Review of: "Analysis of Dosimetric Parameters of Linear Accelerator"

Hassan Vafapour[1]

1 Yasuj University of Medical Sciences

Dear Authors,

Thank you for submitting your manuscript for review. Your study investigating the dosimetric parameters of linear accelerators using the PTW QUICKCHECK device provides valuable insights into quality assurance in radiotherapy. However, there are several areas where further clarification and enhancement could significantly strengthen your manuscript.

- **It is suggested that the title be changed to** **"Evaluating the Precision and Reliability of the PTW QUICKCHECK Device for Dosimetric Quality Assurance in Linear Accelerators"**

1. **Accuracy of Flatness Measurement:** The article indicates that the PTW QUICKCHECK device exhibits variability in measuring flatness, with the best accuracy at 5.92% and the worst at 16.12%, which are outside the standard tolerance range of 3%. This issue warrants further discussion to understand the cause of these fluctuations and assess their impact on treatment quality.

2. **Repeatability and Reliability of Results:** The study evaluates the repeatability and reliability of the device over a period of 50 days. Additional explanations regarding the methodologies employed for assessing these metrics and the analysis of the data would enhance the comprehensibility and robustness of the findings.

3. **Data Analysis and Methodology:** As the paper delves deeply into data analysis, it is crucial to ensure that the statistical methods applied are appropriate and clearly explained. Furthermore, it is essential that all assumptions associated with the analyses are reasonable and well-articulated.

4. **Comparison with Other Techniques or Devices:** Although the study focuses extensively on the PTW QUICKCHECK device, comparing its performance with other available devices in the market could add value to the research and provide a better understanding of the device's market position.

5. **Clarity and Precision in Writing:** It is important to ensure that all technical and specialized information is presented

accurately and clearly. Details regarding the experimental procedures, data collection, and analysis methods should be thoroughly and clearly described to ensure comprehensibility and transparency.

Here are some specific suggestions:

Improving Clarity and Precision in Technical Descriptions

1. Detailed Experimental Setup Description:

   - Clearly specify all parameters and settings used during the experiments, including the precise positioning of the PTW QUICKCHECK device, environmental conditions, and any deviations from standard protocols.

   - Include a schematic or diagram of the experimental setup to visually support the textual description.

2. Explicit Methodology:

   - Detail the step-by-step procedures followed in the daily and monthly quality assurance checks, specifying any calibration processes.

   - Clearly define all terms and acronyms at their first use and ensure consistency throughout the text.

3. Enhanced Descriptions of Data Collection:

   - Describe the data collection process more comprehensively, including how data was logged, the frequency of measurements, and any software used for data acquisition and initial processing.

4. Robust Explanation of Analytical Methods:

   - Include a subsection detailing the statistical tests used, the justification for their use, and the interpretation of results.

   - Provide formulas and detailed calculations for all dosimetric parameters measured and explain how these calculations are linked to the research questions.

 Recommended Statistical Methods and Comparative Analyses

1. Statistical Methods:

   - Error Analysis: Conduct a thorough error analysis to understand the sources and magnitude of measurement errors. This could include calculations of standard deviation, variance, and confidence intervals for the measurements.

   - Regression Analysis: If applicable, use regression models to explore the relationship between various machine settings and the dosimetric outputs.

   - Repeatability Tests: Employ statistical tests like the Intraclass Correlation Coefficient (ICC) to assess the repeatability of measurements. Also, consider using Bland-Altman plots to visualize agreement between repeated measures.

2. Comparative Analyses:

   - Benchmarking Against Other Devices: Compare the performance of the PTW QUICKCHECK device against other commercially available quality assurance devices. Metrics for comparison could include accuracy, reliability, ease of use, and time efficiency.

   - Longitudinal Study: If possible, include data from a longitudinal study to evaluate how the device's performance may vary over an extended period under typical clinical conditions.

   - Meta-Analysis: Include a review or meta-analysis of published data on similar devices to provide context for the performance of the PTW QUICKCHECK device.

Presentation of Results

- Graphical Representation of Data: Use graphs and charts effectively to illustrate key findings, such as the variability of measurements across different energy levels and the comparison of results with standard tolerance limits.

-Discussion of Outliers: Address any outliers in the data explicitly, discussing potential causes and their implications on the overall study findings.

Implementing these suggestions will not only improve the scientific rigour of the paper but also make the findings more accessible and useful to the target audience, enhancing the impact of the research within the academic community and clinical practice.