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### Current position

2005-Present Medical Physicist Radiotherapy Clinical expertise: Adaptive radiotherapy and image guided radiotherapy for both photon and proton therapy Research subjects: - Radiomics / Image biomarkers for improved prediction of treatment outcome after radiotherapy (both tumor related outcomes and complications). - Development and implementation of deep learning methods in radiation oncology.

### Education

2001-2005 Training for Medical Physicist Radiation Oncology, Department of Radiation Oncology, University Medical Center Groningen, the Netherlands. 1993-1997 PhD. Biophysics, Faculty of Applied Physics, University of Twente, Enschede, the Netherlands. Thesis: Towards Chemical Imaging of Living Cells: Design and Application of a Confocal Raman Microscope. Promotor: Prof. J. Greve. 1987-1993 M. Sc. Applied Physics, University of Twente, Enschede, the Netherlands.

### Employment

1997-2001 Postdoc, Applied Physics, Radboud University Nijmegen, Nijmegen, the Netherlands. Development of laser-based techniques for characterization of supersonic nozzle flows.

### Memberships

Full member of the European Society for Therapeutic Radiology and Oncology (ESTRO) Full member of the Dutch Society of Medical Physicist (NVKF) Full member of the Dutch Society of Radiotherapy and Oncology (NVRO)

### Peer-reviewed journal articles

- A comparison of cardiovascular and pulmonary morbidities and risk factors in breast cancer survivors compared to an age-matched female control group in the Lifelines prospective population cohort**  
Spoor, D. S., van den Bogaard, V. A. B., Sijtsema, N. M., Van der Meer, P., de Bock, G. H., Langendijk, J. A., Maduro, J. H. & Crijns, A. P. G., Aug-2023, In: Breast. 70, p. 49-55 7 p.
- CT-based deep multi-label learning prediction model for outcome in patients with oropharyngeal squamous cell carcinoma**  
Ma, B., Guo, J., Zhai, T. T., van der Schaaf, A., Steenbakkens, R. J. H. M., van Dijk, L. V., Both, S., Langendijk, J. A., Zhang, W., Qiu, B., van Ooijen, P. M. A. & Sijtsema, N. M., 23-May-2023, (E-pub ahead of print) In: Medical Physics. 10 p.
- Survival prediction for stage I-IIIa non-small cell lung cancer using deep learning**  
Zheng, S., Guo, J., Langendijk, J. A., Both, S., N J Veldhuis, R., Oudkerk, M., van Ooijen, P. M. A., Wijsman, R. & Sijtsema, N. M., Mar-2023, In: Radiotherapy and Oncology. 180, 18 p., 109483.
- Validation of the <sup>18</sup>F-FDG PET image biomarker model predicting late xerostomia after head and neck cancer radiotherapy**  
Li, Y., Sijtsema, N. M., de Vette, S. P. M., Steenbakkens, R. J. H. M., Zhang, F., Noordzij, W., Van den Bosch, L., Langendijk, J. A. & van Dijk, L. V., Mar-2023, In: Radiotherapy and Oncology. 180, 109458.
- Head and neck cancer predictive risk estimator to determine control and therapeutic outcomes of radiotherapy (HNC-PREDICTOR): development, international multi-institutional validation, and web implementation of clinic-ready model-based risk stratification for head and neck cancer**  
van Dijk, L. V., Mohamed, A. S. R., Ahmed, S., Nipu, N., Marai, G. E., Wahid, K., Sijtsema, N. M., Gunn, B., Garden, A. S., Moreno, A., Hope, A. J., Langendijk, J. A. & Fuller, C. D., Jan-2023, In: European Journal of Cancer. 178, p. 150-161 12 p.

6. **Deep learning aided oropharyngeal cancer segmentation with adaptive thresholding for predicted tumor probability in FDG PET and CT images**  
De Biase, A., Sijtsema, N. M., van Dijk, L., Langendijk, J. A. & van Ooijen, P. M. A., 2023, In: Physics in Medicine and Biology. 68, 5
7. **Daily dose evaluation based on corrected CBCTs for breast cancer patients: accuracy of dose and complication risk assessment**  
Hamming, V. C., Andersson, S., Maduro, J. H., Langendijk, J. A., Both, S. & Sijtsema, N. M., Dec-2022, In: Radiation oncology. 17, 1, 11 p., 205.
8. **Diaphragm-Based Position Verification to Improve Daily Target Dose Coverage in Proton and Photon Radiation Therapy Treatment of Distal Esophageal Cancer**  
Visser, S., den Otter, L. A., Ribeiro, C. O., Korevaar, E. W., Both, S., Langendijk, J. A., Muijs, C. T., Sijtsema, N. M. & Knopf, A., 1-Feb-2022, In: International Journal of Radiation Oncology, Biology, Physics. 112, 2, p. 463-474 12 p.
9. **A novel semi auto-segmentation method for accurate dose and NTCP evaluation in adaptive head and neck radiotherapy**  
Gan, Y., Langendijk, J. A., Oldehinkel, E., Scandurra, D., Sijtsema, N. M., Lin, Z., Both, S. & Brouwer, C. L., Nov-2021, In: Radiotherapy and Oncology. 164, p. 167-174 8 p.
10. **Assessment of a diaphragm override strategy for robustly optimized proton therapy planning for esophageal cancer patients**  
Visser, S., Neh, H., Oraboni Ribeiro, C., Korevaar, E. W., Meijers, A., Poppe, B., Sijtsema, N. M., Both, S., Langendijk, J. A., Muijs, C. T. & Knopf, A. C., Oct-2021, In: Medical Physics. 48, 10, p. 5674-5683 10 p.
11. **Validation of separate multi-atlases for auto segmentation of cardiac substructures in CT-scans acquired in deep inspiration breath hold and free breathing**  
Spoor, D. S., Sijtsema, N. M., van den Bogaard, V. A. B., van der Schaaf, A., Brouwer, C. L., Ta, B. D. P., Vliegthart, R., Kierkels, R. G. J., Langendijk, J. A., Maduro, J. H., Peters, F. B. J. & Crijns, A. P. G., Oct-2021, In: Radiotherapy and Oncology. 163, p. 46-54 9 p.
12. **The Importance of Radiation Dose to the Atherosclerotic Plaque in the Left Anterior Descending Coronary Artery for Radiation-Induced Cardiac Toxicity of Breast Cancer Patients?**  
van den Bogaard, V. A. B., Spoor, D. S., van der Schaaf, A., van Dijk, L. V., Schuit, E., Sijtsema, N. M., Langendijk, J. A., Maduro, J. H. & Crijns, A. P. G., 1-Aug-2021, In: International Journal of Radiation Oncology, Biology, Physics. 110, 5, p. 1350-1359 10 p.
13. **Towards the clinical implementation of intensity-modulated proton therapy for thoracic indications with moderate motion: Robust optimised plan evaluation by means of patient and machine specific information**  
Ribeiro, C. O., Visser, S., Korevaar, E. W., Sijtsema, N. M., Melissa Anakotta, R., Dieters, M., Both, S., Langendijk, J. A., Wijsman, R., Muijs, C. T., Meijers, A. & Knopf, A., Apr-2021, In: Radiotherapy and Oncology. 157, p. 210-218 9 p.
14. **External validation of nodal failure prediction models including radiomics in head and neck cancer**  
Zhai, T-T., Wesseling, F., Langendijk, J. A., Shi, Z., Kalendralis, P., van Dijk, L. V., Hoebbers, F., Steenbakkers, R. J. H. M., Dekker, A., Wee, L. & Sijtsema, N. M., Jan-2021, In: Oral Oncology. 112, 6 p., 105083.
15. **Head and neck IMPT probabilistic dose accumulation: Feasibility of a 2 mm setup uncertainty setting**  
Wagenaar, D., Kierkels, R. G. J., van der Schaaf, A., Meijers, A., Scandurra, D., Sijtsema, N. M., Korevaar, E. W., Steenbakkers, R. J. H. M., Knopf, A. C., Langendijk, J. A. & Both, S., Jan-2021, In: Radiotherapy and Oncology. 154, p. 45-52 8 p.
16. **Inter-fraction motion robustness and organ sparing potential of proton therapy for cervical cancer**  
Gort, E. M., Beukema, J. C., Matysiak, W., Sijtsema, N. M., Aluwini, S., Langendijk, J. A., Both, S. & Brouwe, C. L., Jan-2021, In: Radiotherapy and Oncology. 154, p. 194-200 7 p.
17. **A comprehensive motion analysis - consequences for high precision image-guided radiotherapy of esophageal cancer patients**  
Roos, C. T. G., Faiz, Z., Visser, S., Dieters, M., van der Laan, H. P., den Otter, L. A., Plukker, J. T. M., Langendijk, J. A., Knopf, A-C., Muijs, C. T. & Sijtsema, N. M., 2021, In: ACTA ONCOLOGICA. 60, 3, p. 277-284 8 p.
18. **Weekly robustness evaluation of intensity-modulated proton therapy for oesophageal cancer**  
Anakotta, R. M., van der Laan, H. P., Visser, S., Ribeiro, C. O., Dieters, M., Langendijk, J. A., Both, S., Korevaar, E. W., Sijtsema, N. M., Knopf, A. & Muijs, C. T., Oct-2020, In: Radiotherapy and Oncology. 151, p. 66-72 7 p.
19. **Can we safely reduce the radiation dose to the heart while compromising the dose to the lungs in oesophageal cancer patients?**  
Beukema, J. C., Kawaguchi, Y., Sijtsema, N. M., Zhai, T-T., Langendijk, J. A., van Dijk, L. V., van Luijk, P., Teshima, T. & Muijs, C. T., Aug-2020, In: Radiotherapy and Oncology. 149, p. 222-227 6 p.
20. **Investigation of inter-fraction target motion variations in the context of pencil beam scanned proton therapy in non-small cell lung cancer patients**  
den Otter, L. A., Anakotta, R. M., Weessies, M., Roos, C. T. G., Sijtsema, N. M., Muijs, C. T., Dieters, M., Wijsman, R., Troost, E. G. C., Richter, C., Meijers, A., Langendijk, J. A., Both, S. & Knopf, A-C., 9-Jul-2020, In: Medical Physics. 47, 9, p. 3835-3844 10 p.

21. **Pre-treatment radiomic features predict individual lymph node failure for head and neck cancer patients**  
Zhai, T-T., Langendijk, J. A., van Dijk, L. V., van der Schaaf, A., Sommers, L., Vemer-van den Hoek, J. G. M., Bijl, H. P., Halmos, G. B., Witjes, M. J. H., Oosting, S. F., Noordzij, W., Sijtsema, N. M. & Steenbakkens, R. J. H. M., May-2020, In: Radiotherapy and Oncology. 146, p. 58-65 8 p.
22. **The Image Biomarker Standardization Initiative: Standardized Quantitative Radiomics for High-Throughput Image-based Phenotyping**  
image standardization initiative, Zwanenburg, A., Vallières, M., Abdalah, M. A., Aerts, H. J. W. L., Andrearczyk, V., Apte, A., Ashrafinia, S., Bakas, S., Beukinga, R. J., Boellaard, R., Bogowicz, M., Boldrini, L., Buvat, I., Cook, G. J. R., Davatzikos, C., Depeursinge, A., Desserot, M-C., Dinapoli, N., Dinh, C. V., & 1 othersEchegaray, S., May-2020, In: Radiology. 295, 2, p. 328-338 11 p.
23. **Organ sparing potential and inter-fraction robustness of adaptive intensity modulated proton therapy for lung cancer**  
van der Laan, H. P., Anakotta, R. M., Korevaar, E. W., Dieters, M., Ubbels, J. F., Wijsman, R., Sijtsema, N. M., Both, S., Langendijk, J. A., Muijs, C. T. & Knopf, A. C., 25-Sept-2019, In: ACTA ONCOLOGICA. 8 p.
24. **Delta-radiomics features during radiotherapy improve the prediction of late xerostomia**  
van Dijk, L. V., Langendijk, J. A., Zhai, T-T., Vedelaar, T. A., Noordzij, W., Steenbakkens, R. J. H. M. & Sijtsema, N. M., 28-Aug-2019, In: Scientific Reports. 9, 1, 8 p., 12483.
25. **The prognostic value of CT-based image-biomarkers for head and neck cancer patients treated with definitive (chemo-)radiation**  
Zhai, T. T., Langendijk, J. A., van Dijk, L. V., Halmos, G. B., Witjes, M. J. H., Oosting, S. F., Noordzij, W., Sijtsema, N. M. & Steenbakkens, R. J. H. M., 1-Aug-2019, In: Oral Oncology. 95, p. 178-186 9 p.
26. **Evaluation of a 3D surface imaging system for deep inspiration breath-hold patient positioning and intra-fraction monitoring**  
Hamming, V. C., Visser, C., Batin, E., McDermott, L. N., Busz, D. M., Both, S., Langendijk, J. A. & Sijtsema, N. M., 11-Jul-2019, In: Radiation oncology. 14, 1, 8 p., 125.
27. **Development and evaluation of an auto-segmentation tool for the left anterior descending coronary artery of breast cancer patients based on anatomical landmarks**  
van den Bogaard, V. A. B., van Dijk, L. V., Vliegenthart, R., Sijtsema, N. M., Langendijk, J. A., Maduro, J. H. & Crijns, A. P. G., Jul-2019, In: Radiotherapy and Oncology. 136, p. 15-20 6 p.
28. **Cardiac Function After Radiation Therapy for Breast Cancer**  
van den Bogaard, V. A. B., van Luijk, P., Hummel, Y. M., van der Meer, P., Schuit, E., Boerman, L. M., Maas, S. W. M. C., Nauta, J. F., Steggink, L. C., Gietema, J. A., de Bock, G. H., Berendsen, A. J., Smit, W. G. J. M., Sijtsema, N. M., Kierkels, R. G. J., Langendijk, J. A., Crijns, A. P. G. & Maduro, J. H., 1-Jun-2019, In: International Journal of Radiation Oncology, Biology, Physics. 104, 2, p. 392-400 9 p.
29. **Parotid gland fat related Magnetic Resonance image biomarkers improve prediction of late radiation-induced xerostomia**  
van Dijk, L. V., Thor, M., Steenbakkens, R. J. H. M., Apte, A., Zhai, T-T., Borra, R., Noordzij, W., Estilo, C., Lee, N., Langendijk, J. A., Deasy, J. O. & Sijtsema, N. M., Sept-2018, In: Radiotherapy and Oncology. 128, 3, p. 459-466 8 p.
30. **An automated, quantitative, and case-specific evaluation of deformable image registration in computed tomography images**  
Kierkels, R. G. J., den Otter, L. A., Korevaar, E. W., Langendijk, J. A., van der Schaaf, A., Knopf, A-C. & Sijtsema, N. M., 21-Feb-2018, In: Physics in Medicine and Biology. 63, 24 p., 045026.
31. **(18)F-FDG PET image biomarkers improve prediction of late radiation-induced xerostomia**  
van Dijk, L. V., Noordzij, W., Brouwer, C. L., Boellaard, R., Burgerhof, J. G. M., Langendijk, J. A., Sijtsema, N. M. & Steenbakkens, R. J. H. M., Jan-2018, In: Radiotherapy and Oncology. 126, 1, p. 89-95 7 p.
32. **Geometric Image Biomarker Changes of the Parotid Gland Are Associated With Late Xerostomia**  
van Dijk, L. V., Brouwer, C. L., van der Laan, H. P., Burgerhof, J. G. M., Langendijk, J. A., Steenbakkens, R. J. H. M. & Sijtsema, N. M., 1-Dec-2017, In: International Journal of Radiation Oncology Biology Physics. 99, 5, p. 1101-1110 10 p.
33. **Improving the prediction of overall survival for head and neck cancer patients using image biomarkers in combination with clinical parameters**  
Zhai, T-T., van Dijk, L. V., Huang, B-T., Lin, Z-X., Ribeiro, C. O., Brouwer, C. L., Oosting, S. F., Halmos, G. B., Witjes, M. J. H., Langendijk, J. A., Steenbakkens, R. J. H. M. & Sijtsema, N. M., Aug-2017, In: Radiotherapy and Oncology. 124, 2, p. 256-262 7 p.
34. **CT image biomarkers to improve patient-specific prediction of radiation-induced xerostomia and sticky saliva**  
van Dijk, L. V., Brouwer, C. L., van der Schaaf, A., Burgerhof, J. G. M., Beukinga, R. J., Langendijk, J. A., Sijtsema, N. M. & Steenbakkens, R. J. H. M., Feb-2017, In: Radiotherapy and Oncology. 122, 2, p. 185-191 7 p.
35. **Reply letter to "Texture analysis of parotid gland as a predictive factor of radiation induced xerostomia: A subset analysis"**  
van Dijk, L. V., Langendijk, J. A., Sijtsema, N. M. & Steenbakkens, R. J. H. M., Feb-2017, In: Radiotherapy and Oncology. 122, 2, p. 322-322 1 p.

36. **Selection of head and neck cancer patients for adaptive radiotherapy to decrease xerostomia**  
Brouwer, C. L., Steenbakkers, R. J. H. M., van der Schaaf, A., Sopacua, C. T. C., van Dijk, L. V., Kierkels, R. G. J., Bijl, H. P., Burgerhof, J. G. M., Langendijk, J. A. & Sijtsema, N. M., Jul-2016, In: Radiotherapy and Oncology. 120, 1, p. 36-40 5 p.
37. **An exploratory study of volumetric analysis for assessing tumor response with 18F-FAZA PET/CT in patients with advanced non-small-cell lung cancer (NSCLC)**  
Kerner, G. S. M. A., Bollineni, V. R., Hiltermann, T. J. N., Sijtsema, N. M., Fischer, A., Bongaerts, A. H. H., Pruijm, J. & Groen, H. J. M., 18-Apr-2016, In: EJNMMI Research. 6, 8 p., 33.
38. **CT-based delineation of organs at risk in the head and neck region: DAHANCA, EORTC, GORTEC, HKNPCSG, NCIC CTG, NCRI, NRG Oncology and TROG consensus guidelines**  
Brouwer, C. L., Steenbakkers, R. J. H. M., Bourhis, J., Budach, W., Grau, C., Gregoire, V., van Herk, M., Lee, A., Maingon, P., Nutting, C., O'Sullivan, B., Porceddu, S. V., Rosenthal, D. I., Sijtsema, N. M. & Langendijk, J. A., Oct-2015, In: Radiotherapy and Oncology. 117, 1, p. 83-90 8 p.
39. **Identifying patients who may benefit from adaptive radiotherapy: Does the literature on anatomic and dosimetric changes in head and neck organs at risk during radiotherapy provide information to help?**  
Brouwer, C. L., Steenbakkers, R. J. H. M., Langendijk, J. A. & Sijtsema, N. M., Jun-2015, In: Radiotherapy and Oncology. 115, 3, p. 285-294 10 p.
40. **The effects of computed tomography image characteristics and knot spacing on the spatial accuracy of B-spline deformable image registration in the head and neck geometry**  
Brouwer, C. L., Kierkels, R. G. J., van t Veld, A. A., Sijtsema, N. M. & Meertens, H., 29-Jul-2014, In: Radiation oncology. 9, 169, 10 p.
41. **Differences in delineation guidelines for head and neck cancer result in inconsistent reported dose and corresponding NTCP**  
Brouwer, C. L., Steenbakkers, R. J. H. M., Gort, E., Kamphuis, M. E., van der Laan, H. P., van t Veld, A. A., Sijtsema, N. M. & Langendijk, J. A., Apr-2014, In: Radiotherapy and Oncology. 111, 1, p. 148-152 5 p.
42. **Systematic review of the role of a belly board device in radiotherapy delivery in patients with pelvic malignancies**  
Wiesendanger-Wittmer, E. M., Sijtsema, N. M., Muijs, C. T. & Beukema, J. C., Mar-2012, In: Radiotherapy and Oncology. 102, 3, p. 325-334 10 p.
43. **External beam radiotherapy combined with intraluminal brachytherapy in esophageal carcinoma**  
Muijs, C. T., Beukema, J. C., Mul, V. E., Plukker, J. T., Sijtsema, N. M. & Langendijk, J. A., Feb-2012, In: Radiotherapy and Oncology. 102, 2, p. 303-308 6 p.
44. **Electronic portal images (EPIs) based position verification for the breast simultaneous integrated boost (SIB) technique**  
Sijtsema, N. M., van Dijk-Peters, F. B. J., Langendijk, J. A., Maduro, J. H. & van 't Veld, A. A., Jan-2012, In: Radiotherapy and Oncology. 102, 1, p. 108-114 7 p.
45. **Patient position verification with oblique radiation beams**  
Sijtsema, N. M., van den Bergh, A. C. M., Burlage, F. R., Bijl, H. P., Langendijk, J. A. & Meertens, H., Oct-2007, In: Radiotherapy and Oncology. 85, 1, p. 126-131 6 p.
46. **Quantitative spectrally resolved imaging through a spectrograph**  
Tolboom, RAL., Sijtsema, NM., ter Meulen, JJ. & Dam, N. J., 1-Nov-2003, In: Optics Letters. 28, 21, p. 2046-2048 3 p.
47. **Air photolysis and recombination tracking: A new molecular tagging velocimetry scheme**  
Sijtsema, NM., Dam, NJ., Klein-Douwel, RJH. & ter Meulen, JJ., Jun-2002, In: AIAA Journal. 40, 6, p. 1061-1064 4 p.
48. **Nitric oxide flow tagging in unseeded air**  
Dam, NJ., Klein-Douwel, RJH., Sijtsema, NM. & ter Meulen, JJ., 1-Jan-2001, In: Optics Letters. 26, 1, p. 36-38 3 p.
49. **Intracellular reactions in single human granulocytes upon phorbol myristate acetate activation using confocal Raman microspectroscopy**  
Sijtsema, N. M., Tibbe, A. G. J., Segers-Nolten, I. G. M. J., Verhoeven, A. J., Weening, R. S., Greve, J. & Otto, C., 2000, In: Biophysical Journal. 78, 5, p. 2606-2613 8 p.
50. **Characterization of the Asp94 and Glu242 mutants in myeloperoxidase, the residues linking the heme group via ester bonds**  
Kooter, I. M., Moguilevsky, N., Bollen, A., Sijtsema, N. M., Otto, C., Dekker, H. L. & Wever, R., 1-Aug-1999, In: European Journal of Biochemistry. 264, 1, p. 211-217 7 p.
51. **Localization study of Co-phthalocyanines in cells by Raman micro(spectro)scopy**  
Arzhantsev, S. Y., Chikishev, A. Y., Koroteev, N. I., Greve, J., Otto, C. & Sijtsema, N. M., Mar-1999, In: Journal of Raman Spectroscopy. 30, 3, p. 205-208 4 p.
52. **Two-dimensional multispecies imaging of a supersonic nozzle flow**  
Sijtsema, N. M., Tolboom, R. A. L., Dam, N. J. & ter Meulen, J. J., 1999, In: Optics Letters. 24, 10, p. 664-666 3 p.

53. Resonance Raman Microspectroscopy of Myeloperoxidase and Cytochrome b(558) in Human Neutrophilic Granulocytes  
Sijtsema, N. M., Otto, C., Segers-Nolten, G. M. J., Verhoeven, A. J. & Greve, J., Jun-1998, In: Biophysical Journal. 74, 6, p. 3250-3255 6 p.
54. **Confocal direct imaging Raman microscope: Design and applications in biology**  
Sijtsema, N. M., Wouters, S. D., Grauw, C. J. D., Otto, C. & Greve, J., 1998, In: Applied Spectroscopy. 52, 3, p. 348-355 8 p.
55. Confocal Raman microspectroscopy of the activation of single neutrophilic granulocytes  
Otto, C., Sijtsema, N. M. & Greve, J., 1998, In: European Biophysics Journal. 27, 6, p. 582-589 8 p.
56. **Axial resolution of confocal Raman microscopes: Gaussian beam theory and practice**  
Grauw, C. J. D., Sijtsema, N. M., Otto, C. & Greve, J., Dec-1997, In: Journal of Microscopy. 188, p. 273-279 7 p.
57. Site-directed mutagenesis of Met243, a residue of myeloperoxidase involved in binding of the prosthetic group  
Kooter, I. M., Moguilevsky, N., Bollen, A., Sijtsema, N. M., Otto, C. & Wever, R., 1-Apr-1997, In: Journal of biological inorganic chemistry. 2, 2, p. 191-197 7 p.
58. Applications of micro-Raman imaging in biomedical research  
Otto, C., DeGrauw, C. J., Duindam, J. J., Sijtsema, N. M. & Greve, J., Feb-1997, In: Journal of Raman Spectroscopy. 28, 2-3, p. 143-150 8 p.
59. **Carotenoid levels in human lymphocytes, measured by Raman microspectroscopy**  
Ramauskaite, R. B., SegersNolten, IGMJ., DeGrauw, K. J., Sijtsema, N. M., VanderMaas, L., Greve, J., Otto, C. & Figdor, C. G., 1997, In: Pure and Applied Chemistry. 69, 10, p. 2131-2134 4 p.
60. Evidence for Hoogsteen GC base pairs in the proton-induced transition from right-handed to left-handed poly(dG-dC)center dot poly(dG-dC)  
SegersNolten, G. M. J., Sijtsema, N. M. & Otto, C., 1997, In: Biochemistry. 36, 43, p. 13241-13247 7 p.
61. **Imaging with extrinsic Raman labels**  
Sijtsema, N. M., Duindam, J. J., Puppels, G. J., Otto, C. & Greve, J., 1-May-1996, In: Applied Spectroscopy. 50, 5, p. 545-551 7 p.
62. **Confocal Raman microscopy on eye lenses and single living cells**  
Sijtsema, N. M., Duindam, J. J., Tibbe, A. G. J., Ramauskaite, R., Otto, C., Figdor, C. & Greve, J., 1996, In: Progress in Biophysics & Molecular Biology. 65, p. 192 1 p.
63. **Evidence for the presence of protonated Hoogsteen GC base pairs in poly(DG-DC)center dot poly(DG-DC) at reduced pH values.**  
SegersNolten, G. M. J., Otto, C., DeGrauw, C. J., Sijtsema, N. M. & Greve, J., 1996, In: Progress in Biophysics & Molecular Biology. 65, p. PB110-PB110
64. Raman microspectroscopy of phthalocyanines in living cells  
Arzhantsev, S. Y., Otto, C., Ruzmetov, D. A., Sijtsema, N. M., Grève, J. & Chikishev, A. Y., 1996, In: Izvestiya Akademii Nauk. Ser. Fizicheskaya. 60, 3, p. 136-141 6 p.
65. **Development and Application of Raman Microspectroscopic and Raman Imaging Techniques for Cell Biological Studies**  
PUPPELS, G. J., SCHUT, T. C. B., SIJTSEMA, N. M., GROND, M., MARABOEUF, F., DEGRAUW, C. G., FIGDOR, C. G. & GREVE, J., 1-Mar-1995, In: Journal of Molecular Structure. 347, p. 477-483 7 p.

## Meeting Abstracts

1. **Proton-therapy and concurrent chemotherapy in stage III NSCLC: Effects on toxicity and immune therapy**  
Cortiula, F., Hendriks, L., Wijsman, R., Debakker, S., Steens, M., Peeters, S. T., Michelotti, A., Sijtsema, N. M., Urban, S., Niezink, A., Dursun, S., Bootsma, G., Canters, R., Tohidinezhad, F., Fasola, G., Rinaldi, I., Taasti, V., Houben, R. & De Ruysscher, D., Sept-2022, In: Annals of Oncology. 33, S7, p. S984-S985 2 p.
2. **Big data prediction models to select head and neck patients for personalized dose prescription**  
van Dijk, L. V., Ahmed, S., Mohammed, A. S. R., Wahid, K., Sijtsema, N. M., Gunn, B., Garden, A. S., Langendijk, J. A. & Fuller, C. D., May-2022, In: Radiotherapy and Oncology. 170, p. S668-S670 3 p.
3. **Daily dose evaluation based on synthetic CTs: accuracy of dose and complication risk assessment**  
Hamming, V., Langendijk, J. A., Both, S., Sijtsema, N. M. & Maduro, J., May-2022, In: Radiotherapy and Oncology. 170, p. S333-S334 2 p.
4. **External Validation of NTCP-models for Acute Coronary Events after Breast Cancer Radiotherapy**  
Spoor, D., van Leeuwen, F., Russell, N., Boekel, N., Jacob, S., Combs, S., Borm, K., Vliegthart, R., Sikkema, G., Sijtsema, M., van der Schaaf, A., Maduro, J., Langendijk, H., Schuit, E. & Crijns, A., May-2022, In: Radiotherapy and Oncology. 170, p. S722-S723 2 p.
5. **Slice-by-slice deep learning aided oropharyngeal cancer segmentation on PET and CT images**  
De Biase, A., Sijtsema, N. M., Langendijk, J. A., van Dijk, L. V. & van Ooijen, P. M., May-2022, In: Radiotherapy and Oncology. 170, p. S1392-S1394 4 p.

6. **A novel semi auto-segmentation method for head and neck adaptive radiotherapy**  
Gan, Y., Langendijk, J. A., Oldehinkel, E., Scandurra, D., Sijtsema, N., Lin, Z., Both, S. & Brouwer, C., Aug-2021, In: Radiotherapy and Oncology. 161, p. S1412-S1414 4 p.
7. **Deep learning predicts survival for early stage NSCLC patients treated with SBRT**  
Zheng, S., Guo, J., Langendijk, J., Both, S., Veldhuis, R., Oudkerk, M., van Ooijen, P., Wijsman, R. & Sijtsema, N., Aug-2021, In: Radiotherapy and Oncology. 161, p. S375-S376 2 p.
8. **Improved robustness in oesophageal cancer treatment by diaphragm based position verification**  
Visser, S., den Otter, L. A., Ribeiro, C. O., Korevaar, E. W., Both, S., Langendijk, J. A., Muijs, C. T., Sijtsema, N. M. & Knopf, A., Aug-2021, In: Radiotherapy and Oncology. 161, p. S515-S516 2 p.
9. **Outcome prediction for the prognosis of head and neck cancer patients based on deep learning**  
Guo, J., Zhai, T., van der Schaaf, A., Steenbakkers, R. J. H. M., Both, S., Langendijk, J. A., van Ooijen, P. M. A. & Sijtsema, N. M., Aug-2021, In: Radiotherapy and Oncology. 161, p. S71-S72 2 p.
10. **Reduction of post-operative toxicity in esophageal cancer patients after model based proton therapy**  
Muijs, C., Dieters, M., Mul, V. E., Niezink, A. G., van de Schaaf, A., Sijtsema, N. M., Visser, S., Klinker, P., van Etten, B., Korevaar, E. & Langendijk, J. A., Aug-2021, In: Radiotherapy and Oncology. 161, p. S714-S715 2 p.
11. **Development and Internal Validation of an NTCP-model for Acute Coronary Events after Breast Cancer Radiotherapy: First Results of the MEDIRAD BRACE Study (H2020-Euratom-1.4 / 755523)**  
Spoor, D., Leeuwen, F. E. V., Russell, N., Boekel, N. B., Jacob, S., Combs, S. E., Borm, K., Vliegthart, R., Sikkema, G., van den Bogaard, V. A. B., Sijtsema, M., Maduro, J. H., Shuit, E., Langendijk, H. & Crijs, A. P. G., 1-Nov-2020, In: International Journal of Radiation Oncology Biology Physics. 108, 3, p. S11-S12 2 p.
12. **External validation of individual nodal failure prediction models including radiomics in HNC**  
Zhai, T., Wesseling, F., Langendijk, J., Shi, Z., Kalendralis, P., Van Dijk, L., Hoebbers, F., Steenbakkers, R., Dekker, A., Wee, L. & Sijtsema, N., Nov-2020, In: Radiotherapy and Oncology. 152, p. S301-S301 1 p.
13. **Is the 4D planning CT representative for breathing motion of esophageal tumors during treatment?**  
Roos, Q., Faiz, Z., Dieters, M., Laan, van der, H. P., Otter, den, L., Plukker, J. T. H. M., Both, S., Langendijk, J. A., Knopf, A., Muijs, C. T. & Sijtsema, N. M., Nov-2020. 1 p.
14. **Is the 4D planning CT representative for breathing motion of esophageal tumors during treatment?**  
Roos, Q., Faiz, Z., Dieters, M., Van der Laan, H. P., Den Otter, L. A., Plukker, J. T. M., Both, S., Langendijk, J. A., Knopf, A., Muijs, C. T. & Sijtsema, N. M., Nov-2020, In: Radiotherapy and Oncology. 152, p. S1060-S1060 1 p.
15. **Prognostic outcome prediction for head and neck cancer patients using convolutional neural networks**  
Guo, J., Zhai, T., Steenbakkers, R. J. H. M., Both, S., Langendijk, J. A., Van Ooijen, P. M. A. & Sijtsema, N. M., Nov-2020, In: Radiotherapy and Oncology. 152, p. S982-S982 1 p.
16. **Robustness Evaluation Using Dose Accumulation in Head and Neck IMPT**  
Wagenaar, D., Kierkels, R. G. J., van der Schaaf, A., Meijers, A., Scandurra, D., Sijtsema, M., Korevaar, E. W., Steenbakkers, R., Knopf, A., Langendijk, J. A. & Both, S., 1-Sept-2019, In: International Journal of Radiation Oncology Biology Physics. 105, 1, p. E744-E745 2 p.
17. **The REACT-Study - a Comprehensive Data Set of REpeated 4D CTs and Cbcts to Prepare for Pencil Beam Scanned Proton Therapy (PBS-PT) in Lung and Esophagus Patients**  
Knopf, A., Muijs, C., Wijsman, R., Meijers, A., Ribeiro, C. O., Visser, S., den Otter, L., van der Laan, H. P., Anakotta, M., Roos, C. T. G., Korevaar, E. W., Sijtsema, M., Both, S. & Langendijk, J. A., 1-Sept-2019, In: International Journal of Radiation Oncology Biology Physics. 105, 1, p. E752 1 p.
18. **Evaluation of AlignRT for deep inspiration breath hold positioning and intrafraction monitoring**  
Hamming, V., Visser, C., Busz, D., Batin, E., Langendijk, J. A., Both, S. & Sijtsema, N. M., Apr-2019, In: Radiotherapy and Oncology. 133, p. S277-S278 2 p.
19. **MR-Delta image biomarkers to identify partial HNC responders that advance to complete responders**  
Van Dijk, L. V., Zhai, T., Van Dijk, M., Bijl, H. P., Vemer-van der Hoek, J. G. M., Dieters, M., Sijtsema, N. M., Steenbakkers, R. J. H. M. & Langendijk, J. A., Apr-2019, In: Radiotherapy and Oncology. 133, p. S521-S522 2 p.
20. **Pre-treatment radiomic features predict individual nodal failure in head and neck cancer**  
Zhai, T., Steenbakkers, R. J. H. M., Van Dijk, L. V., Vemer-van den Hoek, J. G. M., Bijl, H. P., Dieters, M., Noordzij, W., Van der Schaaf, A., Sijtsema, N. M. & Langendijk, J. A., Apr-2019, In: Radiotherapy and Oncology. 133, p. S204 1 p.
21. **Probabilistic Dose Accumulation Based Evaluation of Head and Neck Intensity Modulated Proton Therapy**  
Wagenaar, D., Kierkels, R. G. J., Van der Schaaf, A., Reis, M. R., Meijers, A., Scandurra, D., Sijtsema, M., Korevaar, E., Knopf, A., Van den Hoek, A., Langendijk, J. A. & Both, S., Apr-2019, In: Radiotherapy and Oncology. 133, p. S42-S43 2 p.
22. **The effect of automatic heart contouring on model performance in predicting acute coronary events**  
SPOOR, D., Peters, F., Van den Bogaard, V., Van der Schaaf, A., Ta, B., Vliegthart, R., Kierkels, R., Langendijk, H., Maduro, J., Sijtsema, M. & Crijs, A., Apr-2019, In: Radiotherapy and Oncology. 133, 1, p. S393 1 p.
23. **Can we safely reduce the radiation dose to the heart in esophageal cancer patients?**  
Beukema, J. C., Kawaguchi, Y., Langendijk, J. A., Luijk, P. V., Sijtsema, N. M., Schaaf, A. V. D., Teshima, T. & Muijs, C. T., Apr-2018, In: Radiotherapy and Oncology. 127, p. S55-S56 2 p.

24. **Evaluation of a 3D surface imaging system for patient positioning and intra-fraction monitoring**  
Hamming, V. C., Visser, C., Both, S. & Sijtsema, N. M., Apr-2018, In: Radiotherapy and Oncology. 127, Suppl. 1, p. S509 1 p.
25. **Geometric image biomarker changes at the third treatment week predict late xerostomia**  
Vedelaar, T. A., Van Dijk, L. V., Zhai, T., Brouwer, C. L., Langendijk, J. A., Steenbakkers, R. J. H. M. & Sijtsema, N. M., Apr-2018, In: Radiotherapy and Oncology. 127, p. S536 1 p.
26. **Parotid gland fat related Magnetic Resonance Image biomarkers improve prediction of late xerostomia**  
Van Dijk, L. V., Thor, M., Steenbakkers, R. J. H. M., Apte, A., Zhai, T., Borra, R., Lee, N., Langendijk, J. A., Deasy, J. O. & Sijtsema, N. M., Apr-2018, In: Radiotherapy and Oncology. 127, p. S95-S96 2 p.
27. **Prognostic value of CT based image biomarkers for treatment outcome in head and neck cancer patients**  
Zhai, T. T., Van Dijk, L. V., Langendijk, J. A., Sijtsema, N. M. & Steenbakkers, R. J. H. M., Apr-2018, In: Radiotherapy and Oncology. 127, p. S223-S224 2 p.
28. **Optimizing B-Spline Deformable Image Registration Between Planning CT and Cone-Beam CT in Head and Neck Cancer Patients**  
Nakano, M., Kierkels, R., Hanaoka, S., Korevaar, E., Imae, T., Haga, A. & Sijtsema, M., Jun-2017, In: Medical Physics. 44, 6, 1 p.
29. **OC-0070: 18F-FDG PET image biomarkers improve prediction of late radiation-induced xerostomia**  
Dijk, L. V. V., Noordzij, W., Brouwer, C. L., Burgerhof, J. G. M., Langendijk, J. A., Sijtsema, N. M. & Steenbakkers, R. J. H. M., May-2017, p. S35 - S36. 2 p.
30. **Prognostic Image Biomarkers for Nasopharyngeal Cancer Patients Treated With (Chemo)Radiation**  
Zhai, T. T., van Dijk, L. V., Lin, Z., Huang, B., Ribeiro, C. O., Langendijk, J. A., Steenbakkers, R. J. & Sijtsema, N. M., 1-Oct-2016, In: International Journal of Radiation Oncology Biology Physics. 96, Supplement 2, p. E372 2918.
31. **OC-0067: An automated patient-specific and quantitative approach for deformable image registration evaluation**  
Kierkels, R. G., Brouwer, C. L., Steenbakkers, R. J., Bijl, H. P., Langendijk, J. A. & Sijtsema, N. M., Apr-2016, p. S29 - S30. 2 p.
32. **OC-0261: CT Image biomarkers improve the prediction of xerostomia and sticky saliva**  
Sijtsema, N. M., Dijk, L. V. V., Brouwer, C. L., Beukinga, R. J., Schaaf, A. V. D., Burgerhof, H. G. M., Langendijk, J. A. & Steenbakkers, R. J. H. M., Apr-2016, p. S121. 1 p.
33. **Predicting Response to Neoadjuvant Chemoradiotherapy in Esophageal Cancer by Textural Features Derived from Pretreatment FDG-PET Scans**  
Beukinga, J., Hulshoff, J., Sijtsema, M., van Dijk, S., Muijs, K., Burgerhof, H., Kats, G., Slart, R., Slump, K., Mul, V. & Plukker, J., Feb-2016, In: Annals of Surgical Oncology. 23, p. S160-S160 1 p.
34. **EP-1890: Accurate organs at risk contour propagation in head and neck adaptive radiotherapy**  
Zhai, T. T., Bijl, H. P., Langendijk, J. A., Steenbakkers, R. J., Brouwer, C. L., Laan-Boomsma, H. J. V. D., Sijtsema, N. M. & Kierkels, R. G., 2016, p. S893 - S894. 2 p.
35. **PV-0477: Early CT image biomarkers change and xerostomia score are strong predictors for late xerostomia**  
Dijk, L. V. V., Brouwer, C. L., Beukinga, R. J., Schaaf, A. V. D., Laan, H. P. V. D., Burgerhof, H. G. M., Langendijk, J. A., Steenbakkers, R. J. H. M. & Sijtsema, N. M., 2016, p. S227 - S228. 2 p.
36. **OC-0259: Validation of a multi-atlas based auto-segmentation of the heart in breast cancer patients**  
van Dijk-Peters, F. B. J., Sijtsema, N. M., Kierkels, R. G. J., Vliegenthart, R., Langendijk, J. A., Maduro, J. & Crijs, A., Apr-2015, In: Radiotherapy and Oncology. 115, Supplement 1, p. S132-S133 2 p.
37. **PD-0529: CT image features associated with patient-rated xerostomia after radiotherapy for head and neck cancer**  
Wagenaar, D., Schaaf, A. V. D., Sijtsema, N. M., Dijk, L. V. V., Langendijk, J. A., Steenbakkers, R. J. H. M. & Brouwer, C. L., Apr-2015, p. S256 - S257. 2 p.
38. **Rigid Dose Transformation as a Surrogate for Dose Recalculation When Assessing the Need for Adaptive Re-Planning in Head and Neck Cancer Patients**  
Kierkels, R. G. J., Pickup, L. C., Gooding, M. J., Free, J., Langendijk, J. A., Brouwer, C. L., Bijl, H. P. & Sijtsema, N. M., 1-Sept-2014, In: International Journal of Radiation Oncology Biology Physics. 90, p. S107-S107 1 p.
39. **OC-0579: Decision support for re-planning in head and neck cancer patients treated with adaptive radiotherapy**  
Kierkels, R. G. J., Pickup, L. C., Gooding, M. J., Free, J., Langendijk, J. A., Brouwer, C. L. & Sijtsema, N. M., 2014, p. S227. 1 p.
40. **EP-1259: Influence of the type of headrest (individual or standard) on the actual given dose in target volumes and organs at risk**  
Free, J., Wittendorp, P. W. H., Brouwer, C. L., Schaaf, A. V. D., Langendijk, J. A., Veld, A. A. V. ., Steenbakkers, R. J. H. M. & Sijtsema, N. M., 2013, p. S475 - S476. 2 p.
41. **OC-0341: Robustness of swallowing-sparing proton therapy for head and neck cancer**  
Laan, H. P. V. D., Brouwer, C. L., Korevaar, E. W., Veld, A. A. V. ., Sijtsema, N. M. & Langendijk, J. A., 2013, p. S133. 1 p.

## Awarded grants

**Deep learning Algorithms for Medical image Evaluation (DAME)**, P.M.A. van Ooijen and N.M. Sijtsema. EU INTERREG Deutschland Nederland. Project period: October 2017 - October 2021. **Proton Therapy Research Infrastructure: ProTRAIT**. Prof.dr. J.A. Langendijk, Prof.dr.ir. A. Dekker, dr.ir. N.M. Sijtsema, KWF Pilot infrastructure Initiative proposal. Project period: February 2018 - Februari 2021.

## Invited lectures

**NTCP-model enrichment using radiomics**. Sijtsema, N.M., Opening Symposium Proton Therapy @ Groningen (Groningen 6 June 2018). Invited lecture. **Image biomarkers to improve prediction of treatment outcome in radiotherapy**. Sijtsema, N.M., Noordelijke Refereeravond Radiotherapie. Advance imaging for radiotherapy. (Groningen, 9 oktober 2018). Invited lecture. **Protontherapie in Groningen en het ProTRAIT project**. Sijtsema, N.M., KWF bijeenkomst Hoogezand. (Hoogezand, 1 november 2018), invited lecture. **Image biomarkers add to clinical feature in predicting the overall survival in head and neck cancer patients**. Sijtsema, N.M., Radiomics 2017. (Clearwater Beach, VS, 23 Oktober 2017). Invited lecture.