

## TABLE OF CONTENTS

Foreword .....	S1
<i>J. F. Williamson and B. R. Thomadsen</i>	

### Existing Quality Assurance Programs and Paradigms

Quality Assurance Needs for Modern Image-Based Radiotherapy: Recommendations From 2007 Interorganizational Symposium on "Quality Assurance of Radiation Therapy: Challenges of Advanced Technology" .....	S2
<i>J. F. Williamson, P. B. Dunscombe, M. B. Sharpe, B. R. Thomadsen, J. A. Purdy, and J. A. Deye</i>	

Current External Beam Radiation Therapy Quality Assurance Guidance: Does It Meet the Challenges of Emerging Image-Guided Technologies? .....	S13
<i>J. R. Palta, C. Liu, and J. G. Li</i>	

Current Brachytherapy Quality Assurance Guidance: Does It Meet the Challenges of Emerging Image-Guided Technologies? .....	S18
<i>J. F. Williamson</i>	

Quality Assurance of Radiation Therapy Planning Systems: Current Status and Remaining Challenges .....	S23
<i>J. Van Dyk</i>	

Developing Quality Assurance Processes for Image-Guided Adaptive Radiation Therapy .....	S28
<i>D. Yan</i>	

### Quality Assurance of Imaging and Planning Technology for Image-Guided Radiation Therapy

Quality Assurance of Serial 3D Image Registration, Fusion, and Segmentation .....	S33
<i>M. Sharpe and K. K. Brock</i>	

Quality Assurance of Positron Emission Tomography/Computed Tomography for Radiation Therapy .....	S38
<i>L. Xing</i>	

Newer Imaging Modalities to Assist With Target Localization in the Radiation Treatment of Prostate Cancer and Possible Lymph Node Metastases .....	S43
<i>S. S. John, A. L. Zietman, W. U. Shipley, and M. G. Harisinghani</i>	

(Contents continued on page A4)

Quality Assurance for Kilo- and Megavoltage In-Room Imaging and Localization for Off- and Online Setup Error Correction . . . . .	S48
<i>J. M. Balter and L. E. Antonuk</i>	
Quality Assurance of Ultrasound Imaging Systems for Target Localization and Online Setup Corrections . . . . .	S53
<i>W. A. Tomé and N. P. Orton</i>	
Quality Assurance for the Geometric Accuracy of Cone-Beam CT Guidance in Radiation Therapy . . . . .	S57
<i>J.-P. Bissonnette, D. Moseley, E. White, M. Sharpe, T. Purdie, and D. A. Jaffray</i>	
Quality Assurance of Onboard Megavoltage Computed Tomography Imaging and Target Localization Systems for On- and Off-Line Image-Guided Radiotherapy . . . . .	S62
<i>K. M. Langen, S. L. Meeks, and J. Pouliot</i>	

## **Quality Assurance and the Clinical Trials**

Quality Assurance Issues in Conducting Multi-Institutional Advanced Technology Clinical Trials . . . . .	S66
<i>J. A. Purdy</i>	
Challenges in Credentialing Institutions and Participants in Advanced Technology Multi-institutional Clinical Trials . . . . .	S71
<i>G. S. Ibbott, D. S. Followill, H. A. Molineu, J. R. Lowenstein, P. E. Alvarez, and J. E. Roll</i>	
Processes for Quality Improvements in Radiation Oncology Clinical Trials . . . . .	S76
<i>T. J. Fitzgerald, M. Uriel, K. Ulin, F. Laurie, J. Yortsy, R. Hanusik, S. Kessel, M. Bishop Jodoin, G. Osagie, M. G. Cicchetti, R. Pieters, K. McCarten, and N. Rosen</i>	
International Perspectives on Quality Assurance and New Techniques in Radiation Medicine: Outcomes of an IAEA Conference . . . . .	S80
<i>K. Shortt, L. Davidsson, J. Hendry, M. Dondi, and P. Andreo</i>	

## **Delivery System Quality Assurance Issues**

IMRT Delivery Performance With a Varian Multileaf Collimator . . . . .	S85
<i>T. LoSasso</i>	
Multileaf Collimator Characteristics and Reliability Requirements for IMRT Elekta System . . . . .	S89
<i>C. Liu, T. A. Simon, C. Fox, J. Li, and J. R. Palta</i>	
Siemens Multileaf Collimator Characterization and Quality Assurance Approaches for Intensity-Modulated Radiotherapy . . . . .	S93
<i>J. E. Bayouth</i>	
QA Issues for Computer-Controlled Treatment Delivery: This Is Not Your Old R/V System Any More . . . . .	S98
<i>B. A. Fraass</i>	
Quality Assurance Challenges for Motion-Adaptive Radiation Therapy: Gating, Breath Holding, and Four-Dimensional Computed Tomography . . . . .	S103
<i>S. B. Jiang, J. Wolfgang, and G. S. Mageras</i>	
Quality Assurance of Intensity-Modulated Radiation Therapy . . . . .	S108
<i>J. R. Palta, C. Liu, and J. G. Li</i>	
Helical Tomotherapy Quality Assurance . . . . .	S113
<i>J. Balog and E. Soisson</i>	

## Stereotactic Radiosurgery and Radiotherapy

Linear Accelerator and Gamma Knife-Based Stereotactic Cranial Radiosurgery: Challenges and Successes of Existing Quality Assurance Guidelines and Paradigms . . . . .	S118
S. J. Goetsch	
Quality Assurance Procedures for Stereotactic Body Radiation Therapy . . . . .	S122
J. M. Galvin and G. Bednarz	
Cyberknife Image-Guided Delivery and Quality Assurance . . . . .	S126
S. Dieterich and T. Pawlicki	
Quality Assurance of Immobilization and Target Localization Systems for Frameless Stereotactic Cranial and Extracranial Hypofractionated Radiotherapy . . . . .	S131
T. D. Solberg, P. M. Medin, J. Mullins, and S. Li	

## Brachytherapy Quality Assurance Issues

Quality Assurance Issues for Computed Tomography-, Ultrasound-, and Magnetic Resonance Imaging–Guided Brachytherapy . . . . .	S136
R. A. Cormack	
Clinical Practice and Quality Assurance Challenges in Modern Brachytherapy Sources and Dosimetry . . . . .	S142
W. M. Butler and G. S. Merrick	
Quality Assurance Issues for Therapeutic Application of Radioactive Microspheres . . . . .	S147
W. A. Dezarn	
Quality Assurance/Quality Control Issues for Intraoperative Planning and Adaptive Repeat Planning of Image-Guided Prostate Implants . . . . .	S152
M. Zaider, G. Cohen, J. Meli, and A. B. Rosenfeld	

## Plenary Presentation

Safety and Accountability in Healthcare From Past to Present . . . . .	S157
W. R. Hendee	

## New Paradigm for Radiotherapy Quality Management

Errors in Radiotherapy: Motivation for Development of New Radiotherapy Quality Assurance Paradigms . . . . .	S162
B. A. Fraass	
Critique of Traditional Quality Assurance Paradigm . . . . .	S166
B. Thomadsen	
A Method for Evaluating Quality Assurance Needs in Radiation Therapy . . . . .	S170
M. S. Huq, B. A. Fraass, P. B. Dunscombe, J. P. Gibbons, Jr., G. S. Ibbott, P. M. Medin, A. Mundt, S. Mutic, J. R. Palta, B. R. Thomadsen, J. F. Williamson, and E. D. Yorke	
Human Factors and Systems Engineering Approach to Patient Safety for Radiotherapy . . . . .	S174
A. J. Rivera and B.-T. Karsh	
Error Prevention as Developed in Airlines . . . . .	S178
T. J. Logan	

Improving Patient Safety in Anesthesia: A Success Story? . . . . .	S182
<i>R. Botney</i>	
Tools for Developing a Quality Management Program: Proactive Tools (Process Mapping, Value Stream Mapping, Fault Tree Analysis, and Failure Mode and Effects Analysis) . . . . .	S187
<i>F. Rath</i>	
Tools for Developing a Quality Management Program: Human Factors and Systems Engineering Tools . . . . .	S191
<i>B. S. Caldwell</i>	
Linking Quality Assurance to Performance Improvement to Produce a High Reliability Organization . . . . .	S195
<i>A. B. Silvey and L. H. Warrick</i>	
Taxonometric Applications in Radiotherapy Incident Analysis . . . . .	S200
<i>P. B. Dunscombe, E. U. Ekaette, R. C. Lee, and D. L. Cooke</i>	
Taxonometric Guidance for Developing Quality Assurance . . . . .	S204
<i>B. Thomadsen and S.-W. Lin</i>	
Variation and Control of Process Behavior . . . . .	S210
<i>T. Pawlicki and M. Whitaker</i>	