Purpose: Current criteria that use change in tumor size for assessment of tumor response to therapy (a) categorize therapeutic efficacy values, inappropriate for patient-specific and deterministic studies, (b) neglect the natural growth characteristics of tumors, (c) are based on post-treatment tumor shrinkage (cytotoxic effect), inappropriate for new generation of cytostatic therapies, and (d) do not accommodate integration of functional/biological means of therapeutic efficacy assessed with, e.g. PET or MRI, into data from anatomical changes in tumor. The aim of this study was to develop a general tumor response model based on the effect of therapy on kinetics of tumor growth.

Materials and methods: The specific growth rate of tumor, SGR=(1/V) dV/dt (V=tumor volume at time t), is a result of the challenge between cell proliferation rate, CPR, and cell loss rate, CLR, within tumor. Assuming that an effective treatment may decrease the CPR (cytostatic effect) and/or increase the CLR (cytotoxic effect), which consecutively decreases the SGR of tumor; a quantity for tumor response was formulated in relation to pre- and post-treatment volumes of tumor. Tumor response values were analyzed for a group of 11 Non-Hodgkin's lymphoma patients treated with ^{131}I-labeled anti-B1 antibody.

Results: Tumor response was found to be equal to the logarithm of the ratio of post-treatment tumor volume to the volume of corresponding untreated tumor. Results from the new tumor response model indicated that neglecting the natural growth characteristics of tumors, results in underestimation of treatment effectiveness calculated based on currently used criteria. The presented model may also facilitate integration of data from tumor size changes into data from functional imaging for therapeutic efficacy assessment, e.g. PET or MRI.

Conclusions: Tumor response to therapy can be assessed with a general continuous dimensionless quantity for both cytotoxic, e.g. radiation therapy, and cytostatic treatments.