training; and, 7) Demographics. This study received ethics approval from the Dalhousie University Health Sciences Research Ethics Board.

Questionnaire administration and recruitment: The questionnaire was administered using Opinio software, hosted on a secure server at Dalhousie University. An invitation to complete the questionnaire was emailed to pharmacists in NS as part of the Dalhousie College of Pharmacy Continuing Pharmacy Education (CPE)

Department's weekly email update. The email notification briefly informed pharmacists about the questionnaire and contained a direct link to the questionnaire itself, which when clicked, brought the participant to the Opinio site where the consent/information letter was posted. This page had to be viewed before the respondents completed the questionnaire. A modified Dillman's tailored design method was used: two email reminders were sent at weeks two and three after the first invitation was sent. However, due to a low response rate after the second reminder (~1%), four additional reminders were sent on weeks seven, eight, 11 and 13, in an attempt to improve the response rate.

The study population was estimated to be approximately 1100 NS pharmacists, based on data from the Canadian Institute for Health Information (CIHI).[39] A sample size calculation for a cross sectional survey using Epi-Info STATCALC found that for 95% confidence interval, 80% power and a 4.5% margin of error, 322 respondents (a response rate of 30%) were required.

Data analysis: All data analysis was done using PASW statistics 17.0. Statistical analysis of the survey data consisted of descriptive statistics such as frequencies, means, and modes. Chi-squares were calculated to investigate differences in responses based on: sex, age (≤39 years of age or ≥40 years of age), years of practice (≤10 years or ≥11 years practicing), and whether or not BHTs were compounded in respondents' primary work setting. Chi-square analyses with a p-value less than or equal to 0.05 were deemed significant

RESULTS

Response Rate, Demographics, Education, and Practice: One hundred and thirteen of 1300 pharmacists completed the study resulting in a response rate of 8.7%. The majority (86%) of respondents were between the ages of 30 and 59 years, 74% were female, and 81% had six or more years of experience in the practice of pharmacy (Table 1). In addition, a large portion (83%) of respondents graduated between 1980 and 2009. The majority (88%) of respondents graduated from Dalhousie University. Eighty two percent of respondents reported that they were currently working in a community pharmacy, with 83% working full time and 17% working part time. Approximately 14% of respondents selected hospital pharmacy as their primary work setting followed by academia (3%), "other" (3%), and long term care (1%). Only 13% of respondents indicated that BHs were compounded in their primary work setting.

Conventional Estrogen/Progesterone Hormone Therapy for Menopausal Symptoms: Pharmacist Services: Participants were asked how frequently they offered four services for women regarding CHT for menopausal symptoms. Over 50% of respondents reported that they have never offered patient assessment (66%), collaborative decision making with the patient (57%), or ongoing monitoring (53%) (Table 2). However, 52% stated that they provided education and treatment information 1-2 times per month. There were respondents who offered these services more often than once week: patient assessment (7%), collaborative decision making with the patient (5%), education and treatment information (20%), and ongoing monitoring (8%).

Table 1. Demographics and Practice Information of Respondents

Characteristic	Number (%)
Gender (n=112)	
Male	29 (25.9)
Female	83 (74.1)
Age (n=113)	
< 30 years	13 (11.6)
30-39 years	42 (37.5)
40-49 years	30 (26.8)
50-59 years	25 (22.3)
≥ 60 years	2 (1.8)
Years practicing as pharmacists (n=113)	
< 2 years	5 (4.4)
2-5 years	16 (14.2)
6-10 years	20 (17.7)
11-20 years	31 (27.4)
≥ 21 years	41 (36.3)
Year of graduation from pharmacy (n=113)	
1960-1979	15(13.3)
1980-1989	25 (22.1)
1990-1999	25 (22.1)
2000-2009	44 (38.9)
2010 or after	4 (3.5)
University graduated from (n=112)	
Dalhousie University	98 (87.5)
Other Canadian University	11 (9.8)
Foreign University	3 (2.7)
Currently work in community pharmacy (n=113)	
Yes	93 (82.3)
No	20 (17.7)
Work full time or part time (n=92)	
Full time	76 (82.6)
Part time	16 (17.4)
Primary work setting (n=112)	
Independent pharmacy	24 (21.4)
Chain pharmacy	28 (25.0)
Franchise pharmacy	16 (14.3)
Grocery store pharmacy	21 (18.8)
Hospital pharmacy	16 (14.3)
Long term care	1 (0.9)
Academia	3 (2.7)
Other	3 (2.7)
Compound bioidentical hormones in primary work setting (n=113)	
Yes	15 (13.3)
No	94 (83.2)
Do not know	2 (1.8)
Not applicable	2 (1.8)

Knowledge of Bioidentical Hormones: When questioned about their knowledge with respect to BHs, over 50% of respondents identified the correct definition of BHs, knew that BHs were not free from adverse effects, and that conjugated equine estrogens (CEE) and medroxyprogesterone acetate (MPA) were not examples of BHs (Table 3). However, for seven of eleven knowledge questions 33% - 45% of pharmacists stated they did not know the answer. Chi-square analysis of the knowledge questions did not demonstrate any significant differences by age or sex of respondents or whether or not BHs were compounded in their primary work setting. A significant difference (p=0.035) was

Table 2. Frequency of Provision of Conventional Hormone Therapy Services for Menopausal Symptoms

Frequency of the provision of the following services for women regarding conventional hormone therapy for menopausal symptoms:	Never Number (%)	1-2 times per month Number (%)	1-2 times per week Number (%)	1-2 times per day Number (%)	>2 times per day Number (%)
a) Patient assessment (n=113)	74 (65.5)	32 (28.3)	3 (2.7)	2 (1.8)	2 (1.8)
b) Collaborative decision making with the patient (n=113)	64 (56.6)	43 (38.1)	3 (2.7)	1 (0.9)	2 (1.8)
c) Education and treatment information (n=113)	32 (28.3)	59 (52.2)	18 (15.9)	2 (1.8)	2 (1.8)
d) Ongoing monitoring (n=112)	59 (52.7)	44 (39.3)	5 (4.5)	1 (0.9)	3 (2.7)

observed in the Chi-square analysis between pharmacists who practiced more than 10 years versus those who practiced 10 years or less when comparing answers to the question "BHs must be custom compounded for each specific patient" (data not shown).

Comparison of Beliefs about BHT and CHT: Efficacy and Safety: When asked about their beliefs regarding the efficacy of BHT compared to CHT, most respondents believed that BHT was similar or more effective than CHT for treating menopause related vasomotor symptoms or preventing osteoporotic fracture (Table 4). Likewise, the majority of respondents indicated that they believed the risks of BHT and CHT were similar. However, 17-27% of respondents felt that the risks associated with BHT were less than those for CHT. Between 21% and 41% of pharmacists indicated that they did not know how BHT compared to CHT with respect to efficacy or safety. Chi-square analysis of the efficacy and safety questions did not demonstrate any significant differences by age, sex, or years of practice of respondents, or whether or not BH's were compounded in respondents' primary work setting.

Respondents were also asked about their beliefs regarding the efficacy and safety of the specific bioidentical hormones estriol, estradiol, and progesterone. As shown in Table 5, the majority of respondents indicated that they believed the efficacy and safety of BHs was similar to other estrogens (or medroxyprogesterone in the case of progesterone). There were also many respondents who indicated they did not know how they compared. Chi-square analysis did not demonstrate any significant differences by age, sex, or years in practice of respondents, or whether or not BH's were compounded in respondents' primary work setting.

Beliefs about Compounded Progesterone Cream: When asked about their beliefs regarding compounded progesterone cream, most respondents answered that they did not know if progesterone cream was effective in relieving menopause related vasomotor symptoms (44%) or in reducing endometrial hyperplasia while taking concurrent estrogen (43%) , with Chi-square analysis not showing any significant differences by sex, or years in practice of respondents, or whether or not BHs were compounded in respondents' primary work setting. Beliefs about the effectiveness of compounded progesterone for the treatment of menopausal related vasomotor symptoms did differ (p=0.037) between age groups (data not shown).

Beliefs about Bioidentical Hormone Therapy and Saliva Testing: The majority of respondents answered that they did not know whether salivary testing of estrogen and progesterone was useful for assessing hormone status (62%), determining an initial hormone dose (65%), or titrating hormone doses (63%), with Chi-square analysis showing no significant differences by age, sex, or years in practice of respondents, or whether or not BHs were compounded in respondents' primary work setting.

Education Needs: Nearly all respondents indicated that they felt they would benefit from additional education, specifically in the following areas: 1) safety and efficacy of BHT compared to CHT for the treatment of menopausal symptoms (93%); 2) difference between CHT and BHT (84%); 3) saliva testing (82%); 4) cost of BHT (73%); 5) availability of commercial BHT in Canada (78%); 6) patient education regarding BHT (84%); 7) compounding BH products (73%); and 8) other (2%). Respondents said that they would also like to learn more about dosage selection, assessment of symptoms, and monitoring.

DISCUSSION

Response Rate, Demographics, Education, and Practice: This study examined the knowledge and beliefs of NS pharmacists regarding the use of BHs for the treatment of menopausal symptoms. The overall response rate to the survey of 8.7% was low,

Table 3. Respondents Answers to Knowledge Questions about Bioidentical Hormones

Knowledge statement	Correct Number (%)	Incorrect Number (%)	Do not Know Number (%)
BHs must be custom compounded for each specific patient *(false)*	33 (29.2)	47 (41.6)	33 (29.2)
BHs are chemical substances that are identical in molecular structure to human hormones *(true)*	74 (65.1)	20 (17.7)	19 (16.8)
All BHs come from natural sources *(false)*	50 (44.3)	24 (21.2)	39 (34.5)
BHs are free from adverse reactions *(false)*	105 (93.8)	1 (0.9)	6 (5.4)
BHs bind better to human estrogen/progesterone receptors than non-BH *(false)*	32 (28.6)	29 (25.9)	51 (45.5)
BHs can be found in commercially available products *(true)*	55 (49.1)	20 (17.8)	37 (33.1)
Conjugated equine estrogens (CEE) are an example of BHs *(false)*	75 (66.4)	16 (14.2)	22 (19.5)
Estriol is an example of a BH *(true)*	47 (42.3)	17 (15.3)	47 (42.3)
Estrone is an example of a BH *(true)*	48 (42.5)	14 (12.4)	51 (45.1)
Estradiol is an example of a BH *(true)*	52 (46.4)	17 (15.2)	43 (38.4)
Medroxyprogesterone acetate (MPA) is an example of a BH *(false)*	59 (52.2)	15 (13.3)	39 (34.5)

Table 4. Respondents Beliefs regarding the Efficacy and Safety of Bioidentical Hormone Therapy Compared to Conventional Hormone Therapy

Statement	Less Number (%)	Same Number (%)	More Number (%)	Do not Know Number (%)
Number of respondents completing the following statements based on their beliefs about the efficacy of BHT compared to conventional hormone therapy (CHT).				
I believe the efficacy of BHT compared to CHT for the treatment of vasomotor symptoms associated with menopause is: (n=113)	8 (7.1)	55 (48.7)	24 (21.2)	26 (23.0)
I believe the efficacy of BHT compared to CHT for the prevention of osteoporotic fractures is: (n=112)	10 (8.9)	51 (45.5)	5 (4.5)	46 (41.1)
Number of respondents completing the following statements based on their beliefs about the risks of BHT compared to conventional hormone therapy (CHT).				
I believe the risk of cardiovascular disease (e.g. myocardial infarction, stroke) with BHT compared to CHT is: (n=112)	20 (17.9)	64 (57.1)	1 (0.9)	27 (24.1)
I believe the risk of blood clots with BHT compared to CHT is: (n=112)	19 (17.0)	67 (59.8)	1 (0.9)	25 (22.3)
I believe the risk of breast cancer with BHT compared to CHT is: (n=112)	22 (19.7)	64 (57.1)	1 (0.9)	25 (22.3)
I believe the risk of side effects (e.g. headache, breast tenderness, gastrointestinal upset) with BHT compared to conventional HT is: (n=112)	30 (26.8)	56 (50.0)	2 (1.8)	24 (21.4)

however, surveys using email or other electronic means to recruit participants are reported to typically have low response rates.[40] Surveys of pharmacists using similar methodology have reported response rates ranging from 1.4% to 63.1%, although most were in the range of 3.5-15%.[41-49] From data provided in two surveys of Canadian pharmacists that used a variety of means of recruitment, including email, we estimated a response rate of approximately 4% for both surveys.[41,42] Based on our review of surveys with similar administration strategies and/or similar target participants, our response rate is comparable to those seen with pharmacists in general and Canadian pharmacists in particular.

Survey respondents were fairly representative of the NS pharmacist population as described by CIHI, with the percentage of female respondents (74%) being similar to the overall percentage of female pharmacists in NS (71%).[39] The proportion of respondents according to age group, new graduates, and community pharmacists was similar to the values reported by CIHI; however, there was a slight underrepresentation of pharmacists who were new graduates, and also those 60 years of age and above.

Knowledge of Bioidentical Hormones: Although respondents answered some knowledge questions correctly, results shown in Table 3 suggest that there are significant gaps in pharmacists' knowledge about BHs. More specifically, responses to seven of the eleven questions showed that more than a third of respondents did not know the answers, particularly in the areas of availability of BHs and which individual hormones were examples of BHs. The reasons for these results are not clear. It may be that the topic has not been addressed in pharmacy curricula or continuing pharmacy education programs. It could also indicate that respondents are aware of the confusion, controversies, and misconceptions regarding BHs and this is reflected in their answers. It is also not known if this lack of knowledge about BHs is typical among pharmacists, as there is little published information about pharmacists' knowledge of or beliefs about BHs. One published abstract provides preliminary results from a survey in AB, Canada.[38] In that study, 33% of respondents believed that BHT included both compounded and commercial products.[38] We did not ask the question in the same way in our study; but rather separated it into two more specific questions. Forty one percent of NS respondents thought that BHs must be custom compounded for each specific patient, while 49% knew that BHs could be found in commercially available products. While a direct comparison of knowledge about BH products is not possible between the 2 surveys, it would seem that results of both surveys show that the majority of pharmacists in AB and NS do not know that BHT includes both compounded and commercial products. The survey has therefore identified a basic knowledge gap in how BHT can be formulated. Given that many of the responding NS pharmacists provide some form of service to women regarding hormone therapy at least once a month (Table 2), and that some women have beliefs that may cause them to prefer BHT over CHT[15,35], helping pharmacists to increase their knowledge about BHT is important so they can provide women with accurate information.[15,35]

Comparison of Beliefs about BHT and CHT: Efficacy and Safety: Forty-five - 60% of respondents believed that BHT had similar efficacy and safety when compared to CHT (Table 4). More specifically, 49% of NS respondents believed the effectiveness of BHT compared to CHT for the treatment of vasomotor symptoms associated with menopause was the same. This is similar to the 56% of AB respondents who believed BHT to be equally effective as other hormone therapies for vasomotor symptoms.[38] With regards to safety, 26% of AB respondents and 27% of NS respondents believed that BHT had a lower risk of side effects.[38] On the other hand, in our survey, some respondents' answers favored BHT over CHT. For example, 21% felt that BHT was more effective in treating menopause related vasomotor symptoms than CHT, and 27% felt BHT had a decreased risk of general side effects compared to CHT. It is important to note however, that many respondents

Table 5. Respondents Beliefs of the Effectiveness and Risks of Specific Bioidentical Hormones				
Statements:	Less Number (%)	Same Number (%)	More Number (%)	Do Not Know Number(%)
Number of respondents completing the following statements based on their beliefs about the efficacy and risks of estriol compared to other estrogens.				
I believe the efficacy of estriol compared to other estrogens for the relief of menopause related vasomotor symptoms is: (n=112)	14 (12.5)	48 (42.9)	7 (6.3)	43 (38.4)
I believe the efficacy of estriol compared to other estrogens for the prevention of osteoporosis is: (n=110)	12 (11.0)	48 (43.6)	3 (2.7)	47 (42.7)
I believe the risk of breast cancer with estriol compared to other estrogens is: (n=112)	11 (9.8)	52 (46.4)	3 (2.7)	46 (41.1)
Number of respondents completing the following statements based on their beliefs about the efficacy and risks of estradiol compared to other estrogens.				
I believe the efficacy of estradiol compared to other estrogens for the treatment of menopause related vasomotor symptoms is: (n=112)	1 (0.9)	60 (53.6)	16 (14.3)	35 (31.3)
I believe the efficacy of estradiol compared to other estrogens for the prevention of osteoporosis is: (n=111)	1 (0.9)	65 (58.6)	10 (9.0)	35 (31.5)
I believe the risk of breast cancer with estradiol compared to other estrogens is: (n=112)	2 (1.8)	65 (58.0)	11 (9.8)	34 (30.4)
Number of respondents completing the following statements based on their beliefs about the efficacy and risks of progesterone compared to medroxyprogesterone acetate (MPA).				
I believe the efficacy of progesterone compared to MPA for the treatment of menopause related vasomotor symptoms is: (n=112)	3 (2.7)	53 (47.3)	20 (17.9)	36 (32.1)
I believe the efficacy of progesterone compared to MPA in improving the quality of life for menopausal patients is: (n=113)	4 (3.5)	49 (43.4)	23 (20.4)	37 (32.7)
I believe the risk of progesterone compared to MPA reversing the favourable effects of estrogen on the lipid profile is: (n=111)	14 (12.6)	50 (45.1)	2 (1.8)	45 (40.5)
I believe the risk of progesterone compared to MPA causing adverse cardiovascular effects is: (n=110)	21 (19.1)	52 (47.3)	0 (0)	37 (33.6)

indicated that they did not know how BHT compared to CHT with regards to safety and efficacy. This may be reflective of respondents' perceived lack of knowledge in this area or may be due to their awareness of the conflicting reports in the literature concerning benefits and risks of BHT as compared to CHT.[17,18,22,23,25,26] The variability in beliefs of pharmacists surrounding the safety and efficacy of BHT compared to CHT illustrates the need for education of pharmacists and definitive research to support the education.

Many responding pharmacists indicated that they did not know if individual BHs such as estriol, estradiol, and progesterone had similar efficacy and safety when compared to non-bioidentical hormones (Table 5). Although not definitive, a trend could be seen toward the belief that estriol was less effective than non-bioidentical estrogens for menopause related vasomotor symptoms and osteoporosis, and less likely to cause breast cancer (Table 5). Proponents of bioidentical estriol support its use in hormone therapy as some literature suggests it is protective versus breast cancer[20,28]; however, evidence-based reviews of the literature have found no well-designed randomized controlled trials (RCTs) to support that estriol is safer than other estrogen hormones with regards to breast cancer.[18,28-30,50] Results of our study also showed a trend toward the belief that bioidentical estradiol is more effective than other estrogens for menopause-related vasomotor symptoms but associated with a higher risk of breast cancer (Table 5).There was also a small trend favoring progesterone over MPA with regards to beliefs of effectiveness (menopause related vasomotor symptoms and improving quality of life) and safety (Table 5). Again, these beliefs reflect some of the data reported in the literature, however at this time the evidence is equivocal.[19,20,27,51-54]

Beliefs about Compounded Progesterone Cream: For the most part, responding pharmacists answered that they did not know if compounded progesterone cream used alone was effective for the management of menopause related vasomotor symptoms, and in reducing the risk of endometrial hyperplasia in women with an intact uterus who are receiving concurrent estrogen therapy. More pharmacists (37%) agreed that compounded progesterone cream is effective in reducing the risk of endometrial hyperplasia compared to those who disagreed (19%). On the other hand, more pharmacists disagreed (30%) than agreed (26%) that compounded progesterone cream is effective for menopause-related vasomotor symptoms. This is reflective of the literature on this issue as the available RCTs provide conflicting results with regards to efficacy of progesterone cream on vasomotor symptoms.[19,20,27,51-54] A significant difference (p=0.037) was observed according to age, with a trend of pharmacists 40 years age and above being more likely to agree that compounded progesterone cream is effective for menopausal symptoms compared to younger pharmacists (≤39 years of age) (data not shown). Overall, beliefs regarding progesterone cream were varied which may reflect a lack of knowledge and/or an understanding of the conflicting evidence that is available. Additional well designed studies may

provide clarity on the safety and efficacy of compounded progesterone cream.

Beliefs about Bioidentical Hormone Therapy and Saliva Testing: The majority of respondents answered that they did not know if salivary hormonal levels were useful in assessing hormone status, determining the initial dose of hormone, and titrating the dose of hormones. These results may reflect a lack of knowledge in this area, or an understanding of the controversy in the literature where proponents of BHT believe that salivary testing is an essential part of therapy[55-57] while others caution that there is little evidence to support any use of saliva testing.[25,28,29]

Strengths and limitations: This study is the first of its kind to be conducted in NS and therefore provides important insight into NS pharmacists' knowledge and beliefs regarding BHs for treatment of menopausal symptoms. The responses received may have varied based on the individual respondent's belief regarding the meaning of and use of the term; a possible limitation to consider. The sampling methodology used is a strength of the study as it was designed to reach as many NS pharmacists as possible. The fact that the pool of respondents was representative of NS pharmacist population in general when compared to CIHI data is also a strength, as this made the results more generalizable to the general population of NS pharmacists.[39] The response rate, although similar to other email surveys, was low and presents a clear limitation of the results. Using CIHI data the number of pharmacists in registered in NS was estimated to be approximately 1100.[39] However, the email list used to contact pharmacists contained approximately 1300 addresses. This difference in numbers could be due to factors such as: inactive email addresses, multiple addresses for a given pharmacist, and pharmacists relocating into or out of the province. This may have resulted in overestimation of the denominator and therefore underestimation of the response rate. Additionally, it is possible that not all emails were opened so it may be that many pharmacists did not even see the invitation to participate in the study. We were aware that email surveys in general have lower response rates, yet financial limitations precluded other techniques for wide distribution of the questionnaire. The low response rate prevented the study from reaching the desired sample size, and therefore resulted in some statistical analyses being underpowered which may partially account for most Chi-square analysis showing insignificant results. Although the results of our study are generalizable to pharmacists practicing specifically in NS, it remains to be seen how knowledge and beliefs of NS pharmacists compares to pharmacists across Canada.

CONCLUSIONS

This study examined the knowledge and beliefs of pharmacists in NS with respect to the safety and efficacy of BHs in the treatment of menopause related symptoms. Results show that NS pharmacists have some knowledge about BHs. However, knowledge was lacking in specific areas and beliefs varied across sections, with a large portion of respondents indicating they did not know the answer to some of the questions. In addition, most responding pharmacists indicated that they felt additional education on various topics concerning BHs would be beneficial. To improve pharmacists' knowledge and to allow pharmacists to help patients make informed decisions regarding the use of BHs, additional education of NS pharmacists with respect to BHs through modification of undergraduate pharmacy programs and supplementary CPE are needed.

ACKNOWLEDGEMENTS

Funding was provided by the Dalhousie Pharmacy Endowment Fund. We thank the CPE department at Dalhousie University, the Pharmacy Association of Nova Scotia, Dr. N. Yuksel and all pharmacists who completed the survey.

CONFLICT OF INTEREST

No conflicts of interest to declare.

Funding: Source of Support: Dalhousie Pharmacy Endowment Fund.

References

1. Maclennan AH, Broadbent JL, Lester S, Moore V. Oral oestrogen and combined oestrogen/progestogen therapy versus placebo for hot flushes. Cochrane Database Syst Rev. 2004;(4):CD002978.
2. North American Menopause Society. Estrogen and progestogen use in postmenopausal women: 2010 position statement of The North American Menopause Society. Menopause. 2010;17(2):242-255.
3. Suckling J, Lethaby A, Kennedy R. Local oestrogen for vaginal atrophy in postmenopausal women. Cochrane Database Syst Rev. 2006;(4):CD001500.
4. Wells G, Tugwell P, Shea B, Guyatt G, Peterson J, Zytaruk N, Robinson V, Henry D, O'Connell D, Cranney A; Osteoporosis Methodology Group and The Osteoporosis Research Advisory Group. Meta-analyses of therapies for postmenopausal osteoporosis. V. Meta-analysis of the efficacy of hormone replacement therapy in treating and preventing osteoporosis in postmenopausal women. Endocr Rev. 2002;23(4):529-539.
5. Reid RL, Blake J, Abramson B, Khan A, Senikas V, Fortier M. Menopause and Osteoporosis Update 2009. [SOGC Clinical Practice Guideline No. 222] J Obstet Gynaecol Can. 2009;31(suppl 1):S1-S64.
6. Rossouw JE, Anderson GL, Prentice RL, LaCroix AZ, Kooperberg C, Stefanick ML, Jackson RD, Beresford SA, Howard BV, Johnson KC, Kotchen JM, Ockene J; Writing Group for the Women's Health Initiative Investigators. Risks and benefits of estrogen plus progestin in healthy postmenopausal women: principal results From the Women's Health Initiative randomized controlled trial. JAMA. 2002;288(3):321-333.

7. Anderson GL, Limacher M, Assaf AR, Bassford T, Beresford SA, Black H, Bonds D, Brunner R, Brzyski R, Caan B, Chlebowski R, Curb D, Gass M, Hays J, Heiss G, Hendrix S, Howard BV, Hsia J, Hubbell A, Jackson R, Johnson KC, Judd H, Kotchen JM, Kuller L, LaCroix AZ, Lane D, Langer RD, Lasser N, Lewis CE, Manson J, Margolis K, Ockene J, O'Sullivan MJ, Phillips L, Prentice RL, Ritenbaugh C, Robbins J, Rossouw JE, Sarto G, Stefanick ML, Van Horn L, Wactawski-Wende J, Wallace R, Wassertheil-Smoller S; Women's Health Initiative Steering Committee. Effects of conjugated equine estrogen in postmenopausal women with hysterectomy: the Women's Health Initiative randomized controlled trial. JAMA. 2004;291(14):1701-1712.
8. Hulley S, Grady D, Bush T, Furberg C, Herrington D, Riggs B, Vittinghoff E. Randomized trial of estrogen plus progestin for secondary prevention of coronary heart disease in postmenopausal women. Heart and Estrogen/progestin Replacement Study (HERS) Research Group. JAMA. 1998;280(7):605-613.
9. Grady D, Herrington D, Bittner V, Blumenthal R, Davidson M, Hlatky M, Hsia J, Hulley S, Herd A, Khan S, Newby LK, Waters D, Vittinghoff E, Wenger N; HERS Research Group. Cardiovascular disease outcomes during 6.8 years of hormone therapy: Heart and Estrogen/progestin Replacement Study follow-up (HERS II). JAMA. 2002;288(1):49-57.
10. Hersh AL, Stefanick ML, Stafford RS. National use of postmenopausal hormone therapy: annual trends and response to recent evidence. JAMA. 2004;291(1):47-53.
11. Hing E, Brett KM. Changes in U.S. prescribing patterns of menopausal hormone therapy, 2001-2003. Obstet Gynecol. 2006;108(1):33-40.
12. Ettinger B, Grady D, Tosteson AN, Pressman A, Macer JL. Effect of the Women's Health Initiative on women's decisions to discontinue postmenopausal hormone therapy. Obstet Gynecol. 2003;102(6):1225-1232.
13. North American Menopause Society. Treatment of menopause-associated vasomotor symptoms: position statement of The North American Menopause Society. Menopause. 2004;11(1):11-33.
14. American College of Obstetricians and Gynecologists. ACOG Practice Bulletin no. 28: Clinical Management Guidelines for Obstetrician-Gynecologists. Use of botanicals for management of menopausal symptoms. Obstet Gynecol. 2001;97(6 suppl):1-11.
15. Adams C, Cannell S. Women's beliefs about "natural" hormones and natural hormone replacement therapy. Menopause. 2001;8(6):433-440.
16. Kaufert P, Boggs PP, Ettinger B, Woods NF, Utian WH. Women and menopause: beliefs, attitudes, and behaviors. The North American Menopause Society 1997 Menopause Survey. Menopause. 1998;5(4):197-202.
17. Somers S. Ageless: The Naked Truth About Bioidentical Hormones. New York: Crown Publishing Group; 2006.
18. Boothby LA, Doering PL. Bioidentical hormone therapy: a panacea that lacks supportive evidence. Curr Opin Obstet Gynecol. 2008;20(4):400-407.
19. Effects of estrogen or estrogen/progestin regimens on heart disease risk factors in postmenopausal women. The Postmenopausal Estrogen/Progestin Interventions (PEPI) Trial. The Writing Group for the PEPI Trial. JAMA. 1995;273(3):199-208.
20. Holtorf K. The bioidentical hormone debate: are bioidentical hormones (estradiol, estriol, and progesterone) safer or more efficacious than commonly used synthetic versions in hormone replacement therapy?. Postgrad Med. 2009;121(1):73-85.
21. Girouard LG, Holm RC. The role of natural progesterone in natural hormone replacement. Int J Pharmaceut Compounding. 2001;5(3):218.
22. Paoletti JE. The physiological role and use of estriol . Int J Pharmaceut Compounding. 2009;13(4):269.
23. Boothby LA, Doering PL, Kipersztok S. Bioidentical hormone therapy: a review. Menopause 2004;11(3):356-367.
24. Sood R, Shuster L, Smith R, Vincent A, Jatoi A. Counseling postmenopausal women about bioidentical hormones: ten discussion points for practicing physicians. J Am Board Fam Med. 2011;24(2):202-210.
25. Chervenak J. Bioidentical hormones for maturing women. Maturitas. 2009;64(2):86-89.
26. Cirigliano M. Bioidentical hormone therapy: a review of the evidence. J Womens Health (Larchmt). 2007;16(5):600-631.
27. Curcio JJ, Wollner DA, Schmidt JW, Kim LS. Is bio-identical hormone replacement therapy safer than traditional hormone replacement therapy?: a critical appraisal of cardiovascular risks in menopausal women. Treat Endocrinol. 2006;5(6):367-374.
28. Derzko CM. Bioidentical hormone therapy at menopause. Endocrinology Rounds. 2010;9(6):1.
29. Fugh-Berman A, Bythrow J. Bioidentical hormones for menopausal hormone therapy: variation on a theme. J Gen Intern Med. 2007;22(7):1030-1034.
30. Sites CK. Bioidentical hormones for menopausal therapy. Womens Health (Lond) 2008;4(2):163-171.
31. Bio-Identicals: Sorting myths from facts. Available at: http://www.fda.gov/downloads/ForConsumers/ConsumerUpdates/ucm049312.pdf. Accessed 08/15/ 2012.
32. Whelan AM, Jurgens TM, Trinacty M. Defining bioidentical hormones for menopause-related symptoms. Pharm Pract. 2011;9(1):16-22.
33. Bhavnani BR, Stanczyk FZ. Misconception and concerns about bioidentical hormones used for custom-compounded hormone therapy. J Clin Endocrinol Metab. 2012;97(3):756-759.
34. Trinacty M, Whelan AM, Dr., Jurgens TM, Dr. Definition of bioidentical hormones. Can Pharm J. 2010;143(sp2):S17.
35. Iftikhar S, Shuster LT, Johnson RE, Jenkins SM, Wahner-Roedler DL. Use of bioidentical compounded hormones for menopausal concerns: cross-sectional survey in an academic menopause center. J Womens Health (Larchmt). 2011;20(4):559-565.
36. Speroff L, Fritz M. The clinical gynecologic endocrinology and infertility. 8th Edition ed. 2001 Market Street Philadelphia, PA 19103 USA: Lippincott Williams & Wilkins; 2010.
37. Dimaggio JL, Reed-Kane D. Patient satisfaction with pharmacist intervention and consultation in HRT. Int J Pharmaceut Compounding. 2003;7(4):258.

38. Yuksel N, Siyam T, Steyn A, Prochnau T. Pharmacists' beliefs about bioidentical hormone therapy. Can Pharm J. 2010;143(5):e3.
39. Pharmacists in Canada, 2010- National and Jurisdictional Highlights and Profiles. Ottawa, Ont.: Canadian Institute for Health Information; 2011.
40. Sheehan K. E-mail Survey Response Rates: A Review . J Comput-Mediat Commun. 2001;6(2).
41. Jorgenson D, Lamb D, MacKinnon NJ. Practice change challenges and priorities: A national survey of practising pharmacists. Can Pharm J 2011; /;144(3):125-131.
42. Marra F, Kaczorowski JA, Marra C. Assessing pharmacists' attitudes regarding delivery of the pandemic influenza vaccine in British Columbia. Can Pharm J. 2010;143(6):278-83.
43. McCullough KB, Formea CM, Berg KD, Burzynski JA, Cunningham JL, Ou NN, Rudis MI, Stollings JL, Nicholson WT. Assessment of the pharmacogenomics educational needs of pharmacists. Am J Pharm Educ. 2011;75(3):51.
44. Law AV, Okamoto MP, Brock K. Ready, willing, and able to provide MTM services?: A survey of community pharmacists in the USA. Res Social Adm Pharm. 2009;5(4):376-381.
45. Pollard SR, Clark JS. Survey of health-system pharmacy leadership pathways. Am J Health Syst Pharm. 2009;66(10):947-952.
46. Lounsbery JL, Green CG, Bennett MS, Pedersen CA. Evaluation of pharmacists' barriers to the implementation of medication therapy management services. J Am Pharm Assoc. 2009;49(1):51-58.
47. Ulbrich TR, Dula CA, Green CG, Porter K, Bennett MS. Factors influencing community pharmacists' enrollment in a state prescription monitoring program. J Am Pharm Assoc. 2010;50(5):588-594.
48. Bellanger RA, Shank TC. Continuing professional development in Texas: survey of pharmacists' knowledge and attitudes: 2008. J Am Pharm Assoc. 2010;50(3):368-374.
49. Goodwin SD, Kane-Gill SL, Ng TM, Melroy JT, Hess MM, Tallian K, Trujillo TC, Vermeulen LC. Rewards and advancements for clinical pharmacists. Pharmacotherapy. 2010;30(1):114.
50. Conaway E. Bioidentical hormones: an evidence-based review for primary care providers. J Am Osteopath Assoc. 2011;;111(3):153-164.
51. Benster B, Carey A, Wadsworth F, Vashisht A, Domoney C, Studd J. A double-blind placebo-controlled study to evaluate the effect of progestelle progesterone cream on postmenopausal women. Menopause Int. 2009;15(2):63-69.
52. Leonetti HB, Longo S, Anasti JN. Transdermal progesterone cream for vasomotor symptoms and postmenopausal bone loss. Obstet Gynecol. 1999;94(2):225-228.
53. Schüssler P, Kluge M, Yassouridis A, Dresler M, Held K, Zihl J, Steiger A. Progesterone reduces wakefulness in sleep EEG and has no effects on cognition in healthy postmenopausal women. Psychoneuroendocrinology. 2008;33(8):1124-1131.
54. Wren BG, Champion SM, Willetts K, Manga RZ, Eden JA. Transdermal progesterone and its effect on vasomotor symptoms, blood lipid levels, bone metabolic markers, moods, and quality of life for postmenopausal women. Menopause. 2003;10(1):13-18.
55. Kells J, Dollbaum CM. Saliva tests, Part 1: Clinical use, elements of testing, and guidelines for posttreatment interpretation. Int J Pharmaceut Compounding. 2009;13(4):280.
56. Kells J, Dollbaum CM. Saliva tests, Part 2: Salivary hormones, hormone replacement pharmacokinetics, and the importance of timely testing. Int J Pharmaceut Compounding. 2009;13(5):392.
57. Stephenson K. The salivary hormone profile in the clinical evaluation of women. Int J Pharmaceut Compounding. 2004;8(6):427.