

AAPM Safety Profile Assessment: A Tool for Safety and Quality Improvement in Radiotherapy

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1. Introduction

The current high levels of quality and safety in radiation oncology owe much to the extensive consensus recommendations on quality assurance and control from professional organizations, such as the American Association of Physicists in Medicine, ASTRO and other organizations. Notable in the field of external beam radiotherapy is the classic AAPM Task Group-40¹ document and the recent TG 142², both of which have had an impact well beyond the borders of the U.S. However, most such documents have addressed quality improvement from a relatively narrow perspective, focusing on the performance of the devices used in radiotherapy such as linacs and treatment planning systems.

More recently, and largely as a response to several well publicized radiotherapy accidents, the quality and safety literature in radiotherapy has both expanded dramatically and also adopted a broader perspective including emphasizing the importance of features of the facility's infrastructure such as staffing and incident learning. These new reports are in addition to the already existing recommendations such as ACR-ASTRO practice guidelines, AAPM Task Group reports, and the like. The result is that the radiation oncology community is now subject to an overwhelming volume of advice from various authoritative bodies. While all this advice is undoubtedly timely, comprehensive and relevant, the practical implementation of the numerous recommendations in a busy clinic is a daunting, if not impossible, task.

The Safety Profile Assessment (SPA) Tool described here is intended to address this issue. The SPA facilitates the implementation of key recommendations from the recent literature and other sources by providing a straightforward, accessible and efficient means of documenting, benchmarking and improving quality and safety in the radiotherapy clinic. The development of SPA was led by the Work Group on

Prevention of Errors within the American Association of Physicists in Medicine (AAPM) with significant input from other key professional organizations. The SPA consists of a series of 92 self-reported indicators designed to provide an assessment of the current status of a radiotherapy department in terms of safety-critical infrastructure, processes, policies and procedures. Once the assessor completes the self assessment, the SPA provides feedback in two formats: 1) A summary of results via aggregated pie charts and 2) a list of the numerical results for each of the 92 indicators benchmarked against global performance (i.e. the average of other facilities contributing to the SPA database). Two additional useful features of the system are links to helpful relevant papers, presentations and recommendations, and a Safety/Quality Improvement (S/Q I) Tracking Log, which is linked to the self assessment and is designed to provide a convenient method for documenting and tracking progress on quality/safety improvement initiatives. The concept of the S/QI Tracking Log is for the clinic to repeat the self assessment exercise after a period of time and, by comparison with the initial assessment, objectively demonstrate safety/quality improvement.

This report describes the development and initial experience with the SPA tool.

2. Materials and Methods.

2.1 Design Principles.

The content of the tool was built principally on four foundations. The first is derived from the Agency for Healthcare Research and Quality (AHRQ)³, a federal agency within the United States which focuses specifically on patient safety. AHRQ has developed validated tools for assessing quality and safety in hospital environments. Selected items from AHRQ survey instruments have been adapted for use in the SPA. The second foundation is from Dunscombe⁴ who reviewed recommendations in the area of patient safety in seven recent authoritative documents specific to radiation oncology⁵⁻¹¹. The author identified those safety-related issues which were most commonly cited. Third is the AAPM's Work Group on the Prevention of Errors (WGPE) recently published report "Consensus recommendations for incident learning database structures in radiation oncology"¹². This report contains a detailed process map as well as safety barriers considered to be desirable in a safe radiation treatment program. The SPA is designed to assess the implementation and use of these standard safety barriers. The final basis for the SPA was the requirements for accreditation of radiation oncology practices within the ACR/ASTRO system as of 2011¹³.

Indicators for incorporation in the tool were written to broadly satisfy the following criteria:

- compliant with (and supported by) professional recommendations
- supported by evidence where available
- reasonably immune to perspective bias
- consisting of only a single question (no “and”s) and admitting a single interpretation
- accurately reflects specific program vulnerabilities
- accurately reflects broad facets of program strength and weakness
- accurately reflects program changes over time

2.2 Tool development

An initial set of 49 indicators was derived from the four sources identified above. Further development of the Tool took place through an iterative process during which their number grew from the original 49 to 92. The first iterations were between the development group of seven members and guests of the WGPE leading to Version 0 of the Tool. In June 2012 the Tool was further refined with detailed input from a wider audience of 16 contributors including representatives of American Society of Radiologic Technologists, American Society of Radiation Oncology, American Society of Medical Dosimetrists and the Society of Radiation Oncology Administrators at a dedicated Workshop in Seattle, funded by the AAPM and collaborating groups. Following the Workshop, Version 1 of the SPA was released to all Workshop attendees; feedback was received and incorporated where possible. A further series of iterative testing and refinement was then conducted leading to the release of Version 2 to workshop attendees and the entire WGPE. Further minor refinement lead to the development of Version 3 referred to below as the pilot version.

2.3 Pilot testing

In September and October of 2012 the pilot version of the SPA was released to 32 volunteer clinics for testing. These volunteers were purposefully identified to include a broad spectrum both in terms of clinic size and professional responsibility. Feedback was solicited through a structured response form, Appendix B, designed to capture details of the experience and areas for improvement.

3. Results

3.1 The Safety Profile Assessment Tool

The Safety Profile Assessment (SPA) Tool consists of 92 statements considered to represent important dimensions or measures of Safety in radiotherapy. To provide a logical format for its practical use, the SPA has been divided into four major sections: 1) Institutional Culture, 2) Quality Management, 3) Managing Change and Innovation and 4) Clinical Performance. The fourth section, Clinical Performance, is further subdivided into the major process steps as identified previously¹².

The indicators take the form of statements with which the assessor identifies the degree of compliance on a five-point Likert scale. An example question from the SPA with the associated Likert response scale is given in Figure 1. The full SPA is shown in Appendix A. A free text comment box is associated with each of the 92 questions. The comment box allows the assessor(s) to record the reasons for their evaluation which will be useful for year on year comparisons.

Inadequate policies and procedures are major contributors to incidents in radiotherapy¹⁴. Therefore, in the fourth section on Clinical Performance, each of the 50 statements in this section also includes a question as to whether or not a formal policy exists for the issue in question.

The output of the tool is in two formats:

- A pie chart and bar graph for each of the four major sections presenting composite scores for the safety environment of the department (Figure 2).
- Bar graphs for each of the 92 statements benchmarking the respondent's evaluation of the department's performance against the global average of all participants using the SPA (Figure 3)

Additional features of the SPA are:

- A Safety/Quality Improvement (S/Q I) Tracking Log. This component of the SPA is intended to assist the Department in implementing safety improvements identified as necessary through the use of self-assessment (Figure 4). The S/Q I Tracking Log lists each of the 92 statements in the SPA together with the assessment. The Log encourages the user to enter the individual/team responsible for implementing the improvement strategy, the timeline and a box confirming that the appropriate action has been taken.
- Links to helpful relevant papers, presentations and recommendations to assist the assessor(s) in identifying appropriate Quality/Safety improvement initiatives.

Completion of the Self Assessment and the identification of improvement strategies for the performance areas where the greatest deficiencies have been identified constitute the first iteration of the SPA. If the

Improvement Strategies are successful, the second iteration will show an increased preponderance of Strongly Agree/Agree responses to the 92 indicators.

3.2 Pilot testing.

Of 32 centers invited to participate in pilot testing, 21 completed the SPA and 11 provided their feedback on the survey form. Results are shown on the form itself in Appendix B.

Our objective of encompassing a range of clinical facilities was clearly met as can be seen from the clinic profiles summarized in the first part of the questionnaire.

On average it required respondents 1.3 (0.3-6) hours to complete the SPA.

Respondents did not identify any significant difficulty in using the Tool. In terms of ease of use, all respondents ranked the SPA as either 3 or 4 on a 5-point scale (5 being "very easy to complete"). The responses to the two questions about the utility of the Tool are possibly contradictory. While 6/9 of respondents answered very probably or definitely (the highest ranking) when asked if they would use the SPA in a year's time, there was only guarded agreement that use of the Tool would improve safety in the clinic, with 9/10 answering "possibly" (3 of 5 on Likert scale) and 1/10 answering "very possibly" (4 of 5).

Having bars, pies, and tables available to suit the users' preference aligns with the variety of opinions voiced on the output format.

Although there were a few comments on the length of the Tool and the clarity of the statements there was little to guide changes. The only exception is the comment on separating permanent seed implants from HDR brachy.

Respondents were approximately evenly split between those who completed the SPA by themselves versus those who completed it within a group. Respondents reported a value in completing the SPA questions as a group rather than as individuals noting that no one person can possibly provide accurate answers to all of the indicator questions. It was further noted that completing the SPA as a group improves efficiency and completion and also serves to bring clinical staff together facilitating interaction.

4. Discussion

Presently, clinical staff in radiation oncology is overwhelmed by the sheer volume of recommendations on how to improve quality and safety (the seven documents analyzed in reference 2 run to more than 200 pages). Realistically most radiotherapy departments do not have the resources to digest all the documents presently available and then determine a plan of action. The SPA is a relatively compact set of indicators (92 items) developed to assist busy clinical departments to obtain a snapshot of their current status with respect to quality and safety and, hence to identify opportunities for improvement. Pilot testing indicates that the effort involved in the SPA is not overly burdensome, requiring only 1.3 hours to complete on average. From the survey results presented in Appendix B it can be seen that responders are optimistic about the potential value of the tool as the majority would probably or definitely use it in a year's time if available. There was less certainty, however, concerning the ability of the tool to facilitate quality and safety improvement. A valuable feature of the SPA is the Q/SI Tracking Log which allows the user to document a plan of action for addressing identified weaknesses and track the subsequent change in indicator performance. An important finding from the pilot test is that respondents noted a value in completing the SPA questions as a group rather than as individual respondents.

The full utility of the tool will only be established through its use. It will be important, as the project moves forward, to elicit the users' experience with the SPA and continue to refine it to maximize its impact in the clinic.

Before concluding it is noted that this project was well into its final stages when "Safety is No Accident" was published¹⁵ and it was thus too late to take into account the suggestions made in that document. However, although there is clearly not a one-to-one correspondence between the SPA and Safety is No Accident, a detailed comparison illustrated considerable overlap. The uptake of most of the valuable advice offered by the ASTRO document can be measured at one point in time and monitored over a period of time using the Safety Profile Assessment Tool described here.

5. Conclusion

The Safety Profile Assessment Tool is a practical, efficient means for enhancing quality and safety in radiotherapy clinics of all sizes and structures. It distills advice and experience from a variety of respected sources into a convenient, logically configured, on-line resource which has received overwhelmingly positive reviews during pilot testing.

6. Acknowledgements

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Clinical staff submits written reports of near-miss incidents.

Always /Strongly Agree	Most of the time /Agree	Sometimes /Neutral	Rarely /Disagree	Never /Strongly Disagree	Dont know /Not Applicable
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 1. An example of a performance indicator together with response options.

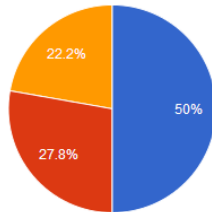
Safety Profile Assessment

There are 74 assessments in the system.

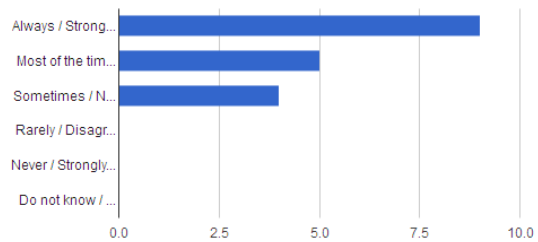
The pie charts and bar graphs for each section below are based on your current answers only.

1. INSTITUTIONAL CULTURE

- Always / Strongly Agree
- Most of the time / Agree
- Sometimes / Neutral

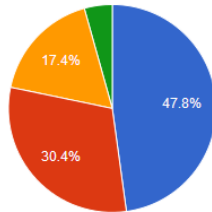


1. INSTITUTIONAL CULTURE



2. QUALITY MANAGEMENT

- Always / Strongly Agree
- Most of the time / Agree
- Sometimes / Neutral
- Rarely / Disagree



2. QUALITY MANAGEMENT

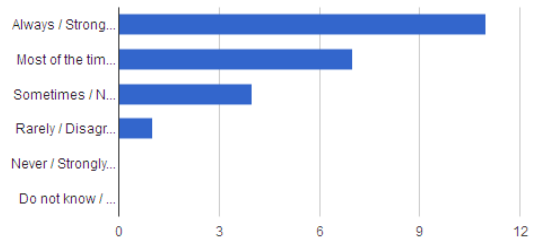


Figure 2. Pie chart and bar graph output from SPA. The example shows results from one clinic for the composite indicators from two of the four major sections of the SPA, institutional culture, and quality management.

51. Patient identity is verified before simulation.
 You answered **Always / Strongly Agree** for a score of 1



52. A time out is performed at simulation.
 You answered **Sometimes / Neutral** for a score of 3



53. Physician specifies anatomic extent of the simulation scan.
 You answered **Sometimes / Neutral** for a score of 3



54. Patient set-up is explained by the simulator therapist with visual and textual documentation.
 You answered **Always / Strongly Agree** for a score of 1



Figure 3. Benchmark output from SPA. The clinic response (blue) is shown together with the average of all responses in the database (red). Additional data bars would be added as the clinic completes the SPA again at a future time point.

13. The Radiation Oncology Department formally reviews reports of errors and near misses.				Disagree	
#	Improvement Strategy	Responsible	Timeline	v	
1	Add to Terms of Reference of QA Committee	Smith	02/13		

Figure 4. The Safety/Quality Improvement Log.

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