Purpose:
1. Develop a tool for data collection, retrieval, visualization, real-time feedback and advanced statistical analysis of IMRT QA process.
2. Evaluate the need for site-specific tolerances for IMRT QA.
3. Timely identify systematic drifts in the IMRT QA measurements.

Methods: Statistical process control (SPC) is a statistical tool that can be used to study process variations and evaluate process capability. This tool is applicable to IMRT QA processes. There are two causes of variation present in a process – common cause, which is the reason for random variation in the process, and special (assignable) cause, which is the reason for identifiable variation in the process. Process capability and control charts (S chart for process variability and EWMA chart to study the process mean) are two of the several tools available to study the process of interest. We use SPC and paperless environment for collection and processing of clinical IMRT QA data to create a tool for improved management of IMRT QA.

Results: Automatic data collection, data validation and visualization are facilitated with the help of the developed tool. Data visualization and control charts are used to study the process variation and identify drifts and outliers. Process capability studies identify systematic variations present in the process and evaluate the need for site-specific tolerances. For instance, process capability studies of the QA results for treatment plans using 6 MV X-rays revealed a 1.1% variation in calibration and 0.5% variation in beam model and MLC leaf model.

Conclusion: We have built a tool that collects data, analyzes them, plots S chart for process variability and EWMA charts. Process capability studies show that using a global tolerance for all different sites is not sufficient. Hence, we propose the use of 2 standard deviations for a 95% confidence level in the IMRT QA measurements.