significant improvement in survival. By modeling our preclinical study on current clinic workflows, we show clear compatibility with modern patient care, thus heightening the translational significance.

**Material and Methods:** AGuIX (Nano-H, Lyon, France) is a gadolinium-based nanoparticle that has been proposed for an upcoming clinical trial. We performed in vitro cell uptake and radiosensitization studies of a pancreatic cancer cell line in preclinical (220kVp) and clinical (6 MV and 6 MV FFF) beams. MRI was used to monitor tumor uptake and biodistribution. Due to their small size (2-3 nm), the GdNP have good renal clearance and long blood circulation (around 20-30 min in mice). In vivo radiation therapy studies were performed to characterize the effect of AGuIX as a radiosensitizer (n=8/cohort). Histology was performed to measure the increase in damage in the tumor and to evaluate the toxicity in healthy tissues.

**Results:** The in vitro results demonstrate a dose enhancement factor (DEF) of 1.37 (p<0.005) when the combination of irradiation and GdNP is used with the 220kV and a DEF of 1.26 for the clinical 6MV FFF. The maximum tumor uptake and tumor/muscle ratio is reached 15 minutes after IV injection. The in vivo results demonstrated statistically significant tumor regression (P<0.001) and increase in median survival (p<0.005) for AGuIX combined with radiation vs. radiation alone. There was no observed increase in toxicity in the surrounding healthy organs.

**Conclusion:** MRI contrast and radiosensitization have been demonstrated in a preclinical pancreatic tumor model. There is a strong translational potential for AGuIX with modern and likely future MRI-guided radiation therapy procedures.

**Proffered Papers: Clinical 11: Health Economics and patient reported outcomes**

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*Time driven activity based costing: a conceptual framework for cost assessment in radiation therapy*

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**Purpose or Objective:** The value of healthcare can be defined as the additional health outcomes gained for each euro spent. Thus, understanding costs, and their origins, of a medical intervention is key to the estimation of value. Costing studies to date have yielded highly variable results largely due to which and how resources have been analyzed. A rigorous health economics approach requires the cost of the real resources used to be identified (ISPOR, 2007). We report on such an approach to the estimation of the cost of radiation therapy.

**Material and Methods:** A Time-Driven Activity Based Costing (TDABC) model was created for external photon beam radiotherapy at the national level. The model was developed in an iterative manner by a panel of experts, taking into account current knowledge of resources, products, and clinical processes. The resources were identified through a systematic review of the literature from 1981 to 2015. In TDABC, resource unit costs per minute are defined as the ratio of gross expense to available capacity. The products, defined as courses of treatment for specific tumor indications, were derived from the decision trees developed by the Collaboration for Cancer Outcomes, Research and Evaluation (CCORE). The process map was derived from that developed by the AAPM (2012, Ford).

**Results:** Resources are organized in 3 categories: personnel, equipment and overhead. Products are grouped per organ site and target volume. For each of these, treatment complexity and diversity are addressed by extending the AAPM process map in three ways:

1. six technique categories, specified as follows: single-field, 2D-RT, 3D-CRT, IMRT, rotational IMRT and stereotactic techniques;
2. eight possible fractionation schedules can be defined;
3. some steps along the patient care pathway are identified separately from the 7 high level steps, see figure.

These, reflecting an additional level of treatment complexity, are optional and hence not necessarily applicable to all treatment courses.

The core input required is the time of personnel’s involvement at each process step for every technique and product. This TDABC approach yields two classes of output:

1. costs, at the level of the resources, activities and products, the latter being the sum of the costs of the component process steps; and
2. resource utilization efficiency.

**Conclusion:** A TDABC model for external photon beam radiotherapy is developed for use at the national level. In the next step, the model is being tested in close collaboration with selected European Radiotherapy Societies, by introducing nation-specific data on the resources consumed, monetary values and resources’ time devoted to each step, reflecting complexity. These data generate national cost estimates per course for a range of radiotherapy treatments. The cost estimates and details of the methodology will be presented.