Materials and Methods: As well as how QA approaches may change in the future. The survey IMRT is defined as inverse planned treatments and assurance (QA) processes for these IMRT treatments. For the purposes was to determine how each centre currently carries out the quality assurance testing. The NRIG suggests that the provision of IMRT has been slow, as 66% of centres are currently using 6MV with 27% also using 8, 10 or 15MV. 66% measuring both point doses and dose distributions and the main body of the measurements for every patient, and 49% have changed their plans due to other factors such as time and cost. 66% measuring both point doses and dose distributions and the main body of the measurements for every patient, and 49% have changed their plans due to other factors such as time and cost.

Results: Machine based verification, software based verification, future plans.

Categories: Background and equipment, machine tolerance and QA, measurement process and QA. The aim was to collect information on equipment, approach and tolerances as well as how QA approaches may change in the future.

Materials and Methods: The survey was web based, however a word version was also available. Questions were divided into the following categories: Background and equipment, machine tolerance and QA, and machine based verification, software based verification, future plans.

Results: 57 responses were received from 53 centres (4 centres answered separately for different systems). All centres use 6MV with 27% also using 8, 10 or 15MV. 41% use dynamic delivery, 48% use step and shoot and 35% use VMAT with 11% using Tomotherapy. 82% are using dynamic delivery, 48% use step and shoot and 35% use VMAT with 11% using Tomotherapy. 82% are using dynamic delivery, 48% use step and shoot and 35% use VMAT with 11% using Tomotherapy.

Conclusions: All centres currently include machine based measurements in their QA processes. This is time consuming, taking up to 30 minutes per patient, even when batched. The majority have already started looking at other techniques and the trend is towards reduction of measurements and sharing of workload.

PO-0883
Light ions particle therapy with cost-effective new tools
C. Nordin1, B. Nordlin2, Y. Kumata3, L. Weber4, N. Tanizaki5
1ESS Light Ions, R&D, Stockholm, Sweden
2SUMITOMO Heavy Industries, Quantum Division, Tokyo, Japan
3Lund University Hospital, Medical Physics, Lund, Sweden

Purpose/Objective: Proton Therapy and Carbon ion Therapy have shown very good and promising results for a number of indications. The synchrotrons used to date to accelerate light ions up to carbon are however very large and expensive. We have therefore developed efficient, compact, cost effective treatment units that can make light ions treatments available with less complexity and lower costs, for the benefit of more patients. The systems allow for five different light ions species for research and clinical use. There is promising potential in mixing light ions but to date a lack of facilities hinder such research.

Materials and Methods: A new compact superconducting isochronous multiple-light-ion cyclotron has been designed by Sumitomo for Hydrogen (Protons), Helium ions, Lithium ions, Boron and Carbon ions. The peak energy is ~300MeV/u and the maximum ion energy is about 26 cm. In mixed-modality radiation therapy it is possible to simultaneously create a uniform distribution of biological effect, dose and radiation quality in the tumor volume. For instance, with Lithium in combination with Boron or Carbon ions, the Lithium ions are mainly used in the distal tumor region whereas Boron or Carbon ions are used closer to the patient surface. By this method the LET plateau dose from Lithium is elevated significantly by Bragg peak Boron or Carbon ion dose delivery in the shallow tumour region. Pencil Beam Scanning delivery is used exclusively for maximum dose conformity to target volumes and minimized exposure to surrounding tissues and OAR.

Results: An innovative layout and arrangement of treatment rooms and the relatively compact new cyclotron accelerator allows a significant cost reduction compared to previously built carbon ion treatment facilities such as HIMAC at NIRS in Chiba, Japan, HIT in Heidelberg, Germany and CNAO in Pavia, Italy. The overall facility cost and cost per Light Ions treatment room is less than the current market prices of proton-only facilities. High dose rates from the cyclotron, fast switching and continuous line scanning as opposed to synchrotrons’ intermittent beam and spot scanning techniques allow for shorter irradiation times and higher patient throughput.

Conclusions: The new light ions technology provides a compact and very efficient system for curative treatment of several common malignant tumors of: head and neck, lung, liver, prostate, bone/soft tissue sarcoma, cervix, and glioblastoma (Tsunui 2016). At a facility cost equal or less than today’s proton-only facilities, combined with enhanced throughput, the cost per treatment is reduced.

PO-0884
Frameless radiosurgery: less invasive, more accurate
T. Gevaert1, D. Verellen1, B. Engels1, M. Rieder1
1Universitair Ziekenhuis Brussel, Academic Department of Radiation Oncology, Brussels, Belgium

Purpose/Objective: Stereotactic radiosurgery using frame-based positioning is a well-established technique for the treatment of benign and malignant lesions. By contrast, a new trend towards frameless systems is using image-guided positioning techniques is gaining mainstream acceptance. This study was designed to compare the overall accuracy of the frameless with the frame-based radiosurgery technique and to evaluate the immobilization characteristics of a commercially available frameless mask, more specifically, the setup errors and the intrafraction motion, to the invasive fixation of the frame-based technique.

Materials and Methods: Multiple hidden target tests(HTT) were performed to measure the overall accuracy of the two positioning techniques for radiosurgery (i.e. frameless using stereoscopic-x-ray imaging and 6DOF registration/positioning and frame-based using invasive ring and localizer box). Forty patients with 66 brain metastases were enrolled for frameless stereotactic radiosurgery using X-ray imaging and a 6DOF robotic couch. To analyze the frameless characteristics positioning results were collected before and after treatment to assess patient setup error and intrafraction motion. The obtained data was bench marked to literature for comparison with frame-based techniques.

Conclusions: The new light ions technology provides a compact and very efficient system for curative treatment of several common malignant tumors of: head and neck, lung, liver, prostate, bone/soft tissue sarcoma, cervix, and glioblastoma (Tsunui 2016). At a facility cost equal or less than today’s proton-only facilities, combined with enhanced throughput, the cost per treatment is reduced.

PO-0884
Frameless radiosurgery: less invasive, more accurate
T. Gevaert1, D. Verellen1, B. Engels1, M. Rieder1
1Universitair Ziekenhuis Brussel, Academic Department of Radiation Oncology, Brussels, Belgium

Purpose/Objective: Stereotactic radiosurgery using frame-based positioning is a well-established technique for the treatment of benign and malignant lesions. By contrast, a new trend towards frameless systems is using image-guided positioning techniques is gaining mainstream acceptance. This study was designed to compare the overall accuracy of the frameless with the frame-based radiosurgery technique and to evaluate the immobilization characteristics of a commercially available frameless mask, more specifically, the setup errors and the intrafraction motion, to the invasive fixation of the frame-based technique.

Materials and Methods: Multiple hidden target tests(HTT) were performed to measure the overall accuracy of the two positioning techniques for radiosurgery (i.e. frameless using stereoscopic-x-ray imaging and 6DOF registration/positioning and frame-based using invasive ring and localizer box). Forty patients with 66 brain metastases were enrolled for frameless stereotactic radiosurgery using X-ray imaging and a 6DOF robotic couch. To analyze the frameless characteristics positioning results were collected before and after treatment to assess patient setup error and intrafraction motion. The obtained data was bench marked to literature for comparison with frame-based techniques.