Annual price & usage comparison of three rigid gas permeable contact lens systems

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Annual price & usage comparison of three rigid gas permeable contact lens systems

Abstract
There are many current studies which aid the patient and physician with annual cost and usage values of various soft contact lens care systems. However, evaluation as to the annual cost and usage of rigid gas permeable (RGP) contact lens systems is left undocumented. This study will determine the average annual usage and cost by a patient for three different RGP lens care systems. Ten established RGP lens wearers were assigned to one of three Boston® RGP solution systems for a thirty-day period. All bottles were weighed prior to and after the study period. Determination of annual usage and cost per patient was calculated according to remaining solution volume and the number of days the solutions were used. The average annual cost comparison of Boston Simplicity™, Boston Original®, and Boston Advance® shows the Simplicity™ one-step system to be the most cost effective. Annual usage results indicate the Advance® system is used less than either of the other two systems. The Original® system is the most commonly used. Annual cost and usage comparisons will enhance patient compliance and satisfaction, aid physicians with care system evaluation, and improve RGP care system development for all contact wearers.

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ANNUAL PRICE & USAGE COMPARISON OF THREE RIGID GAS PERMEABLE

CONTACT LENS SYSTEMS

By

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&
GRETA TOROUSSIAN

A thesis submitted to the faculty of the
College of Optometry
Pacific University
Forest Grove, Oregon
for the degree of
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Advisor:
Patrick J. Caroline, C.O.T., F.A.A.O.
AUTHOR BIOGRAPHIES

**Angela Rohde** graduated from Albertson College of Idaho in 1995 where she obtained her Bachelor of Science degree in Zoology. She began her graduate studies in the fall of 1996 at Pacific University College of Optometry and will graduate in the spring of 2000. Angela plans to return to the Walla Walla Valley in Eastern Washington to practice optometry with a special interest in the pediatric population.

**Greta Toroussian** graduated from California State University Northridge in 1994 with a Bachelor of Arts degree in Biology. She began her graduate studies in the fall of 1996 at Pacific University College of Optometry and will graduate in the spring of 2000. Greta plans to open her own practice in Southern California with an emphasis in contact lenses.
ABSTRACT

There are many current studies which aid the patient and physician with annual cost and usage values of various soft contact lens care systems. However, evaluation as to the annual cost and usage of rigid gas permeable (RGP) contact lens systems is left undocumented. This study will determine the average annual usage and cost by a patient for three different RGP lens care systems.

Ten established RGP lens wearers were assigned to one of three Boston® RGP solution systems for a thirty-day period. All bottles were weighed prior to and after the study period. Determination of annual usage and cost per patient was calculated according to remaining solution volume and the number of days the solutions were used.

The average annual cost comparison of Boston Simplicity™, Boston Original®, and Boston Advance® shows the Simplicity™ one-step system to be the most cost effective. Annual usage results indicate the Advance® system is used less than either of the other two systems. The Original® system is the most commonly used.

Annual cost and usage comparisons will enhance patient compliance and satisfaction, aid physicians with care system evaluation, and improve RGP care system development for all contact wearers.

Key Words: annual, cost comparison, usage comparison, rigid gas permeable solution systems
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INTRODUCTION

The annual cost of contact lens care products is a fact of life for many individuals. The estimated yearly cost to both the patient and physician is of importance when determining contact lens materials and services for the prescribed care system. Currently, there are many studies which aid in determining the annual cost of various soft contact lens solution systems. However, evaluation and cost determination among rigid gas permeable (RGP) contact lens systems has not previously been documented.

Studies involving annual soft contact lens care systems show dramatic variation among cost for the “average” patient. In a study by Reindel (1992), much of the variation was contributed to patient compliance issues. To determine annual cost and usage, compliance must be considered a significant variable to research validity and annual volume usage. Such variables of patient compliance include full time vs. part time wear, compliance with care system directions, care system complexity, and the manufacture/in house pricing mark-up for each solution system. Although this data pertains to soft lens care systems, we anticipate the same factors will be comparable and true of RGP solution systems as well.

According to Schornack et al. (1998), to maximize the efficacy of the lens care systems, it has been established that the rub and rinse care portions are the most critical activities. Unfortunately, these are the parts most contact lens wearers leave out. A majority of contact lens wearers appear to simply store the contact lenses overnight without properly cleaning and rinsing them first. This is yet another explanation as to the wide range in usage and cost between systems.
These issues, when integrated with a patient's lifestyle, are likely to persuade the patient and the physician toward a particular care regimen that is tailored to the individual's needs, compliance, and financial situation. Not only will this study provide the physician with knowledge of the products as they relate to the patient, but it will also give the patient financial information about the care regimen of the contact lens system they are prescribed.

Due to the lack of annual usage and cost comparison data among RGP solution systems, this study will assist in determining the annual cost patients can expect when adhering to a RGP lens regimen. The study will quantify the average annual usage and cost per patient for three different Boston® RGP lens care systems. We anticipate this study will enhance both physicians' and patients' understanding of RGP solution systems when contact lenses are prescribed for refractive compensation and/or cosmetic enhancement.

**METHODS**

Ten established RGP contact lens patients, of whom had worn lenses for a three month minimum, were assigned to one of three Boston® RGP solution systems for a thirty-day period of time. This study was conducted at Pacific University College of Optometry Family Vision Center. All patients in the study were either first, second or third year students. The patients were instructed to wear their lenses in a daily wear manner throughout the study. Each patient was provided with one of the three systems, Boston Original®, Boston Advance®, or Boston Simplicity™, and instructed to care for the lenses as directed by the
manufacture's package insert. All patients were told to continue enzyme usage as directed by their optometric physician. Each patient was given a thirty-day calendar at the beginning of the study and was told to indicate with a checkmark each time the solution was used. At the conclusion of the thirty-day usage period, patients were instructed to return all the bottles and remaining solutions. The calendars were also returned at the end of the thirty days.

Prior to disbursement of the solutions to the patients, all bottles were weighed and marked with an identification number, and all values were recorded. At the end of the thirty-day period, all bottles were weighed again with the remaining solution in them. All values were again recorded. Each bottle containing remaining solution was then emptied as completely as possible into a volumetric flask and measured. This determined the amount of unused solution. Each emptied bottle was then weighed. The total volume of solution used by each patient was calculated using the following formula:

\[
\text{Calculated Total Volume Used} = \frac{\left( \text{initial weight of bottle and contents} - \text{weight of empty bottle} \right) \times \text{volume of product remaining in bottle}}{\left( \text{weight of remaining contents and bottle} - \text{weight of empty bottle} \right)}
\]

The calculated volume of daily usage was determined by dividing the number of times per day the patient used the solution by the calculated Total Volume Used. The annual cost of each RGP solution care system to the patient was determined by taking the daily usage and multiplying it by 365 days. This provided the annualized volume used. The annualized volume used was then divided by each bottle size and that value multiplied by the cost of the bottle as defined by the manufacturer/in house mark-up price. The mark-up price was determined by taking the manufacturer's cost of the solution package and
marking it up two dollars over cost. The mark-up was taken from an average of ten local optometrists' values. Understanding that patients are unlikely to use a solution system for 365 days per year, we felt this value would provide the patient with an upper limit of annualized cost and usage projections.

It is noted that not all patients complied with the thirty-day usage guidelines which will affect projected annual costs, however the effect will only be slight and actual values will be geared toward a more "real world" compliance schedule. This study used two solution systems that included a cleaner and a conditioning solution within one package. All annualized data pertains to these packages.

RESULTS

Table 1 shows the mean and average difference of usage between the five indicated Boston® care products. Product usage per individual per day and

![FIGURE 1. AVERAGE ANNUAL COST COMPARISON OF THREE BOSTON RGP SOLUTION SYSTEMS](image)
year are defined. There is marked variation between the minimum and maximum daily and yearly usage, which is supported with Figure 1. Both Table 1 and Figure 1 indicate the Boston Original® solution and cleaner are used the most per day and per year. The Boston Advance® solution and cleaner are used the least per day and year.

Strikingly evident among the data is that the cleaner in either system is hardly used. In Table 1, the Original® cleaner is used an average of 62.0 ml per year while the Advance® cleaner is used an average of 30.7 ml per year. This data is in comparison to the average usage of solution per year; Original® 593.0 ml and Advance® 163.5 ml. Upon calculation, we found in both the Original® and Advance® systems that for every twenty bottles of solution used per year only six bottles of cleaner are needed.

Figure 2 visually describes the average annual cost comparison of the three Boston® RGP solution systems. As indicated, the Boston Simplicity™ system does not include a cleaner. It is a multi-purpose solution which is used
for cleaning, rinsing, disinfection and storage. As anticipated, the Simplicity™ system, with no cleaner, was found to be the least expensive averaging $42.50-$59.24 per year. The Advance® system proves the most expensive at $75.52 to $99.00 per year.

**DISCUSSION**

The results of this study provide the patient and physician with information about actual usage patterns and annual costs associated with three RGP contact lens care systems. This information is useful when advising patients on associated costs of specific care systems. The ultimate annual cost and the involvement associated with a RGP care system will likely impact a patient’s adherence to the recommended care regimen.

Cost comparison of the data from this study proves that a multi-purpose system is more cost effective to the patient and doctor over a two step RGP solution system (Fig. 1). However, several factors exist that may influence the results of this data. To make this study more effective, it is crucial that patients comply to the package insert instructions given. A control method for compliance is desired. Schornack et al.¹ suggests the volume of soaking solution used may be determined by the size of the patient’s contact lens case. The larger the case the more solution needed.

Average usage differences between the two cleaners and solutions may also be attributed to the relative viscosity of the agents. This factor could also influence the annual cost of a system. Although left untested in this study, the Original® cleaner is more viscous than the Advance® cleaner. The Simplicity™ solution is quite fluid while the Original® and Advance® are nearly equal to each other in increased viscosity. This may lead to varying usage of solution and
cleaner by patients. To enhance the validity of these results it would be useful to measure the viscosity of each agent and compare and contrast the results between each of the Boston® lens system components.

Another useful tactic for increasing the validity of the study would be to increase the number of RGP contact lens wearers participating and the number of care systems used. A small study such as this may skew results, therefore a larger population is indicated. This study may have also been more effective if individual bottles were used in annualized calculations rather than component packages.

The large range of usage is evident in all three systems and is likely due to lack of continuity between patient compliance, drop size, storage technique, agent viscosity, and adherence to the manufacturer's package insert instructions. From this study, it was our goal to inform new and established patients and their optometric physicians of the annual usage and cost of Boston® RGP solution systems. We believe this data will enhance patient compliance and satisfaction, aid physicians with care system evaluation, and improve RGP care system development for past, present, and future contact lens wearers.
REFERENCES


### Table 1. Mean Boston Product Usage of Ten Patients for a Thirty Day Time Period and a Projected Period of One Year.

#### Simplicity

<table>
<thead>
<tr>
<th>Patient</th>
<th>Usage per 30 Days</th>
<th>Usage per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.75 ml</td>
<td>638.0 ml</td>
</tr>
<tr>
<td>2</td>
<td>1.09 ml</td>
<td>397.8 ml</td>
</tr>
<tr>
<td>3</td>
<td>1.86 ml</td>
<td>678.0 ml</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>1.56 ml</strong></td>
<td><strong>571.0 ml</strong></td>
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</table>

#### Original Solution

<table>
<thead>
<tr>
<th>Patient</th>
<th>Usage per 30 Days</th>
<th>Usage per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0.307 ml</td>
<td>112.0 ml</td>
</tr>
<tr>
<td>5</td>
<td>3.19 ml</td>
<td>1164 ml</td>
</tr>
<tr>
<td>6</td>
<td>1.38 ml</td>
<td>503.7 ml</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>1.62 ml</strong></td>
<td><strong>593.0 ml</strong></td>
</tr>
</tbody>
</table>

#### Original Cleaner

<table>
<thead>
<tr>
<th>Patient</th>
<th>Usage per 30 Days</th>
<th>Usage per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0.183 ml</td>
<td>66.7 ml</td>
</tr>
<tr>
<td>5</td>
<td>0.107 ml</td>
<td>56.2 ml</td>
</tr>
<tr>
<td>6</td>
<td>0.173 ml</td>
<td>63.0 ml</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>0.154 ml</strong></td>
<td><strong>62.0 ml</strong></td>
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#### Advance Solution

<table>
<thead>
<tr>
<th>Patient</th>
<th>Usage per 30 Days</th>
<th>Usage per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>0.395 ml</td>
<td>144.0 ml</td>
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<tr>
<td>8</td>
<td>0.016 ml</td>
<td>5.84 ml</td>
</tr>
<tr>
<td>9</td>
<td>0.594 ml</td>
<td>216.8 ml</td>
</tr>
<tr>
<td>10</td>
<td>1.18 ml</td>
<td>431.0 ml</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>0.547 ml</strong></td>
<td><strong>163.5 ml</strong></td>
</tr>
</tbody>
</table>

#### Advance Cleaner

<table>
<thead>
<tr>
<th>Patient</th>
<th>Usage per 30 Days</th>
<th>Usage per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>0.16 ml</td>
<td>58.4 ml</td>
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<td>8</td>
<td>0.012 ml</td>
<td>4.38 ml</td>
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<td>9</td>
<td>0.091 ml</td>
<td>33.21 ml</td>
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<td>10</td>
<td>0.117 ml</td>
<td>42.7 ml</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>0.095 ml</strong></td>
<td><strong>30.7 ml</strong></td>
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