Report following Matplotlib challenge - Pymaceuticals

Look across all previously generated figures and tables and write at least three observations or inferences that can be made from the data.

Of the potential treatments for squamous cell carcinoma (SCC) analyzed, 249 mice were included through a variety of 10 drug regimens having a total of 1,893 records in our study. Over the course of 45 days, tumor development was observed and measured. The purpose is to compare the performance of Pymaceuticals' drug of interest, Capomulin, versus the other treatment regimens. Specifically, a higher interest for Ramicane, Ceftamin, and Infubinol.

For an initial assessment, mice g989 was removed and marked as a duplicate because of having different tumor volumes during the same timepoint. The exception occurred for 13 records and so the remaining 1,880 for 248 mice was further analyzed. The distribution of gender was relatively equal in comparison (about 2% higher for males). When observing the total number of mice per treatment, Capomulin and Ramicane tallied with the highest quantity (230 and 228 respectively) and Propriva with the lowest (148); however, when observing the median tumor volume, Ramicane showed the lowest at 40.7 mm3 following closely in second by Capomulin at 41.6 mm3. Ketapril showed the highest at 53.7 mm3. The other two regimens of concern, Ceftamin and Infubinol were relatively moderate in comparison for both observations falling in between these amounts (178 mice each and about 51.8 mm3). Although it is interesting to note how close their median tumor volume is.

In the next assessment, we sought the interquartile range (IQR*) of the tumor volume for each of the four regimen and as combined. This was done to ensure that that there were no outliers in our study. We used timepoint as the control variable and filtered the dataset to reflect for only the mice that had completed the 45 days of treatment as noted above. As combined, there is a total of 63 mice in the four regimens of interest – 21 for Capomulin, 20 for Ramicane, 13 for Ceftamin, and only 9 for Infubinol. Upon completion of the calculations, the findings resulted in zero outliers for each and as combined; however, it is insightful to note the similarities and differences in IQR and median tumor volume. For example, both Capomulin and Ramicane with similar IQR (7.78 mm3 vs. 7.74 mm3) and median tumor volume (37.31 mm3 vs. 34.85 mm3). The same holds true between Ceftamin and Infubinol but with slightly lower IQRs and a much higher median. In fact, these were about double in comparison. Therefore, it is best to further narrow our scope to analyze the effect for only the specific mice using regimens of Capomulin or Ramicane.

In the final assessment, for the regimen Capomulin we used data for mice s185, r944, and i557. And for Ramicane mice k403, d251, a444, and q597. These mice were selected on having the lowest to highest tumor volume after 45 days of treatment. This was done to discover not only differences but also trends compared to the average tumor volume as shown in the created corresponding graphs per mice. The average tumor volume in all cases showed a downward trend as the days progressed. Considering both regimens, mice s185 and k403 were well below the average but i557, a444 and q597 significantly higher. The remaining two, r944 and mostly d251 tended to move closely within the direction of the average.

** IQR calculated by using the "midpoint" average for interpolation when the desired quantile lies between two values.*

There is also another commonality observed for all these mice but with the exception for s185 showing a rather sharp change in direction between 15 to 25 days or roughly 2 to 3 weeks. More apparent for k403 because tumor started to grow within this period but then shrunk significantly after 25 days. In contrast, the opposite happened for r944, and q597 as tumor was shrinking and grew back quite a lot afterwards. Specifically, with q597 that is treated with Ramicane, it grew back to its initial volume; however, for i557 treated with Capomulin, it surpassed this after about 30 days. Therefore, when considering these factors, both regimens seem to show positive and negative effects equally overall. So there is one last factor to consider and that is the weight of the mice.

When comparing their weight for both regimens and even as expected that the heavier mice tended to show higher tumor volumes, Ramicane showed better results because its trend was not as steep as it is for Capomulin across the range of weights. Furthermore, the cluster of heavier mice treated with Capomulin with higher tumor volumes is significantly more than the cluster of mice treated with Ramicane. This means that Capomulin is a better treatment for the lighter weights (less than 18g) and Ramicane for the mid to heavier ones (between 18g to 24g). And there needs to be additional tests and/or treatment alternatives for the heaviest of 24g+ due their receptiveness to higher tumor volumes.

** IQR calculated by using the "midpoint" average for interpolation when the desired quantile lies between two values.*