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Preventing Atypical Hip Fracture After Long-Term Bisphosphonate Use

An Evidence-Based Project

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In recent years there have been an increasing number of case reports linking long-term bisphosphonate use with atypical fractures of the hip. This link led to a synthesis of the evidence regarding this relationship. On the basis of the results, a doctoral project called "Preventing Atypical Hip Fracture After Long-Term Bisphosphonate Use" was created. The tool termed HIPS developed by the project leader helps providers identify those patients who are at potential risk and refer them to their primary care providers when appropriate. The tool also helps educate patients about symptoms of atypical fracture. The goal was to improve preventive strategies of adult providers to screen for patients at risk of atypical hip fracture. Results showed that an educative session modeled around the HIPS tool improved provider awareness about the link between bisphosphonates and atypical hip fractures. An improved willingness to screen for risk, refer to primary care providers, and educate patients about the symptoms of atypical fractures also showed improvement.

Introduction

Hip fractures are the most disabling of all osteoporosis-related fractures. It is estimated that annually there are 300,000 hospitalizations of people older than 50 years who have suffered from a hip fracture. Of those 300,000, 24% will die within the first year after fracture (Benjamin, 2010). According to *Healthy People 2020* (U.S. Department of Health and Human Services, 2011), there is an initiative to reduce hip fractures among the older adults. Currently, there are a reported 10 million people who are 50 years and older who have been diagnosed with osteoporosis. Of these 10 million people, 80% are women (Benjamin, 2010). Half of these women and 25% of the men will suffer some type of osteoporosis-related fracture. Hip fractures are considered to hold the highest morbidity and mortality rates (Healthy People 2020). By 2020, it is estimated that more than half of Americans aged 50 years and older will be diagnosed with osteopenia or osteoporosis (National Institutes of Health, 2011).

One of the most common treatment modalities for osteoporosis is the use of bisphosphonates. Bisphosphonates were approved by the Food and Drug Administration in 1995 (Hornig, Czajka, & Uhl, 2010) and have been used both continuously and intermittently since then. Bisphosphonates are antiresorptive drugs, which inhibit bone resorption. The goal of treatment with bisphosphonates is to prevent hip and other osteoporosis-related fractures, as well as reduce mortality rates after a hip fracture. Evidence has shown treatment with bisphosphonates to be effective. However, recent reports have shown that long-term use of bisphosphonates, 4 years or more, may actually be causing atypical fractures of the femur due to inadequate bone remodeling (Ott, 2011). This atypical fracture can be of the subtrochanteric or femoral shaft regions both distal to the site of typical hip fractures and defined by low-energy impact. This influx of case reports led to the clinically relevant Population, Intervention, Comparison, Outcome, Time frame (PICOT) question: In patients diagnosed with osteoporosis does treatment with bisphosphonates versus no treatment affect the risk of atypical hip fracture after 4 years of continuous therapy?

This article is the result of a doctor of nursing practice (DNP) evidence-based project at Arizona State University (ASU). The purpose of this article was to investigate the PICOT question stated previously, establish recommendations based on the evidence acquired and develop a project that could educate providers in an acute care setting about the collected evidence. The overall goal was to maintain compliance with the Healthy People 2020 initiative to reduce the rate of annual hip fractures.

Search Methods

An exhaustive search was conducted to address the stated PICOT question. To select the articles cited in this

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review, the author searched CINAHL, PubMed, OVID, and Cochrane, using Medical Subject Heading (MeSH) terms, Boolean terms, and the key words: "osteoporosis," "bisphosphonate," "subtrochanteric," and "hip fracture." Limitations included the English language, peer-reviewed journals, and dates from 2008 and later. When search terms "osteoporosis," bisphosphonates," and "subtrochanteric" were combined on CINAHL, 73 results appeared. Search terms "osteoporosis," "bisphosphonates," and "hip fracture" were combined on PubMed to reveal 245 publications on the subject. Search terms "osteoporosis," "bisphosphonates," and "subtrochanteric" were combined on OVID and yielded 14 articles of relevance. There were neither systematic reviews nor randomized controlled trial (RCT) studies that directly addressed the PICOT question as evidenced by a search in the Cochrane Reviews. There was one cross-sectional study of three large, randomized bisphosphonate trials (Black et al., 2010) that contributed to the findings of this article and was included from the CINAHL search.

Inclusion criteria consisted of any cohort, case–control, or trend study that distinguished a link between long-term bisphosphonate use in the patient with osteoporosis and presentation of atypical subtrochanteric fracture. There were no articles related to this subject matter identified prior to 2009. More than 30 articles were pulled for reading and 10 articles were selected for this review on the basis of their reliability, validity, and level of evidence. The review showed a common inquiry in a recent increase in case reports regarding a link between atypical subtrochanteric fractures and long-term use of bisphosphonates.

Critical Appraisal and Synthesis

The exhaustive search led to a review of 10 studies, which may be referenced in the Table of Included Studies (see Table 1). Level of evidence is based on that suggested by Melnyk and Fineout-Overholt (2011). Evidence was synthesized via rapid critical appraisal questions for cohort and RCTs as provided by Melnyk and Fineout-Overholt (2011). In a large, Level IV, age and gender matched cohort study, Abrahamsen, Eiken, and Eastell (2010), examine the risk of subtrochanteric and diaphyseal femur fractures in users of long-term alendronate use. The information was obtained from the National Hospital Discharge Register and National Prescription Database in Denmark. They found that subtrochanteric and diaphyseal fractures occurred at a rate of 13 per 10,000 patient-years in untreated female subjects and 6 per 10,000 in untreated male subjects. In women treated with alendronate, the rate of occurrence was 31 per 10,000 patient-years, and 31 per 10,000 patient-years in men. This study showed that patients who had been treated with Alendronate were at higher risk of subtrochanteric and diaphyseal fracture than those who had not been treated. However, the absolute risks were low and analysis was not able to determine that risk for fracture increases with each year of alendronate use.

Most articles reviewed in this query defined long-term bisphosphonate use as 4 years or greater. Most concluded that while the risk of atypical fracture is low, there are a growing number of case studies linking long-term bisphosphonate use with these atypical fractures. This increase risk factor is due to skeletal retention of bisphosphonates for more than 10 years and improper bone turnover. Also, of concern is the number of healthy postmenopausal women currently taking bisphosphonates that this newfound risk could affect (Ott, 2011). The risk of long-term bisphosphonate therapy actually causing atypical fractures could potentially be contributing against the initiative of Healthy People 2020 to reduce hip fractures and the associated morbidity and mortality. This increase in case reports has allotted both practitioners and patients to become aware of this new public health concern (Giusti et al., 2011). Accumulation of the evidence suggests that practitioners be more vigilant about screening for risk of atypical hip fracture when caring for the patient diagnosed with osteoporosis and taking a bisphosphonate for 4 years or greater.

In a Level II cross-sectional study of three randomized control trials, Black et al. (2010) performed a secondary analysis of the results from the Fracture Intervention Trial (FIT), the FIT Long-Term Extension (FLEX) trial, and the Health Outcomes and reduced Incidence with Zoledronic Acid Once Yearly (HORIZON) pivotal fracture trial. The purpose was to evaluate a connection between long-term bisphosphonate use and atypical fractures of the hip. Of the 14,195 women enrolled in these trials, 294 records were reviewed for hip and femur fractures. There were 12 fractures in 10 patients, or 2.3 per 10,000 patient-years, who had subtrochanteric or diaphyseal femur fractures and were being treated with a bisphosphonate. The study determined that the risk for subtrochanteric or diaphyseal

Table 1. Included Studies

	Studies									
	Abrahamsen	Black	Das De	Giusti	Lenart	Park-Wyllie	Schlicher	Vestergaard	Wang	Yeong Kim
Background										
Year	2010	2010	2010	2011	2009	2011	2011	2011	2011	2011
LOE	IV	II	IV	IV	IV	IV	IV	IV	IV	IV
Design	Cohort	Cross	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort	Cohort
Length	10y	3–5 y	6y	11y	7y	6y	1y	10y	11y	10y

Note. LOE = level of evidence.

femur fracture was rare in women treated with bisphosphonates for up to 10 years. However, a limitation was that the study was underpowered to conclusively dismiss this casual relationship.

A Level IV cohort study conducted by Das De, Setiobudi, and Shen (2010) showed that the occurrence of subtrochanteric fractures had a slightly higher incidence (7%) with alendronate use with a mean duration of 4.6 years than those who were not on alendronate (5%). This blinded case review of x-rays evaluated all subtrochanteric fractures receiving surgical treatment from 2001 to 2007 from one facility. Bilateral fractures were shown not to be uncommon with alendronate use ($p = .018$) and have a distinctive radiographic pattern ($p < .0005$). The conclusion was that bisphosphonates should be stopped in patients suspected of having severe suppression of bone turnover. Bisphosphonates should be reserved for those with diagnosed osteoporosis or osteopenia or with other fractures.

In a large, Level IV cohort study, Giusti et al. (2011) estimated the frequency of atypical fractures of the femur and examined the association between atypical fractures and alendronate. A blinded review of radiographs found that atypical fractures are more common in bisphosphonate users; however, the prevalence is low (1.1%) and therefore not significant. Conversely, a Level IV cohort study by Schilcher, Michaelson, and Aspenberg (2011) also conducted a blinded review of subtrochanteric and femoral shaft fractures and claimed that there is a higher prevalence of bisphosphonate use in patients with atypical fractures (78%) than the control group (10%) creating an odds ratio (OR) of 33.3 (95% confidence interval [CI], 14.3–77.8). However, the absolute risk of fracture was low (5 cases per 10,000 patient-years). Yet the risk did increase with longer duration of bisphosphonate treatment.

In a Level IV cohort study, Lenart et al. (2009) reviewed medical records from a Level I trauma center database for femoral fractures that were confirmed by x-ray. The purpose of the study was to identify a relationship between femoral shaft fractures and long-term bisphosphonate use. There were 15 out of 41 subtrochanteric or femoral shaft cases where the patients reported using bisphosphonates in comparison to 9 of the 82 controls yielding an OR of 4.44 (95% CI, 1.77–11.35). A common radiographic feature was observed in 10 of the 15 cases with bisphosphonate use generating an OR of 15.33 (95% CI, 3.06–76.9, $p < .001$). Long-term bisphosphonate use was higher in the subtrochanteric and femoral shaft case group than in control groups ($p = .001$). In opposition, Yong, Schneeweiss, Katz, Levin, and Solomon (2011) did not find a significant correlation between bisphosphonates and subtrochanteric or diaphyseal fractures with a hazard ratio (HR) = 1.03 (95% CI, 0.70–1.52) in a Level IV cohort study. They also reported a low HR in patients receiving bisphosphonates for more than 5 years (HR = 2.02, 95% CI, 0.41–10.0).

A large, population-based case–control study by Park-Wyllie et al. (2011) examined whether prolonged bisphosphonate therapy is associated with an increased risk of subtrochanteric or femoral shaft fractures. They found that bisphosphonate use for greater than 5 years is associated with atypical fractures. However, the absolute risk is low (OR = 2.74, 95% CI, 1.25–6.02). Similarly, Vestergaard, Schwartz, Rejnmark, and Mosekilde (2011) noted that several bisphosphonates increase the risk of femoral shaft and subtrochanteric fractures (alendronate, HR = 2.41, 95% CI, 1.78–3.27; etidronate, HR = 1.96, 95% CI, 1.62–2.36; and clodronate, HR = 20.0, 95% CI, 0.34–205). However, the study also noted that there was an increased risk before initiating the bisphosphonates and therefore the underlying disease process may also contribute to the risk. Finally, a large, national trend analysis by Wang and Bhattacharyya (2011) compared the incidence of subtrochanteric fractures and typical fractures of the femoral neck and intertrochanteric regions on people using bisphosphonates. Using the Nationwide Inpatient Sample and Medical Expenditure Panel, they determined that bisphosphonate use preceded the increase in the number of subtrochanteric fractures in women. There has been a 20.4% increase in subtrochanteric rates in women from 1999 through 2007. There was no significant change in men ($p = .34$). Annually, a 2.1% (95% CI, 1.3–2.8, $p < .001$) was noted in women. An increase in bisphosphonate use among women was also noted from 3.5% in 1996 to 16.6% in 2007. This suggests that postmenopausal women on bisphosphonates need to be aware of their increased risk in atypical hip fractures.

In summary, the studies reviewed included one Level II study and nine Level IV studies. All of the studies investigated the link between bisphosphonates and atypical hip fractures. The common conclusion was that while the absolute risk of an atypical hip fracture is still considered low (between 1% and 10%), RCTs are necessary. In the meantime the majority of studies suggested that providers be vigilant by screening for changes in dual-energy x-ray absorptiometry (DXA) scores and considering a drug holiday when treating a patient on a bisphosphonate.

Evaluation of the Evidence-Based Practice Model

Given that the evidence was not strong enough to make a bold recommendation to change practice protocol, The Iowa Model for Evidenced-Based Practice was a useful tool to follow for implementation of improving practice regarding long-term bisphosphonate use. The Model provides flexibility in implementing practice changes when level of evidence is not sufficient enough to immediately pilot the change in practice. The model suggests that when further evidence is needed, other resources of research such as case studies, expert opinions, scientific principles, and theory may be explored to strengthen the suggested change in care (Gordon, Bartruff, Gordon, Lofgrin, & Widness, 2008). The use of this model allowed further inquiry regarding the relationship between bisphosphonate use and atypical hip fractures as there are an increasing amount of case studies, expert opinion papers, and scientific principles available. The Iowa model was utilized to go forward with the development of the DNP project because it was concluded from the evidence synthesized in this article in conjunction with the numerous amount of case studies and opinion papers published that the link between

long-term bisphosphonate use and atypical hip fractures is evident. Hence, providers ought to be made aware of this potential relationship and be vigilant while treating a patient on a bisphosphonate.

Purpose of the Project

In spite of the aforementioned studies limitations, there is a growing body of work that indicates a relationship between long-term bisphosphonate use and atypical hip fracture. The importance of provider knowledge about emerging evidence led to the conceptualization of this project. The purpose of the project was to educate the provider of an osteoporosis support group and the nurse practitioners (NPs) of a local hospital system about the potential risk for atypical hip fractures after 4 years of continuous bisphosphonate therapy. The goal of this project was to educate practitioners about atypical fractures associated with long-term bisphosphonate use and facilitate the practice of screening patients on this treatment modality. This project introduced the HIPS (How, Intervention, Primary Care Provider [PCP], Symptoms) tool developed by the project leader to support the practice change. The project will help providers screen for risk and educate patients, who have been on long-term bisphosphonate therapy about their possible increased risk for atypical hip fracture(s).

Methods

To initiate this project, the project leader met with the trauma research coordinator and women's bone health practitioner at the selected hospital. The hospital that was chosen is a local leader in promoting and practicing evidence-based care. The project was approved by both ASU and the hospital's investigational review boards. The project team consisted of the project leader, one ASU faculty member, the trauma research coordinator, and women's bone health practitioner at the hospital. Having a supportive team that consisted of nurses helped contribute to the success of the project. The project leader has a background in orthopaedics as a registered nurse and has completed a DNP degree with an adult gerontology specialty. The faculty member is both an adult NP and a women's health NP. The Women's Diagnostic Center NP and a trauma research NP at the hospital served as facilitators of the project helping to set up the room and meeting time.

An acronym "HIPS," a tool created by the project leader based on the evidence incurred, was designed to help guide providers when caring for the patient taking a bisphosphonate. The "H" stands for "How long have you been taking a bisphosphonate?" The "I" in HIPS guides providers as to what interventions their patients might expect on the basis of their answer to "H. The "P" would suggest that patients follow up with their PCP if they have been on a bisphosphonate for more than 3 years and the "S" reminds providers to teach their patients taking bisphosphonates about the unique symptoms of an atypical hip fracture. A cover letter created by the project leader was sent out by the Women's Diagnostic Center NP to the invited participants before the NP meeting informing them that completion of the pretest and posttest served as their consent to participate. The cover letter assured them that data would be kept confidential and managed anonymously to protect the rights of the participants. This population was selected as they are able to assess patients who are in between PCP visits. This combined group of providers meets every month.

The educative session was given to 15 providers, 14 NPs, and 1 orthopaedic surgeon on staff at the selected site, who served as a pilot. Of the 15 providers, 12 participated in the pretest and posttest as 3 attendees chose not to answer the questionnaire. A pretest and posttest was developed on the basis of the evidence and reflected the major points of the HIPS tool. An orthopaedic surgeon reviewed the questions for validity. The first question of the test validated the providers' awareness of the risk of atypical hip fracture with long-term bisphosphonate use. Questions 2–5 demonstrated provider willingness to assess if their patients may be at risk, refer them to their PCP if they are at risk, and teach them the symptoms of atypical fracture by answering that they would be likely to ask patients how long they have been on bisphosphonates, be willing to refer at-risk patients to their PCPs, as well as teach them the symptoms of atypical hip fracture. Whether or not the providers would use the HIPS tool was not assessed.

Each participant was given an envelope containing a demographic form, pretest and posttest. Participants completed the demographic form and a 5-question Likert-style pretest. The project leader did a 45-minute presentation utilizing PowerPoint. Content covered included educating about the evidence incurred, interventions one might expect when someone has been on a bisphosphonate for a long period of time such as a DXA scan or possible bisphosphonate drug holiday, when they to refer a patient to their PCP, and the symptoms of an atypical fracture. To facilitate sustainability of the project, a paper copy of tool termed "HIPS" was given to the participating providers to promote future utilization of the information to the osteoporosis support group and patients of the other practitioners. After the educational presentation and questions were answered, the participants were asked to take the posttest. Then participants were asked to place their completed pre- and posttests in the envelope, seal the envelope, and place it in the box. This ensured that each participant's pretest was matched with the posttest.

The test packets were immediately collected and stored in a locked file cabinet in the office of the project leader until the data were entered into the triple password-secured computer of the project leader. The project leader and faculty member were the only two individuals with access to the data. The paper tests were immediately shredded by a professional shredding company at the office of the project leader after the data were entered.

Measures, Data Collection, and Analysis

Data analysis included determination of frequencies, descriptive statistics, Wilcoxon matched-pairs signed-ranks test, and independent-samples *t* tests. Measures were used to evaluate the providers' knowledge regarding the association between long-term bisphosphonate use and atypical hip fractures as well as their intent to screen, educate, and refer after the educative session. The outcome was measured by the pretest and posttest

that was given to providers. The data were used from 11 of the NPs and 1 orthopaedic surgeon from the pilot. The sample (N = 12) is recognized as a small sample size; however, this doctoral project served as the first of hopefully more to follow. The level of data was measured by an ordinal scale for the test questions, ratio scale for age, nominal scale for sex, and specialty and interval scale for years in practice. A 0–5 numbered Likert scale was used in the tests to measure outcome. The pre- and postintervention data measured are the questions 1–5 of the pretest and questions 1–5 of the posttest. The total score of the pretest compared with the total score of the posttest was also compared. The collected data were entered into SPSS (version 20.0) for analysis.

Findings

The goal of the project yielded a favorable outcome. Frequencies (see Table 2) were run to look at the sum of the number of instances of each category. The participants included 9 women and three men aged 32–71 and two described themselves as bone health practitioners. Years in practice as an advanced practitioner ranged from 2 to 21 years. The Wilcoxon matched-pairs signed-ranks test (see Table 3) was used to evaluate pretest and posttest results. A P value of $N < .05$ was considered statistically significant. Question 1 used to evaluate the difference in provider awareness of the risk of atypical hip fracture after long-term bisphosphonate use is significant (p = .011). Question 2 evaluated the provider intent to assess duration of patient use of bisphosphonate demonstrated significance (p = .011). Question 3 assessed whether the providers would discuss long-term bisphosphonate use with their patients (p = .011).

Table 2. Frequencies

	n	%
Age (years)		
18–36	1	8.3
37–54	6	50
55–70	3	25
70–100	1	8.3
Not specified	1	8.3
Years in practice		
0–5	4	33.3
6–10	3	25
11–15	3	25
16–20	1	8.3
21–25	1	8.3
Sex		
Male	3	25
Female	9	75
Specialty		
Bone health	2	16.7
Nonbone Health	10	83.3

Table 3. Wilcoxon Signed Ranks Test

	N	Mean Rank	Sum of Ranks	*p*
Question 1 posttest–Question 1 pretest				
Negative ranks	0	.00	.00	
Positive ranks	8	4.50	36.00	.011
Ties	4			
Total	12			
Question 2 posttest–Question 2 pretest				
Negative ranks	0	.00	.00	
Positive ranks	8	4.50	36.00	.011
Ties	4			
Total	12			
Question 3 posttest–Question 3 pretest				
Negative ranks	1	1.50	1.50	
Positive ranks	8	5.44	43.50	.011
Ties	3			
Total	12			
Question 4 posttest–Question 4 pretest				
Negative ranks	0	.00	.00	
Positive ranks	11	6.00	66.00	.011
Ties	1			
Total	12			
Question 5 posttest–Question 5 pretest				
Negative ranks	0	.00	.00	
Positive ranks	8	4.50	36.00	.003
Ties	4			
Total	12			
Post-/pretest total				
Negative ranks	0	.00	.00	
Positive ranks	11	6.00	66.00	.003
Ties	1			
Total	12			

Question 4 asked whether the providers would educate their patients about the unique symptoms of an atypical hip fracture with patients (p = .03). Finally, Question 5 asked whether the providers would refer their patients to their PCPs if on a bisphosphonate 4 years or longer (p = .011). Independent-samples t tests (see Table 4) were run to look at the difference in the test score totals between the bone health specialists and non–bone health practitioners. The pretest total scores indicated a statistically significant difference in bone health provider awareness and practice than those who did not declare themselves as bone health specialists (p = .018). However, posttest scores showed no difference statistically between the bone health specialty group and non–bone health specialty group (p = .099). Cronbach alpha coefficient (r = .88) was used to measure reliability of the Likert scale used in the pretest and posttest demonstrating reliability of the scale.

Table 4 . Independent Samples Test

	Levene's Test for Equality of Variances	*t* Test for Equality of Means							
								95% Confidence Interval of the Difference	
	F	*p*	*t*	*df*	*p* (2-Tailed)	Mean Difference	SE Difference	Lower	Upper
Pretest total									
Equal variances assumed	7.95	.018	−1.5	10	.164	−9.10	6.06	−22.61	4.41
Equal variances not assumed			− 3.4	9.5	.007	−9.10	2.65	−15.06	−3.14
Posttest total									
Equal variances assumed	3.29	.099	−.94	10	.368	−1.70	1.80	−5.71	2.31
Equal variances not assumed			−1.8	7.0	.107	−1.70	.92	−3.87	.47

Discussion

The pre- and posttest results indicated a successful conveyance of new knowledge among the providers educated. Regardless of specialty, 100% of the posttest scores indicated either a better understanding or the same understanding of the risk of long-term bisphosphonate use and atypical hip fractures as scores showed an increased willingness to screen for patients at risk for atypical hip fracture and to educate patients about such fractures when compared with the pretest scores. While the bone health specialists demonstrated more of an awareness of the subject and an incorporation of screening in their practice on the pretest, posttest analysis demonstrated an improved awareness and willingness to screen and educate among all participating specialties. The results of this project give aspiration to continue to educate health care providers at a national level utilizing the HIPS tool.

Initially this project was intended for orthopaedic surgeons and PCPs. However, it was decided that a better target population might be those who are less familiar with bone health and bisphosphonate therapy after discussing the topic with an orthopaedic trauma surgeon and PCP who already demonstrated knowledge about the link between long-term bisphosphonate use and atypical hip fractures. The pretest scores do support the importance and need to disseminate this education to non–bone health providers and non-PCPs. However, the posttest scores of the bone health specialists did improve on a few questions in regard to screening and educating, thus indicating that this project may be valued in all adult health care settings. Given the simplicity of the Likert scale, the low cost of the project, and the anonymity of the participants, no barriers to project outcome were encountered.

While there are no current national projections available on how this implementation of screening for atypical hip fracture risk may lower health care costs, it can be determined that any reduction in hip fracture occurrence would positively benefit health care costs, quality of life, and longevity of life versus no implementation of screening. A detailed cost analysis of projected increase in primary care provider visits and DXA screenings as a result of this project versus a cessation in bisphosphonate therapy and reduction in hip fracture is warranted.

Evaluating Lessons Learned

Innovation and leadership are two qualities that were developed during DNP program by the project leader. Key attributes attained from the program included patience, honesty, and valuing missteps. These qualities and attributes were utilized for the conceptualization, delivery, and dissemination of this project. There were several events that were unanticipated by the project leader. The skills learned from the DNP program helped the project leader navigate through the issues.

One unexpected occurrence was that not all providers present at the meeting completed the test packets. Three envelopes were returned unanswered. A valuable lesson learned was to immediately open the test packets to be sure that there is actual data recorded and not make an assumption that all in attendance would participate as there is always a possibility that no one had participated which would have warranted finding another project site. Also, there were some last minute time changes to the project presentation and one unwelcoming host. Lessons learned included the necessity to be flexible, as well as to be prepared for unwelcoming host(s) by being well prepared to answer an array of questions and have strategies ready to capture their attention such as fun facts in the beginning of presentation, a quick 15-minute delivery of information and a mobile delivery of presentation rather than stationary at a podium. Finally, after reviewing the findings, it was realized that a question needed to be added to the posttest measuring providers' intent to use the HIPS tool in their practice. This question will be added to any future projects.

Conclusion

There is an increase in case studies and evidence from cohort studies linking atypical hip fractures with long-term bisphosphonate therapy. More studies, particularly

RCTs, are needed to further support the evidence and to make a radical change in practice. There was, however, enough evidence to improve practice standards by educating providers about vigilant preventive screening strategies in patients at potential risk for atypical fracture. The project, Preventing Atypical Hip Fracture After Long-Term Bisphosphonate Use, determines to help providers identify which patients may be at risk, advise them as to when their patients should be seen by their PCP for screening tests that would be helpful in distinguishing their risk, and identify when a drug holiday from bisphosphonates may be indicated. The results of this project determined that the need for such education is necessary in this population of providers. The results of the pretest and posttest indicated a statistically significant difference, thus implying necessity of expansion of this project to include publication of the project and HIPS tool in a peer-reviewed journal, further local educative sessions, and presenting at a national evidence-based conference. Expansion of this project would continue to improve quality of care of patients with osteoporosis and taking a bisphosphonate, improve preventive strategies of adult providers to screen for patients at risk of atypical hip fracture, and maintain efforts to reduce the national effort to reduce the incidence of hip fracture annually.

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