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Contact Lens Compliance in First and Fourth Year Optometry Students

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Doctoral Candidate(s)

May 3, 2013
Date

CONTACT LENS COMPLIANCE IN FIRST AND FOURTH YEAR OPTOMETRY
STUDENTS

by

Stephanie Jones and Haley McLennan

Has been approved

May, 2013

APPROVED:

 _____, Faculty Advisor

ACCEPTED:

 _____
Faculty Course Supervisor

CONTACT LENS COMPLIANCE IN FIRST AND FOURTH YEAR OPTOMETRY
STUDENTS

by:

Stephanie Jones and Haley McLennan

This paper is submitted in partial fulfillment of the
requirements for the degree of

Doctor of Optometry

Ferris State University
Michigan College of Optometry

May 2013

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Stephanie Jones & Haley McLennan
Doctoral Candidate(s)

March 26, 2014
Date

ABSTRACT

Purpose: This research study was conducted to determine if formal education in the subject of contact lenses improves contact lens compliance. A second goal was determine if certain behaviors such as buying contact lenses online or purchasing a full year supply have an effect on compliance. The results of this study could provide a further understanding of the patient education required to improve compliance among the contact lens wearing population. *Methods:* First and fourth year optometry students, who are current contact lens wearers, were anonymously surveyed regarding their contact lens wear and care. The responses were then individually appointed a score ranging from 0-3, 0 representing the least compliant and 3 for the most compliant. A total score was calculated and then converted to a percentage out of 100% to represent their overall compliance. The average grade percentages of the first year and fourth year subjects were then compared for statistical significance *Results:* Ten optometry schools chose to participate in the study and a total of 190 subjects qualified for analysis. The results of the survey yielded an overall compliance grade percentage of 70.01% for the first year subjects and 74.64% for the fourth year subjects. The difference in compliance ($p= 0.700$) was statistically insignificant. The significance level was set to $p<0.05$. *Conclusion:* The study did not show a statistically significant improvement in contact lens compliance in the fourth year optometry students compared to the first year students. Further research with varying methods of analysis should be done to draw more significant conclusions.

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CHAPTER 1

INTRODUCTION AND BACKGROUND OF CONTACT LENS COMPLIANCE:

Contact lens compliance is a popular topic of research that has demonstrated an overall rate of noncompliance ranging from 40-91% among contact lens wearers.¹ The most common non-compliant behaviours of contact lens wearers include water exposure, sleeping in lenses overnight, failing to replace lenses correctly, failing to wash hands before handling lenses, failing to clean case and replace case, as well as solution misuse (topping off and switching brands).^{1,2} These types of behaviours put patients at a higher risk of developing serious ocular complications such as microbial keratitis (MK) and acanthamoeba infections. A study found that patients are 10x more likely to develop MK if they sleep in their lenses and 1.5x more likely if they do not wash their hands before handling lenses. Acanthamoeba infections are more prevalent in patients who swim and shower while wearing their lenses or use tap water for cleaning lenses. It has also been found that improper contact lens case cleaning and replacement increases the risk of both MK and acanthamoeba infections due to the case biofilms creating an environment for these microorganisms to grow.² Other behaviours such as failing to clean or replace lenses appropriately can increase lens deposits and development of a biofilm on the lens that will contribute to irritation as well as other complications including giant papillary conjunctivitis, contact lens-induced acute red eye, infiltrative keratitis, and contact lens-related peripheral ulcer.³

There are other risk factors of contact lens related complications that are considered non-modifiable which include a young age (under 50 years), male gender, low socioeconomic status, diabetes mellitus, and less than 6 month contact lens experience.³

Risk factors that are modifiable such as poor hand hygiene, improper lens and case care, exposure to water, and extended/overnight wear are all among the most common non-compliant behaviours and therefore should have special attention during patient education and contact lens training.³

Compliance among different populations has been studied in many different ways investigating their practices, behaviors, and attitudes. To the authors knowledge this is the first study to research the difference in compliance among students within the optometry program. Our purpose is to determine if fourth year optometry students who have had professional education in contact lenses and ocular disease will be more compliant than first year students who have not yet received this education. It will investigate other relationships between contact lens compliance and the method of purchasing lenses or size of supply purchased at a time. The study will also explore the most common types of ocular complications had by the subjects and their reasons for not replacing lenses correctly. The findings for this study may help develop a better approach to educating and demonstrating the importance of proper compliance to contact lens wearers and minimize the incidence of complications.

CHAPTER 2

METHODS OF SURVEYING

Approval for this study was received by the Institutional Review Board for Protection of Human Subjects at Ferris State University. Following approval, an invitation to participate in an anonymous online survey was emailed to first and fourth year students of 10 different optometry schools across the United States and Canada. Included in the email was information about their participation, confidentiality, and consent. There was a total of 259 subjects who participated in the survey, 190 of which were current contact lens wearers and eligible for analysis. At the time of participation, the first year subjects were within the first two months of beginning their program and were confirmed to have not yet had any formal contact lens courses. The fourth year subjects were half way through their final year and were confirmed to have completed all contact lens courses within their school's curriculum.

The survey consisted of a series of questions regarding their contact lens wear and care. (Appendix 1) The responses were then individually appointed a score ranging from 0-3, 0 representing the least compliant and 3 for the most compliant. Selected questions had two answers that were considered equally compliant and therefore were designated equal points. A final score in percentage form was then calculated for each participant based on the questions that were applicable to them. The scoring system used for this study had a similar basis as a compliance study performed on young university students

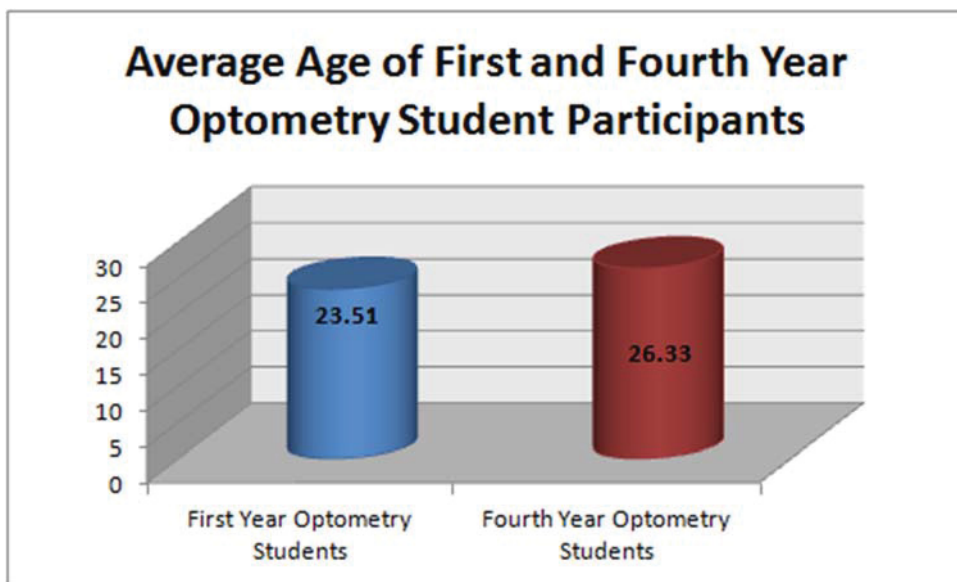
in South India⁴. The average scores of the first years and fourth years were compared for statistical significance. The chi-square test was used to evaluate the compliance between the two groups. The analysis significance level was set to $p < 0.05$.

CHAPTER 3

RESULTS OF CONTACT LENS COMPLIANCE SURVEY

Of the total of 190 optometry students whose surveys were eligible to be used in the analysis, 102 were first year optometry students and 88 were fourth year optometry students. The results of the survey yielded an overall compliance grade percentage of 70.01% for the first year subjects and 74.64% for the fourth year subjects. The chi square test found the difference in compliance to be p- value of 0.70. The significance level was set to be $p < 0.05$.

The average age of the first year subjects was 23.51. 25 (24.51%) subjects were male and 77 (75.49%) were female. The average age of the fourth year subjects was 26.33 and 24 (27.27%) were male and 64 (72.72%) were female.



Graph 1: Average Age of First and Fourth Optometry Student Participants

	First Years	Fourth Years
Average Age	23.51	26.33
Female Participants	77	24
Male Participants	25	64

Chart 1: Demographics of Participants

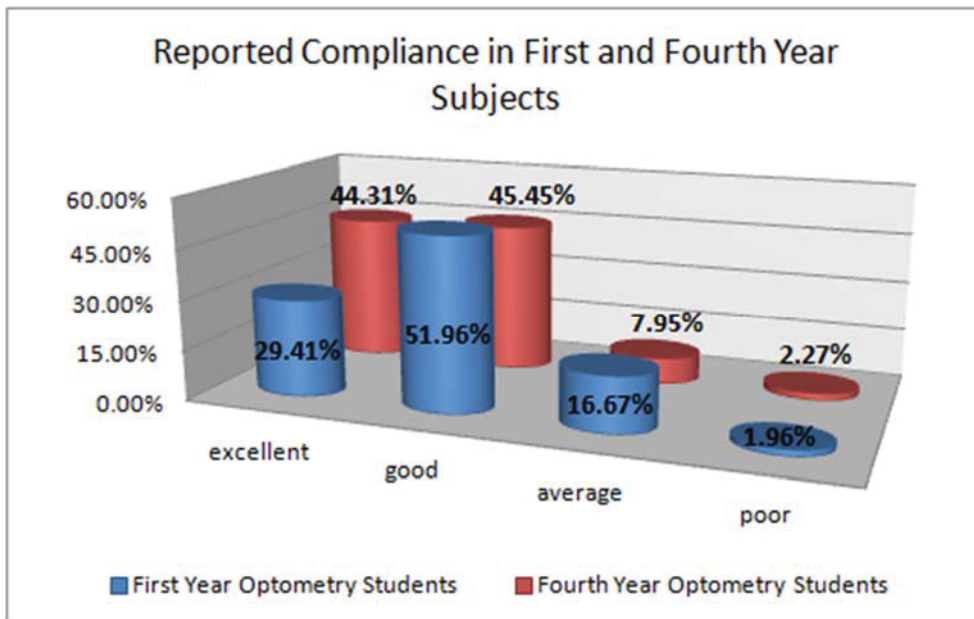
	First Year	Fourth Year	Total
Midwestern University - Arizona	4	8	12

College of Optometry			
University of California Berkeley School of Optometry	15	11	26
Ferris State University - Michigan College of Optometry	12	15	27
University of Montreal	0	8	8
Nova Southeastern University College of Optometry	14	11	25
State University of New York College of Optometry	8	6	14
Ohio State University College of Optometry	8	7	15
College of Optometry at Pacific University	18	12	20

University of Missouri- St. Louis College of Optometry	10	8	18
Western University College of Optometry	13	2	15
Total	102	88	190

Chart 2: Number of Participants by College of Optometry

Subjects were asked, “How compliant do you think you are with your contact lens care?”. The first year subjects reported 30 (29.41%) had excellent compliance, 53 (51.96%) reported good compliance, 17 (16.67%) reported average compliance, and 2 (1.96%) subjects reported poor compliance. The fourth year subjects reported 39 (44.31%) had excellent compliance, 40 (45.45%) had good compliance, 7 (7.95%) had average compliance, and 2 (2.27%) had poor compliance.



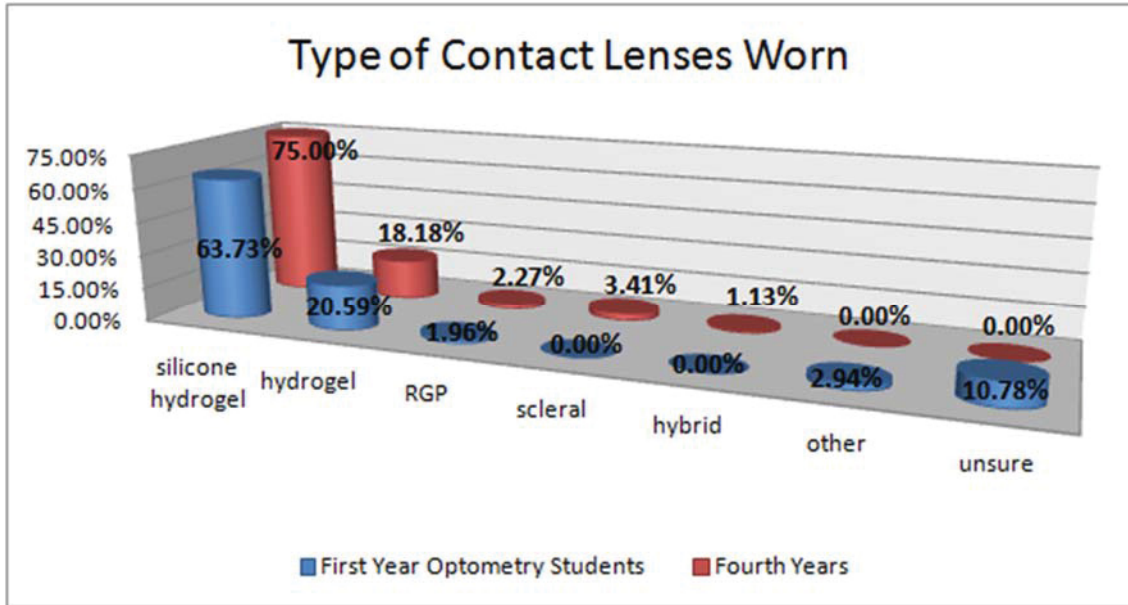
Graph 2: Reported Compliance in First and Fourth Year Subjects

Most first year subjects wore silicone hydrogel lenses 65 (63.73%), 21 (20.59%) wore hydrogel lenses, 2 (1.96%) wore rigid gas permeable lenses, 3 (2.94%) reported wearing other types of contact lenses, and 11 (10.78%) were unsure of contact lens material. Again most fourth year subjects wore silicone hydrogel lenses 66 (75%), 16 (18.18%) wore hydrogel lenses, 2 (2.27%) wore rigid gas permeable lenses (orthokeratology), 3 (3.41%) wore scleral lenses, and 1 (1.14%) subject specified wearing a hybrid lens. Of the first year subjects, 22 (21.57%) were told by their eye care professional to change contact lenses daily, 34 (33.33%) every 2 weeks, 38 (37.25%) every month, 5 (4.90%) yearly, and 3 (2.94%) specified “other” as their advised replacement. Among the fourth year subjects 41 (46.59%) were told to change their lenses daily, 9 (10.23%) every 2 weeks, 31 (35.22%) monthly, 4 (4.55%) yearly, and 3 (3.41%) specified “other” as their advised replacement.

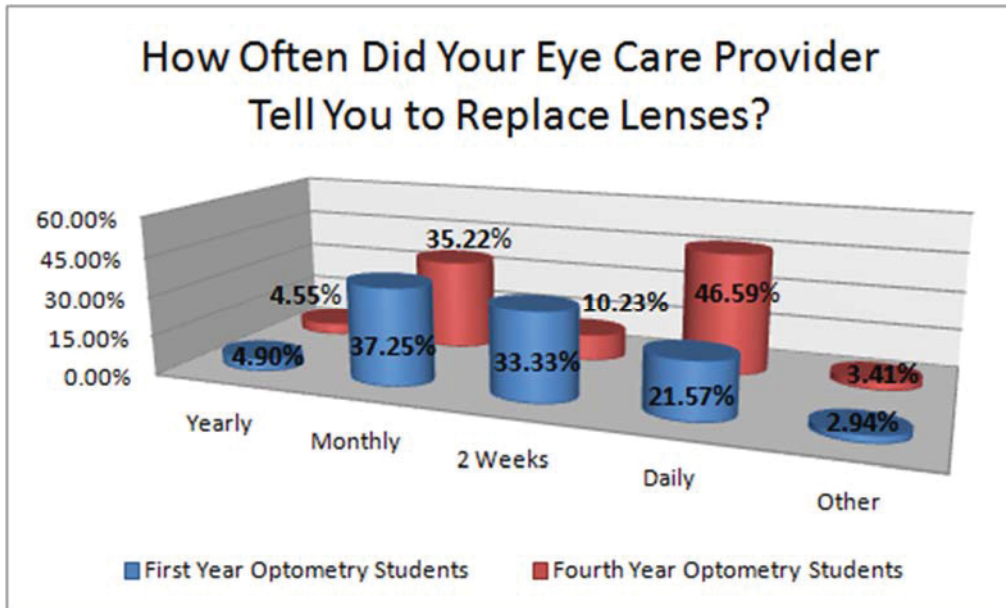
When patients were asked how often they actually replace their lenses 26 (25.5%) of first year students did not replace them as often as they were directed and of fourth year subjects 11 (12.5%) did not replace as often as directed.

Subjects were also asked why they do not replace their lenses as often as advised. 30 (29.41%) of first year subjects said they forgot when to replace, 11 (10.78%) did it to save money, 3(2.94%) were told it was ok by their eye professional that it was ok, 2(1.96%) believe there is no harm, 2(1.96%) lack of time, and 7(6.86%) for other reasons. 15(17.05%) of fourth years said they forgot when to replace lenses is why they do not replace them as often as advised, 7(7.95%) did it to save money, 0(0.00%)were told it was ok by their eye professional that it was ok, 0(0.00%) believe there is no harm,

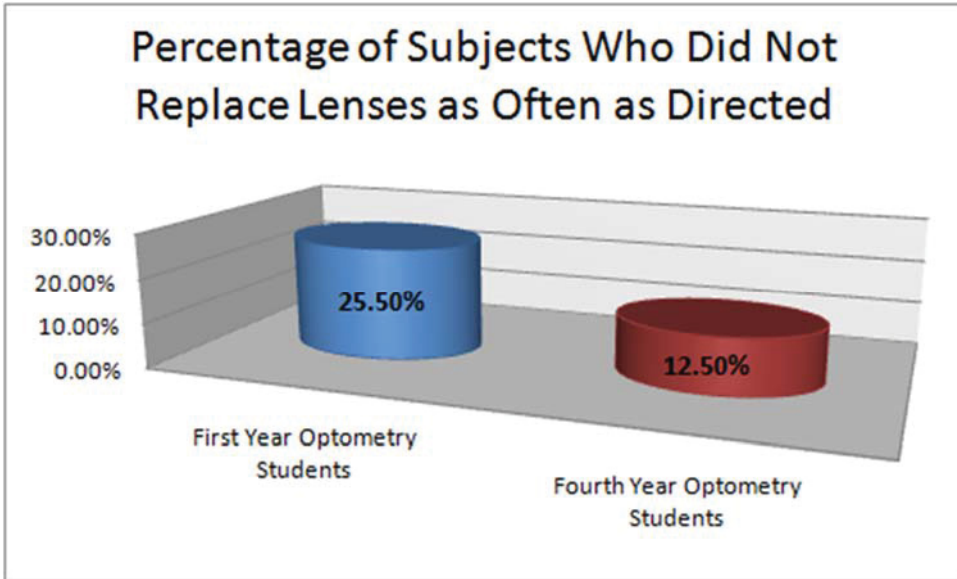
1(1.14%) lack of time, and 6(6.81%) for other reasons.



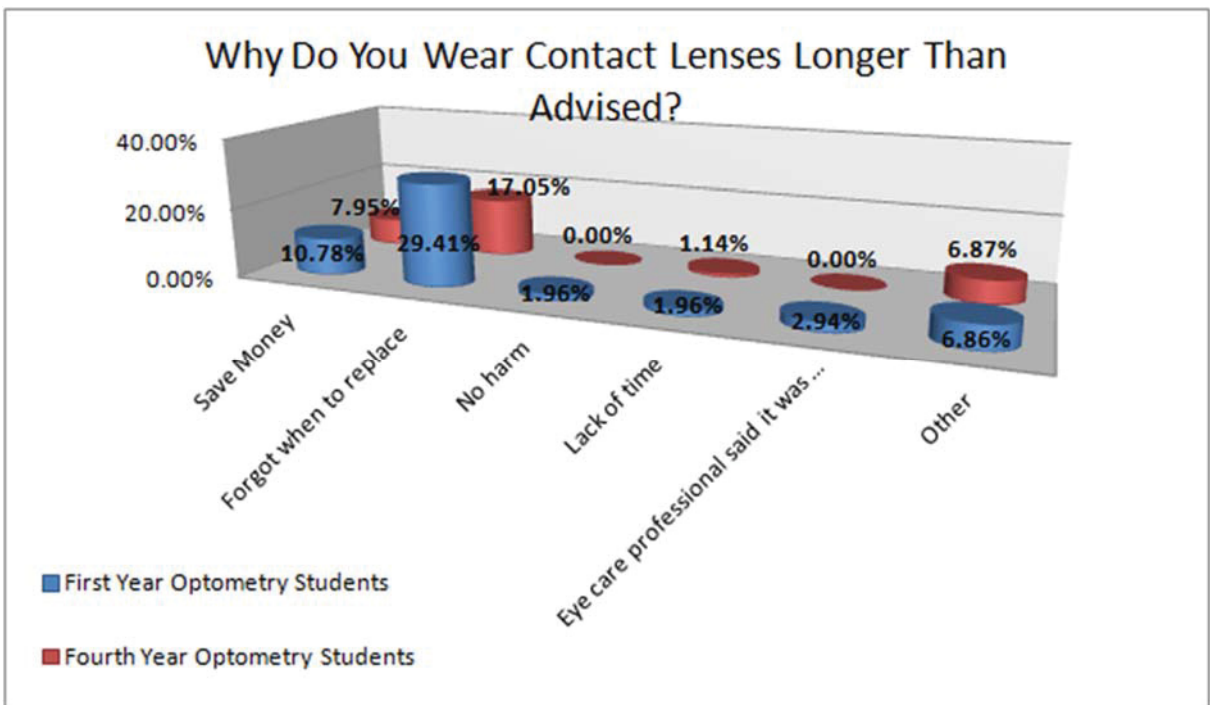
Graph 3: Types of Contact Lenses Worn



Graph 4: How Often Did Your Eye Care Provider Tell You to Replace Lenses?



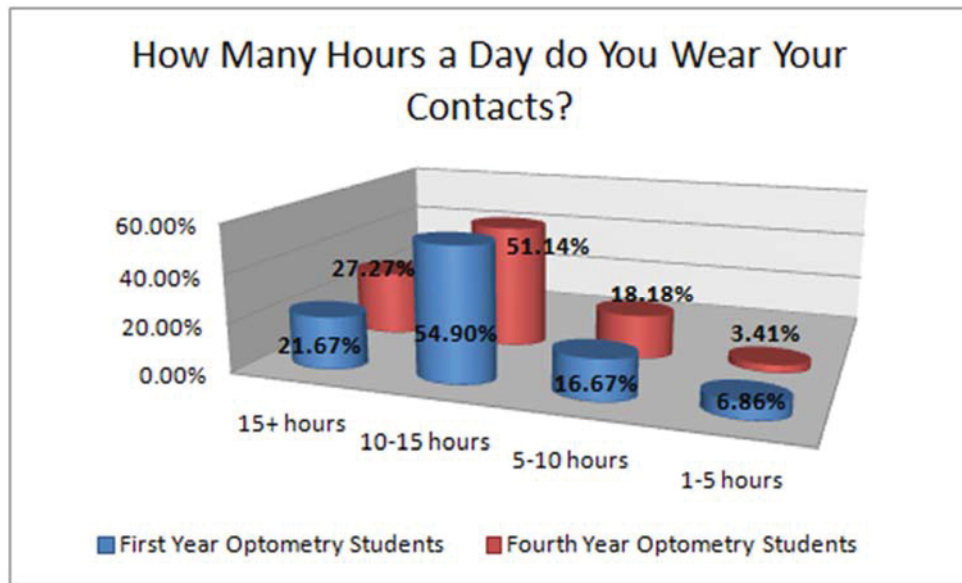
Graph 5: Percentage of Subjects Who Did Not Replace Lenses as Often as Directed



Graph 6: Why Do You Wear Your Lenses For Longer Than Advised?

The results for the total number of hours in a day that first year subjects wear their lenses were 22 (21.67%) reported 15+ hours, 56 (54.90%) wear lenses 10-15 hours a day,

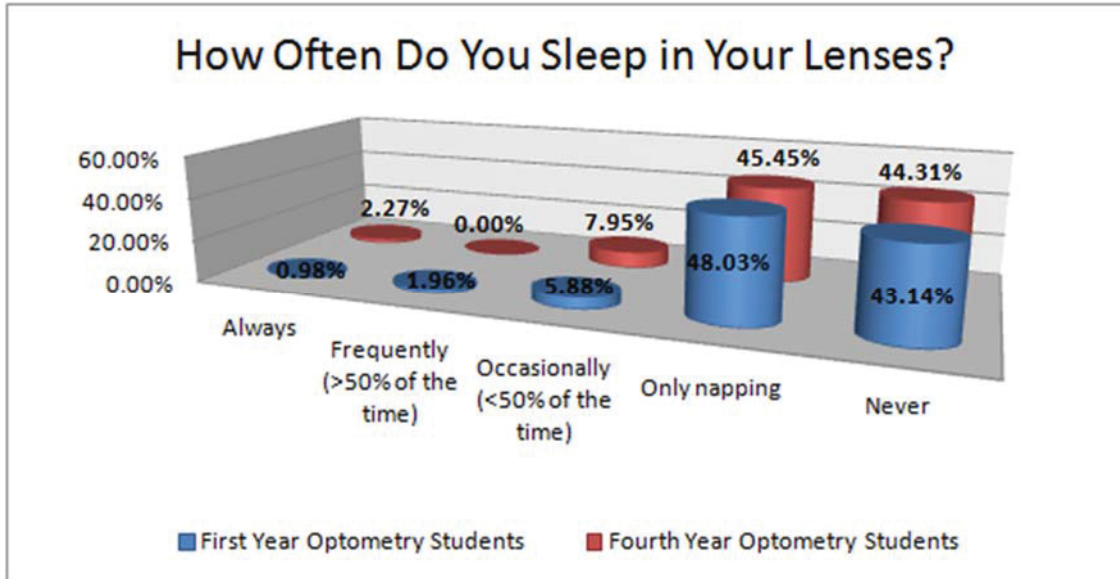
17 (16.67%) reported 5-10 hours, and 7 (6.86%) reported wearing contacts lenses for only 1-5 hours. 24 (27.27%) fourth year subjects reported wearing lenses for 15+ hours a day, 45 (51.14%) wear 10-15 hours a day, 16 (18.18%) 5-10 hours a day, and 3 (3.41%) wear their lenses for only 1-5 hours a day.



Graph 7: How Many Hours a Day Do You Wear Your Contacts

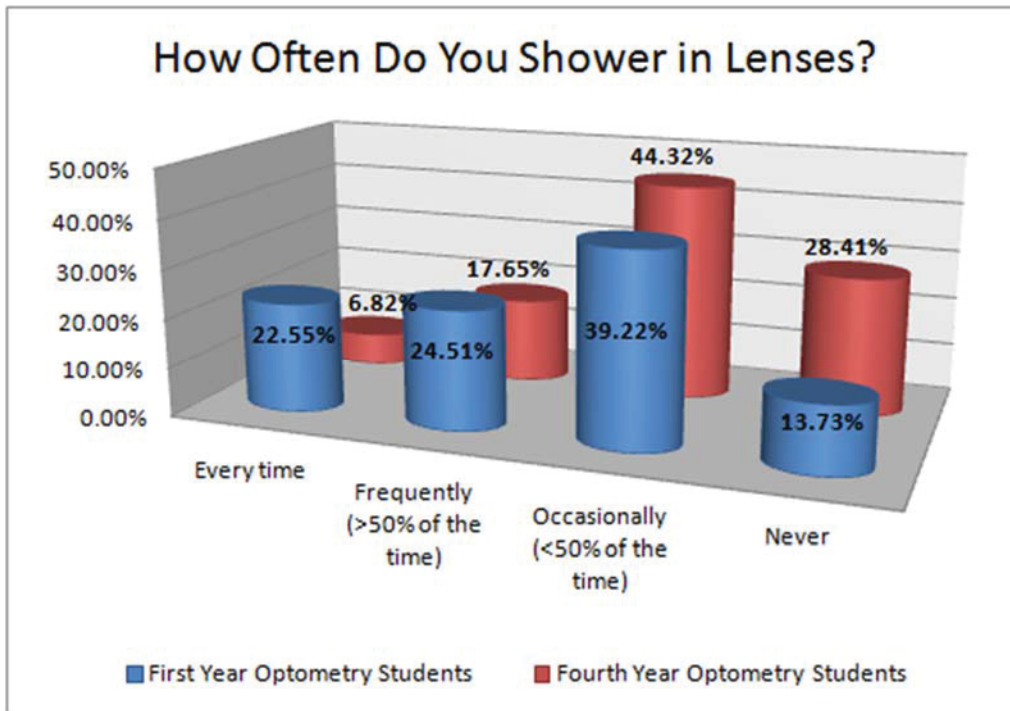
When first year subjects were asked about sleeping in contact lenses, 1(0.98%) reported always sleeping in lenses, 2 (1.96%) reported sleeping in lenses frequently (>50% of the time), 6 (5.88%) reported occasionally (<50% of the time), 49 (48.03%) only napping, and 44 (43.14%) reported never sleeping in lenses. 10 (9.80%) of the first year subjects reported that their eye care professional said it is alright to sleep in their contact lenses. Of the fourth year subjects, 2 (2.27%) reported always sleeping in lenses, 0 (0.00%) reported sleeping in lenses frequently (>50% of the time), 7 (7.95%) reported occasionally (<50% of the time), 40 (45.45%) only napping, and 39 (44.31%) reported never sleeping in lenses. 7 (7.95%) of the fourth year subjects reported that they were

told by their eye care professional it is alright to sleep in their contacts.

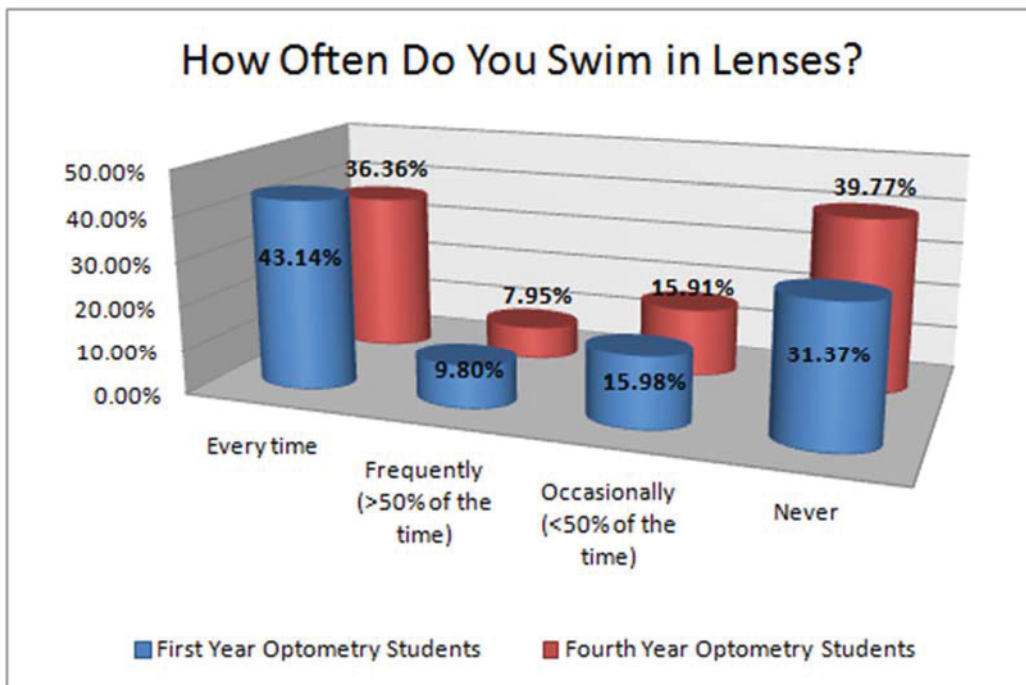


Graph 8: How Often Do You Sleep in Your Lenses

Showering and swimming with contact lenses was also examined. 23 (22.55%) of first years reported wearing contact lenses every time they showered, 25 (24.51%) reported frequently (>50%), 40 (39.22%) reported occasionally (<50%), and 14 (13.73%) reported never showering while wear contact lenses. While swimming 44 (43.14%) first years reported wearing contact lenses every time they swam. 10 (9.80%) reported frequently, 16 (15.98%) reported occasionally, 32 (31.37%) reported never wearing contact lenses while swimming. Fourth years reported 6 (6.82%) wearing contact lenses every time they showered, 18 (17.65%) frequently, 39 (44.32%) occasionally, 25 (28.41%) never showering with contact lenses. 32 (36.36%) reported wearing contact lenses every time they swam, 7 (7.95%) frequently, 14 (15.91%) occasionally, and 35 (39.77%) never wear contact lenses while swimming.



Graph 9: How Often Do You Shower in Lenses?

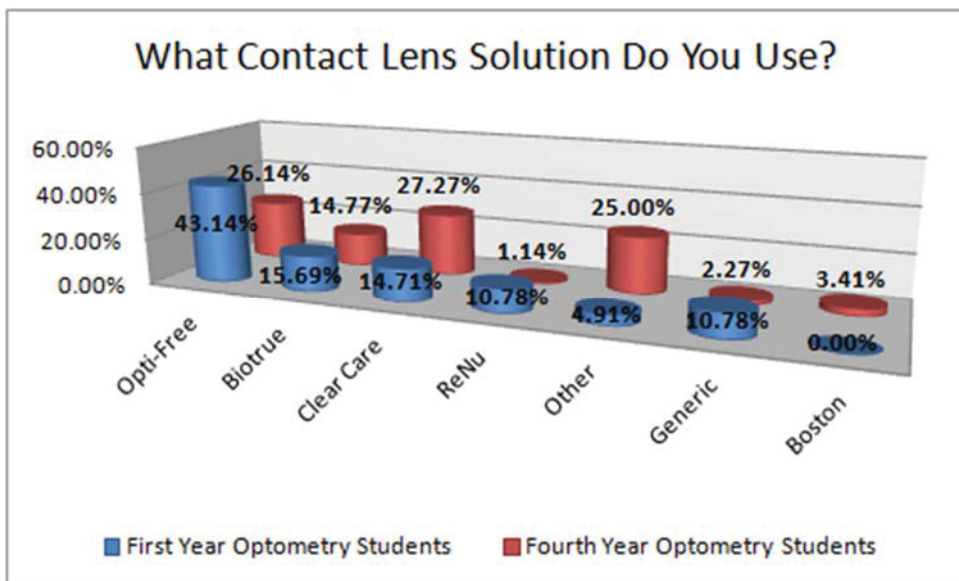


Graph 10: How Often Do You Swim in Lenses?

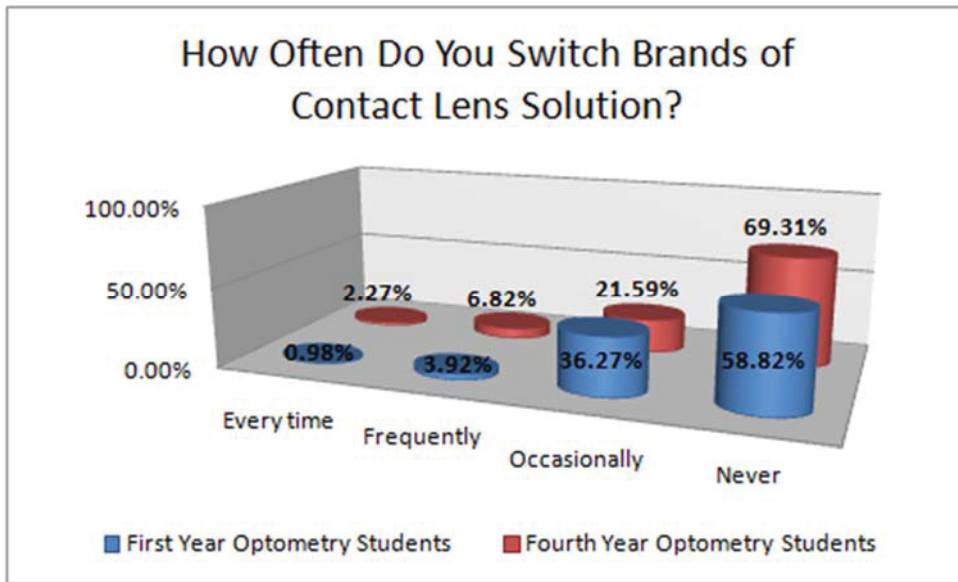
159 (83.68%) of all subjects used brand name contact lens solutions, 7 (3.68%) used generic solution; all were first year subjects, and 24 (12.63%) did not use any

solution. 44(43.14%) of first years used Opti-Free, 11(10.78%) used ReNu, 15(14.71%) used Clear Care, 16(15.69%) used Biotrue, 0(0.00%) used Boston, 11(10.78%) used a different solution than listed or no solution, and 5(4.91%) used a generic solution.

23(26.14%) of fourth years used Opti-Free, 1(1.14%) used ReNu, 24(27.27%) used Clear Care, 13(14.77%) used Biotrue, 3(3.41%) used Boston, 22(25.00%) used a different solution than listed or no solution, and 2(2.27%) used a generic solution. There were no subjects that reported using tap water for cleaning or storing lenses. 42 (41.18%) of first year wearers admitted to changing brands contact lens solution at least occasionally (<50% of the time), whereas only 27 (30.68%) fourth year students reported changing solution, although this difference is not statistically significant (p= 0.2155). 60 (58.82%) of first years reported never changing the brand of contact lenses, 37 (36.27%) reported occasionally, 4 (3.92%) frequently, and 1(0.98%) every time he or she bought solution. 61(69.31%) of fourth years reported never changing brands of contact solution, 19 (21.59%) occasionally, 6 (6.82%) frequently, and 2 (2.27%) every time they bought solution.

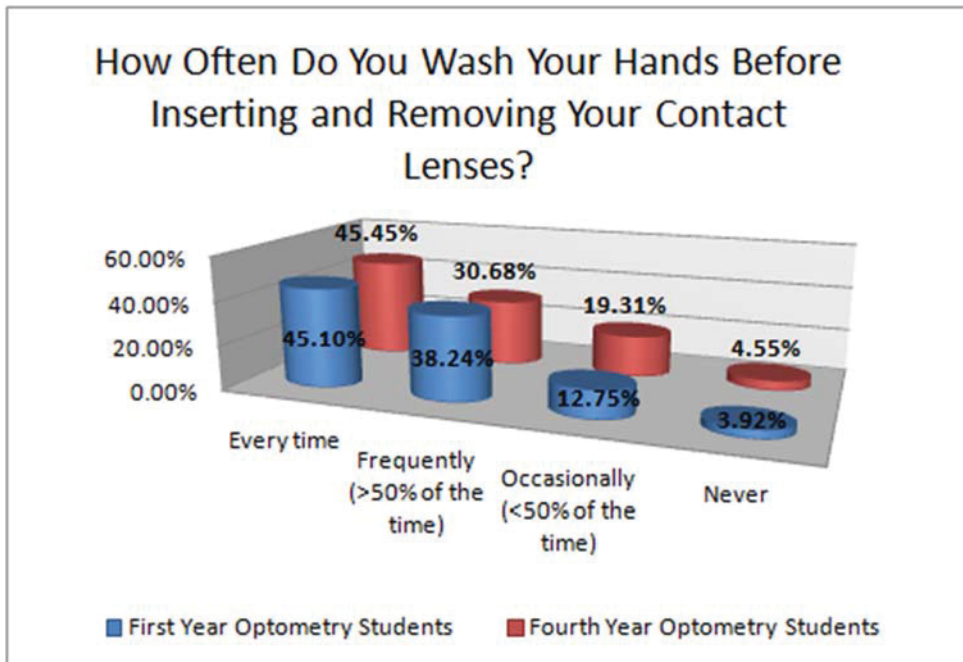


Graph 11: Types of Solutions Used

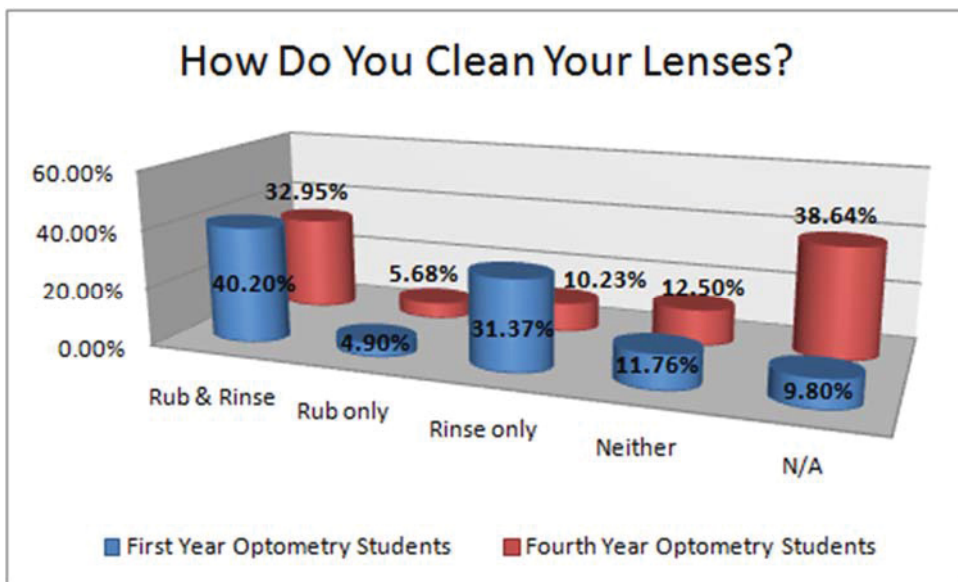


GRAPH 12: How Often Do You Switch Brands of Contact Lens Solution

Contact lens care and hygiene was also surveyed. 46(45.10%) of first year subjects reported washing their hands every time they inserted or removed contact lenses, 39(38.24%) reported frequently (>50% of time), 13(12.75%) reported occasionally(<50% of time), and 4(3.92%) reported never washing hands. 40(45.45%) of fourth year subjects reported washing their hands every time they inserted or removed contact lenses, 27(30.68%) reported frequently (>50% of time), 17(19.31%) reported occasionally(<50% of time), and 4(4.55%) reported never washing hands. When it came to asking how the subjects cleaned their lenses, first year students responded with 41 (40.20%) rub and rinse, 5 (4.90%) rub only, 32 (31.37%) rinse only, and 12 (11.76%) do neither. 10 (9.80%) were excluded as they specified not applicable due to wearing daily lenses. Within the fourth year subjects 29 (32.95%) reported rub and rinse, 5(5.68%) rub only, 9(10.23%) rinse only, and 11(12.5%) do neither. 34 (38.64%) were excluded as they specified not applicable due to wearing daily lenses.



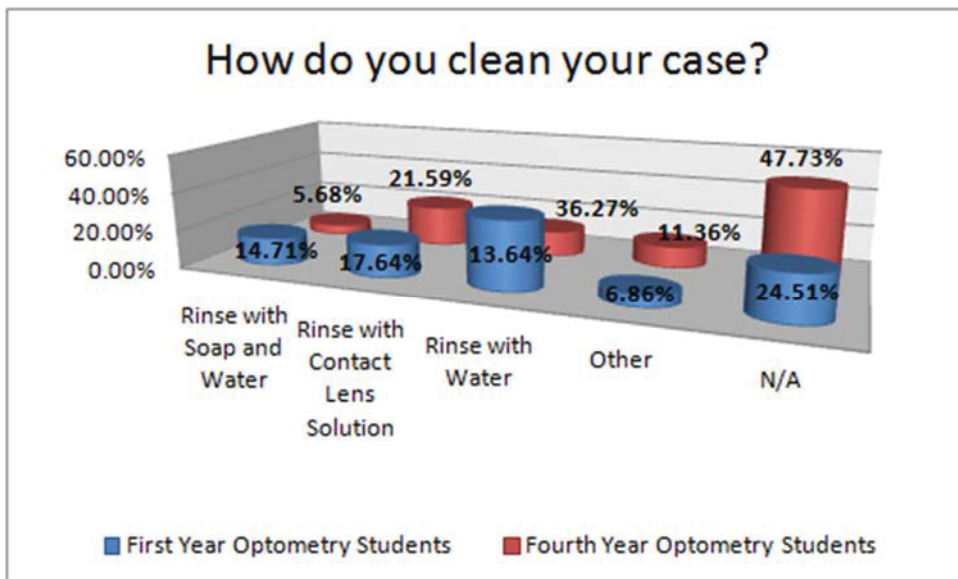
Graph 13: How Often Do You Wash Your Hands Before Inserting and Removing Your Contact Lenses?



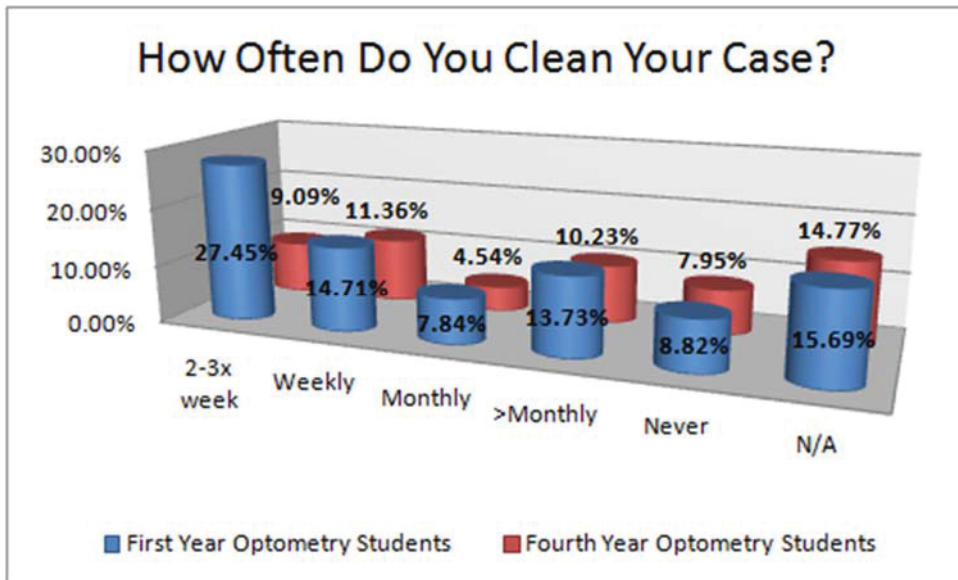
Graph 14: How Do You Clean Your Lenses?

Next case cleaning and storage of lenses was surveyed. 15(14.71%) of first year subjects reported cleaning their case with soap and water, 18(17.64%) rinsing with contact lens solution, 37(36.27%) rinsing with just water, 7(6.86%) other ways, and 25(24.51%) not applicable. 5(5.68%) fourth year subject cleaned their case with soap and

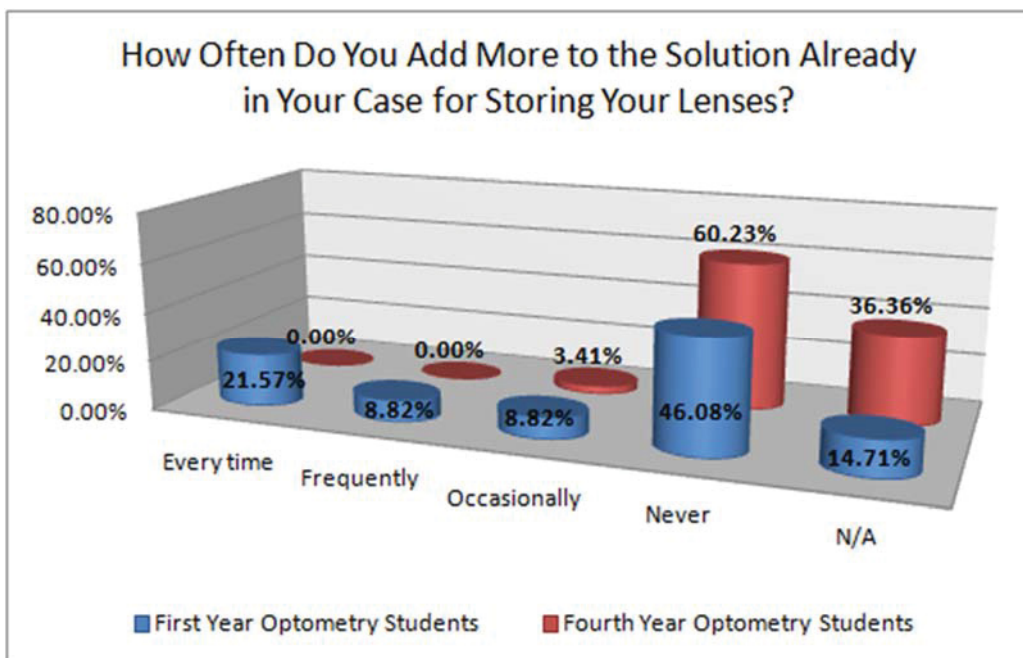
water, 19(21.59%) rinsing with contact lens solution, 12(13.64%) rinsing with just water, 10(11.36%) other ways, and 42(47.73%) not applicable. First year subjects reported 28 (27.45%) cleaned their case two to three times a week, 15(14.71%) weekly, 8(7.84%) once every two weeks, 14(13.73%) monthly, 12(11.76%) greater than monthly, 9(8.82%) never, and 16(15.69%) not applicable. 8(9.09%) of fourth year subjects cleaned their case two to three times a week, 10(11.36%) weekly, 4(4.54%) once every two weeks, 9(10.23%) monthly, 7(7.95%) greater than monthly, 13(14.77%) never, and 37(42.05%) not applicable. 22(21.57%) of first year subjects reported adding solution to previously used solution every time they store their lenses, 9(8.82%) frequently, 9(8.82%) occasionally, 47(46.08%) never, and 15(14.71%) not applicable. 0(0.00%) of fourth year subjects reported adding solution to previously used solution every time they store their lenses, 0(0.00%) frequently, 3(3.41%) occasionally, 53(60.23%) never, and 32(36.36%) not applicable.



Graph 15: How Do You Clean Your Contact Lens Case?



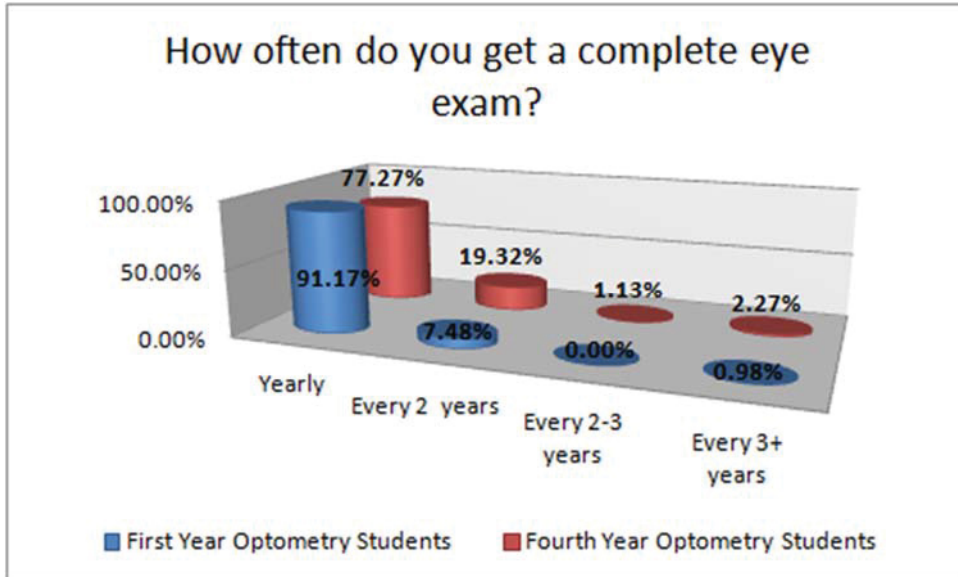
Graph 16: How Often Do You Clean Your Case?



Graph 17: How Often Do You Add More to the Solution Already in Your Case for Storing Your Lenses?

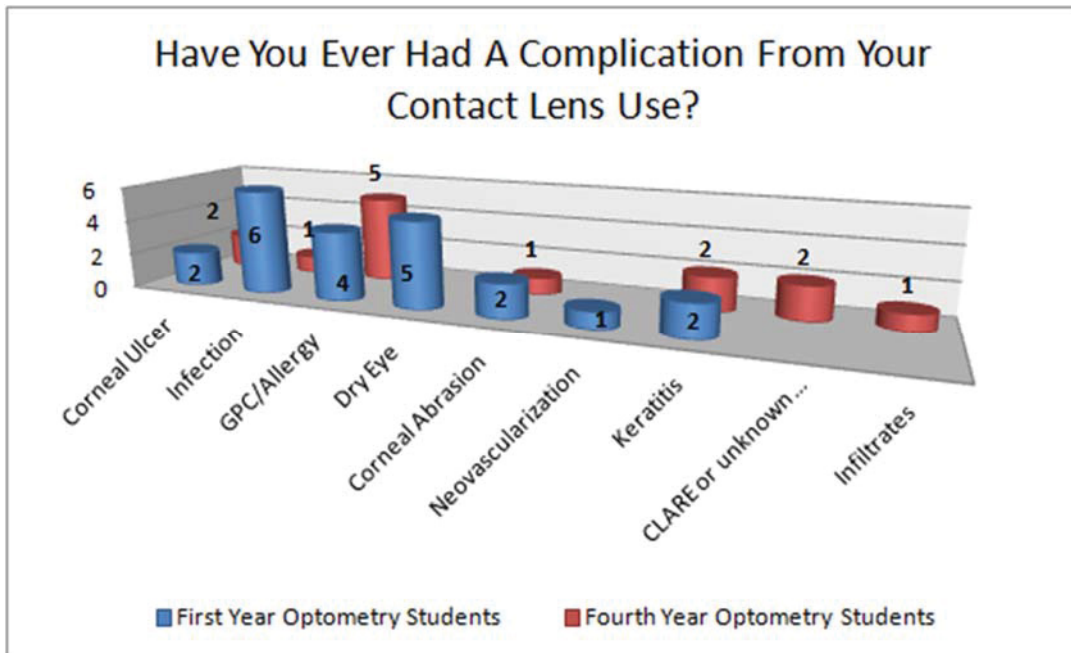
93 (91.17%) of first year students reported having yearly eye exams, 8 (7.48%) reported having eye exams every 2 years, and 1 (0.98%) reported having an eye exam every 3+ years. Fourth years reported 68 (77.27%) having an eye exam every year, 17 (19.32%) reported every 2 years, 1 (1.13%) every 2-3 years and 2 (2.27%) every 3+

years.



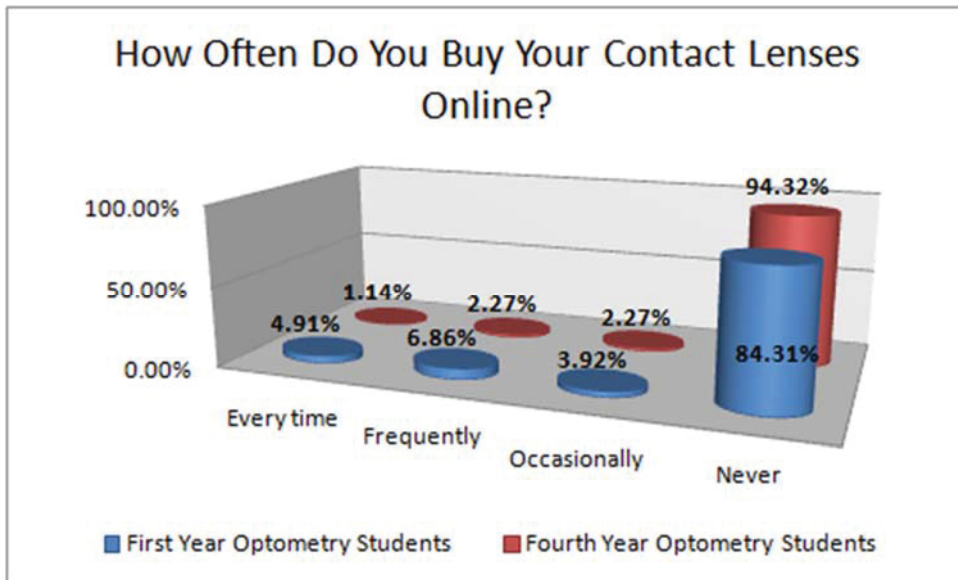
Graph 18: How Often Subjects Got a Complete Eye Exam

Subjects were also asked if they have ever had an ocular complication from their contact lens use and to specify what type. The responses were then evaluated and grouped into the categories of infection/ulcer, allergy/giant papillary conjunctivitis (GPC), mechanical/abrasion, or dry eye. A total of 36 subjects reported having a history of an ocular complication. 22 were first year subjects and 14 were fourth year subjects. 6 of first year subjects reported an infection, 2 keratitis, 2 corneal ulcers, 1 neovascularization, 5 dry eye, 4 GPC or allergic/hypersensitivity, and 2 abrasions. Fourth year subjects reported 5 GPC or allergic/hypersensitivity, 2 case of contact lens associated red eye (CLARE) or unknown red eye, 2 keratitis, 1 abrasion, 2 ulcers, and 1 with infiltrates.



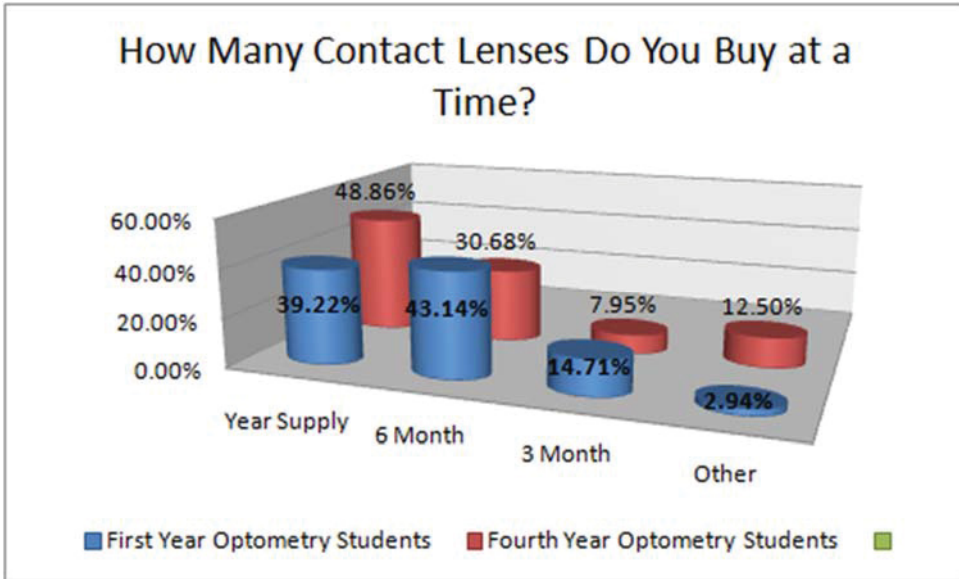
Graph 19 : Have You Ever Had A Complication From Your Contact Lens Use?

This study also explored if there was a relationship between compliance and purchasing contact lenses online. In the first year student subject group 16 bought contacts online or 15.69% and the fourth year subject group 5 bought contacts online or 5.68% a total of 11.05% of all subjects. The compliance for online contact lens buyers were 74.58% and compliance for non-online buyers was 72.25%. The p-value was calculated to be $p = 0.8477$. First year subjected reported 5(4.91%) every time they buy contacts that they bought online, 7(6.86%) frequently, 4(3.92%) occasionally, and 86(84.31%) never buy contacts online. Fourth year subjects reported 1(1.14%) every time they bought contacts buying online, 2(2.27%) frequently, 2(2.27%) occasionally, 83(94.31%) never buy contacts online.



Graph 20: How Often Do You Buy Your Contact Lenses Online?

It was also investigated whether subjects who purchased a full year supply would be more compliant than those who purchase fewer, for example, 3 or 6 month supply. In the two groups, first years and fourth years, 84 (44.21%) reported buying a one year supply and 106 (55.79%) reported buying less than a one year supply of contact lenses. The compliance of full year supply buyers was 68.74% and compliance of smaller supply buyers was 75.5%. The p-value was calculated to be $p=0.5734$. 40(39.22%) of first year subjects report buying a year supply of contact lenses, 44(43.14%) buy 6 months at a time, 15(14.71%) buy 3 months at a time, and 3(2.94%) buy other amounts. 43(48.86%) of fourth year subjects report buying a year supply of contact lenses, 27(30.68%) buy 6 months at a time, 7(7.95%) buy 3 months at a time, and 11(12.5%) buy other amounts.



Graph 21: How Many Contact Lenses Do You Buy at a Time?

CHAPTER 4

DISCUSSION

The comparison of contact lens compliance between the two groups of students did not yield a significant difference. There are many different approaches to quantify a level of compliance and compare groups which can yield varying results. Since most of the results of this study yielded insignificant findings, perhaps a different grading system or method of analyzing the responses would provide more significant conclusions.

There was an observation made that daily contact lenses wearers were much more prevalent within the fourth year subjects (46.59% of fourth years versus only 21.57% of first years, $p=0.0024$). This percentage of daily wearers in the fourth year subjects is also higher than the general population of only 20%.⁵ In this situation daily contact lens wearers had fewer questions that were applicable to them and their percentage was calculated from a lower number of total points. Unfortunately this is a limitation of the grading system as it may have underestimated the compliance of the fourth years. Overall the distribution of the replacement schedule for the 1st years was similar to that of the general population.⁵

When looking at the distribution of the type of lenses worn in each subject group, silicone hydrogel lenses were more prevalent in the fourth year subjects than the first year subjects and the general population (75%, 63.73%, and 66% respectively).⁵ and hydrogel lens wearers were fewer in the fourth years than the first years and general public (18%, 20.59%, and 24% respectively).⁵ Since there were 46.59% of daily wearers in the fourth year subjects, and only few silicone hydrogel daily lens products available, it questions the accuracy of the distribution of soft lens materials in the fourth year subjects.

Although there were more rigid gas permeable lens wearers in the fourth year subjects than the first years both groups had fewer RGP wearers than the general public (5.68%, 1.96%, and 8% respectively).⁵

The larger number of first year subjects versus fourth year subjects who do not replace their lenses as often as advised is statistically significant (p-value was 0.03496). Overall 19.47% of the subjects do not replace their lenses properly, or in other words 80.53% of the optometry students are compliant with their replacement schedule. This is higher than the general population based on a study that yielded only 68% were compliant with their replacement schedule in 2013.⁵

The distribution of reasons for not replacing lenses properly not only included the subjects who admitted to non-compliant replacement but also included a few subjects who reported replacing lenses as advised. The results were similar to a previous study done of US and Canadian subjects although that particular study only included the non-compliant replacement subjects. In both studies the most common reason for not replacing lenses as often as directed was that they forget when to replace, followed by to save money, believe there's no harm, lack of time and ECP said it was okay. This study of optometry students had one extra category, as it was found that a number of subjects specified their reason for not replacing as often was because they do not wear their lenses everyday.⁶ Fortunately there have been smartphone and tablet applications developed that have reminders for when to replace contact lenses. This great use of technology can be a simple recommendation for the forgetful patients who have this technology available to them.

First year and fourth year subjects most commonly wear their lenses for 10-15

hours a day but it was found that a larger percentage of fourth years compared to first years wear their lenses for more than 15 hours a day (27.27% vs 21.67% respectively).

When it came to water exposure both subject groups had an overall rate of <40% compliant. The fourth year subjects had a slightly higher percentage of compliance with never showering or swimming in lenses (28.41% and 39.77% respectively) than the first year subjects (13.73% and 31.37%). Even the optometry students who are educated in acanthamoeba infections are no more compliant than the general public in avoiding water exposure to their lenses. Therefore standard patient education may not be enough to decrease the rate of this noncompliant behaviour.

As mentioned previously there was not a significant difference in the percentage of students switching brands between the two subject groups. For further research on the topic of solution misuse, it would be helpful to have more questions regarding eye care professional recommendations to compare to the subjects behaviour. For example, what solution did the ECP recommend or prescribe and did they advise against switching brands.

Other limitations of this study include when subjects were asked how often they clean their case, there was not a daily option or an “other” option to specify if they do clean it daily. Also there was not a question on how often the subjects replace their case.

Subjects were asked if they have ever had an ocular complication from their contact lens use. The positive history of a complication was unable to be used to compare the compliance between the first and fourth years since the timing of the complication was unknown (pre or post education in contact lenses). Instead the data was used to determine the type of complication most often occurring among all subjects. Dry eye was

reported by some of the subjects as a complication and this number could be underestimated due to the fact that some subjects may not have considered this an ocular complication. To improve this aspect of the study it would be beneficial to have specified the categories and included an “other” option.

The results yielded infections as the most common complication reported by the subjects. Another limitation of this study is that the presence of a complication relies on the subject’s opinion and knowledge of the occurrence and is not an objective finding from an ECP. A previous study on the prevalence of contact lens related complications, found the most common complications were papillae, GPC, corneal neovascularization, and corneal staining, with only one case of a corneal ulcer.⁷ A patient can be unaware if these findings are present if they are asymptomatic or do not view them as real complications.

Our sub analyses did not yield the expected results. It was presumed that the subjects who purchased lenses online would have poorer compliance than those who did not. The difference in compliance between these two groups was not significant ($p=0.8477$). Although the results from this particular study did not show a relationship, a previous study comparing the method of buying lenses (doctor’s office, store, or online) and responses regarding the U.S. FDA recommendations for purchasing contact lenses online, found that subjects purchasing lenses in a store or online do not follow FDA recommendations and have a 5x higher risk of harmful complications from their contact lens practices.⁸

It was also suspected that subjects who purchased a full year supply would be more compliant than those who purchased a shorter supply. Again the difference in

compliance between these groups was insignificant ($p=0.5734$) in this study. A previous study did find a significant correlation with better compliance in patients who purchased an annual year supply and a shorter interval between comprehensive eye exams.⁹

To further investigate the question if formal education in contact lenses and ocular disease improves contact lens compliance, it could be beneficial to compare different groups of subjects such as fourth year students versus the general public or practicing optometrists versus the general public.

CHAPTER 5

CONCLUSION

The results of this study did not show a significant difference in the contact lens compliance of first and fourth year optometry students even though fourth year optometry students are more educated in contact lens care. Fourth year students are in preparation to teach patients the proper practices of contact lenses and the risks of complications with non-compliance. It is crucial that our practicing and prospective optometrists are relaying the knowledge in an effective manner to the contact lens wearing population. Further research on this topic can make an impact on the approach our optometrists take in educating patients and improving contact lens compliance.

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APPENDIX A
IRB APPROVAL LETTER

To: Dr. Amy Dinardo, Ms. Stephanie Jones and Ms. Haley McLennan
From: Dr. Stephanie Thomson, IRB Chair
Re: IRB Application #130804 (Title: *Contact Lens Compliance in First and Fourth Year Optometry Students*)
Date: September 5, 2013

The Ferris State University Institutional Review Board (IRB) has reviewed your application for using human subjects in the study, "*Contact Lens Compliance in First and Fourth Year Optometry Students*" (#130804) and determined that it is exempt-1C from full committee review. This approval has an expiration date of three years from the date of this letter. As such, you may collect data according to procedures in your application until **September 5, 2016**. It is your obligation to inform the IRB of any changes in your research protocol that would substantially alter the methods and procedures reviewed and approved by the IRB in this application. Your protocol has been assigned a project number (#130804) which you should refer to in future communications involving the same research procedure.

We also wish to inform researchers that the IRB requires follow-up reports for all research protocols as mandated by Title 45 Code of Federal Regulations, Part 46 (45 CFR 46) for using human subjects in research. We will send a one-year reminder to complete the final report or note the continuation of this study. The final-report form is available on the [IRB homepage](#). Thank you for your compliance with these guidelines and best wishes for a successful research endeavor. Please let us know if the IRB can be of any future assistance.



Ferris State University | Institutional Review Board
Office of Academic Research | Academic Affairs
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APPENDIX B
SURVEY QUESTIONNAIRE

SURVEY QUESTIONNAIRE

What is your age?

What is your gender?

What year of optometry school are you in?

1st year/2nd year/3rd year/4th year

How compliant do you think you are with your contact lens care?

Excellent/Good/Average/Poor

What kind of contact lenses do you wear?

RGP/RGP Scleral/Ortho K/Hydrogel/Silicone Hydrogel/Unsure/Other _____

How often did your eye care professional tell you to replace your lenses?

Yearly/Monthly/2 Weeks/Daily/Other _____

How often do you actually replace your lenses?

Yearly/Monthly/2 Weeks/Daily/Other _____

** If same as directed = 2 pts

** If different than as directed = 0 pts

If you wear your contact lenses longer than advised, why?

Save money/Forget when to replace/No harm/Lack of time/Eye care professional said it was okay/Other

Approximately how many hours do you wear your contact lenses in a day?

1-5 hours * = 2 pts/5-10 hours * = 2 pts/10-15 hours * = 1 pt/15+ hours * = 0 pts

How often do you sleep in your lenses?

Almost every night * = 0 pts/Frequently * = 1 pt/Occasionally * = 2 pts/Only napping * = 3 pts/Never * = 3 pts

Were you told by your eye care professional that it was okay to sleep in your lenses?

Yes * = 2 pts/No * = 0 pts

How often do you shower in your lenses?

Always * = 0 pts/Frequently (>50% of the time) * = 1 pt/Occasionally (<50% of the time) * = 2 pts/Never * = 3pts

How often do you swim in your lenses?

Always * = 0 pts/Frequently (>50% of the time) * = 1 pt/Occasionally (<50% of the time) * = 2 pts/Never * = 3 pts

How often do you wash your hands before inserting and removing your contact lenses?

Always * = 3 pts/Frequently (>50% of the time) * = 2 pts/Occasionally (<50% of the time) * = 1 pt/Never * = 0 pts

How do you clean your lenses?

Rub and Rinse * = 2 pts/Rinse only * = 1 pt/Rub only * = 1 pt/Neither * = 0 pts

* Excluded if N/A due to daily replacement

What kind of contact lens solution do you use?

Opti-Free * = 2 pts/Renu * = 2 pts/Clear Care * = 2 pts/BioTrue * = 2 pts/Boston * = 2 pts/Generic * = 1 pt

Other * = 0 pts for non-solution uses (ex. water, saliva) /Not applicable * excluded

How often do you switch brands of contact lens solution?

Always * = 0 pts/Frequently (>50% of the time) * = 1 pt/Occasionally (<50% of the time) * = 2 pts/Never * = 3 pts

*Excluded if previously stated no solution was used

How often do you add more to the solution already in your case for storing your lenses?

Always * = 0 pts/Frequently (>50% of the time) * = 1 pt/Occasionally (<50% of the time) * = 2 pts/Never * = 3 pts

*Excluded if previously stated no solution was used

How often do you clean your case?

2-3x a week * = 3 pts/Weekly * = 3 pts/Once every 2 weeks * = 2 pts/Monthly * = 2 pts/<Monthly * = 1 pt/Never * = 0 pts

*Excluded if N/A due to daily replacement

How do you clean your case?

Rinse with water * = 1 pt/Rinse with soap and water * = 3 pts/Rinse with contact lens solution * = 2 pts

*Excluded if N/A due to daily replacement

How often do you get a complete eye exam?

Yearly * = 3 pts/Every 2 Years * = 2 pts/2-3 Years * = 1 pt/3+ Years * = 0 pts

How often do you buy your contact lenses online?

Always/Frequently/Occasionally/Never

How many contact lenses do you buy at a time?

Year supply/6 month supply/3 month supply/Other_____

Have you ever had a complication from your contact lens use?

Yes/No if yes, what kind_____