Dipartimento Integrato Interistituzionale
DIPINT

Primo Workshop

Clinical Research and Innovation

Venerdì 4 luglio 2014 9.00 - 19.00

Aula Magna - Polo Fibonacci - Largo Pontecorvo 3, Pisa

REGIONE TOSCANA

DISTRETTO TOSCANO SCIENZE DELLA VITA

COMUNE DI PISA

Quantitative imaging and imaging biobanks: a forefront international project in diagnostic imaging

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Disclosure

- ***Chair ESR Working Group on Imaging Biobanks***
- ***Member Quantitative Imaging Biomarkers Alliance Europe***
- ***Member ESR eHealth SubCommitte***

- ***Member RSNA Radiology Informatics Committee***

ESR European Society of Radiology

100 YEARS RSNA Radiological Society of North America

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journal homepage: www.elsevierhealth.com/journals/crad

From genotype to phenotype

The biology underlying molecular imaging in oncology: from genome to anatome and back again

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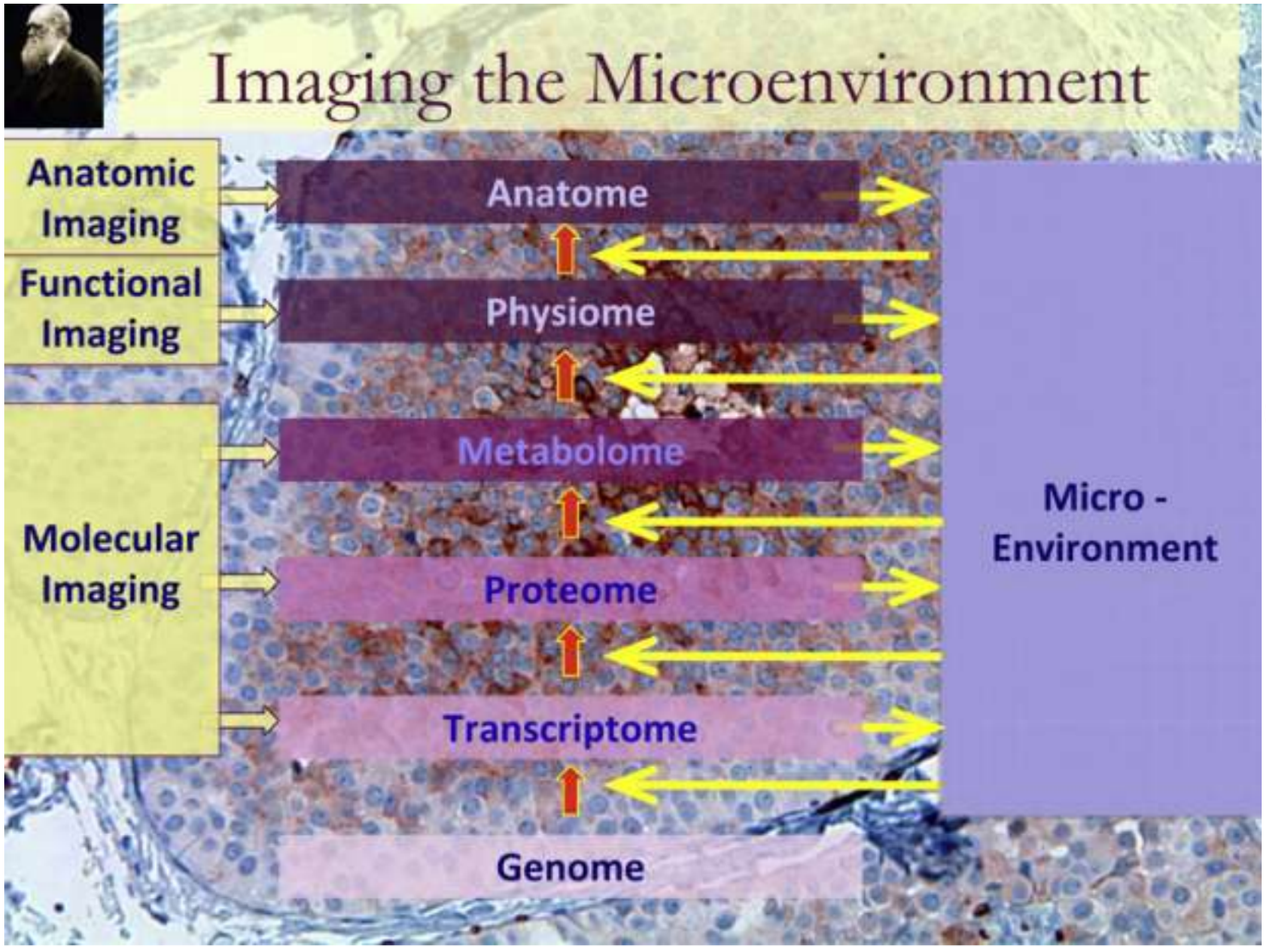
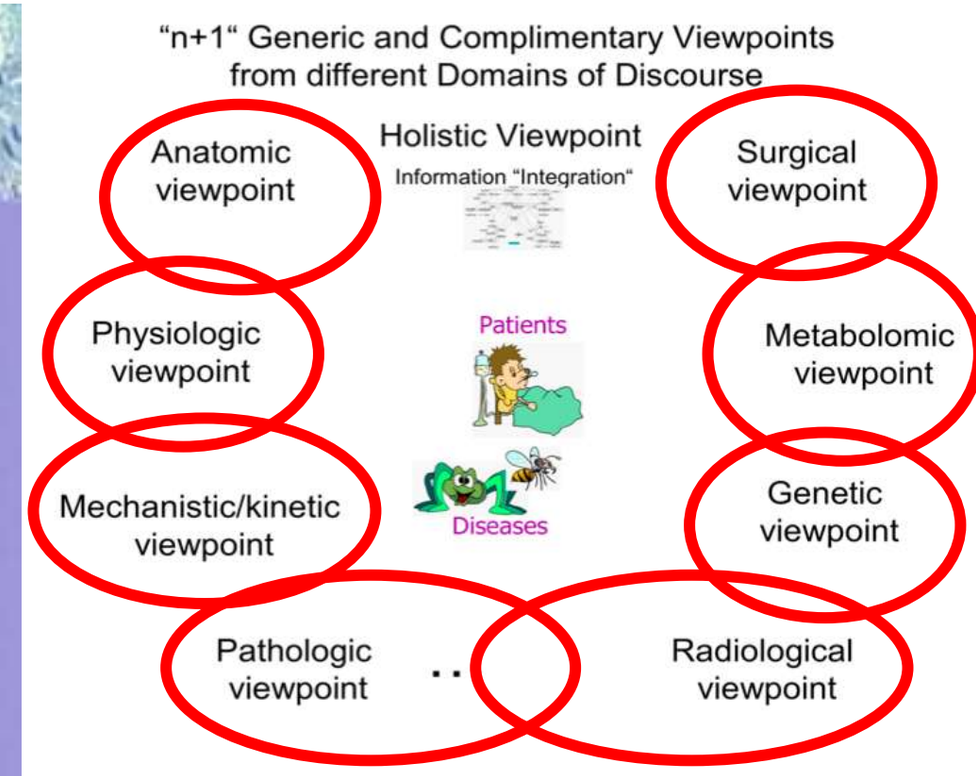
H Lee Moffitt Cancer Center and Research Institute, Tampa, FL 33602, USA





Anatomic Imaging

Functional Imaging

Big data = Imaging Biomarkers

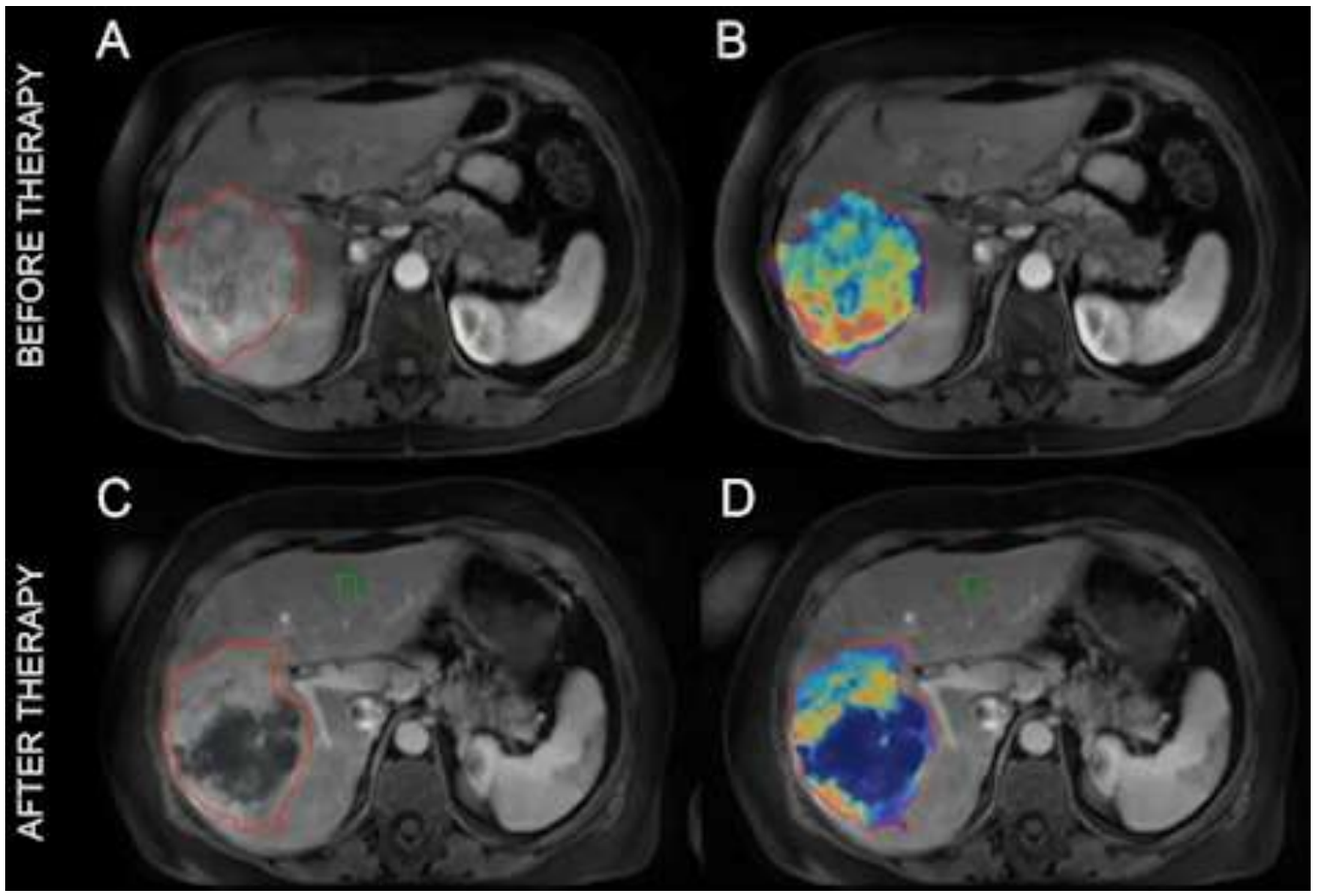
Molecular Imaging

Horizon 2020 and the Big Data issue

Horizon 2020 and the Big Data issue

What is Quantitative Imaging?

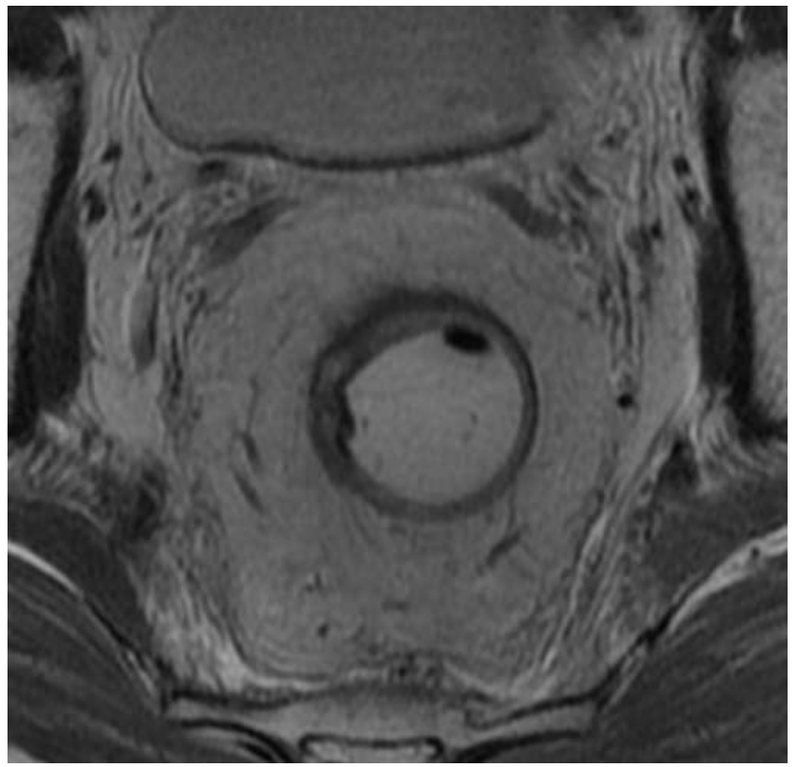
Quantitative imaging is the extraction of quantifiable features from medical images for the assessment of normal or the severity, degree of change, or status of a disease, injury, or chronic condition relative to normal. Quantitative imaging includes the development, standardization, and optimization of anatomical, functional, and molecular imaging acquisition protocols, data analyses, display methods, and reporting structures. These features permit the validation of accurately and precisely obtained image-derived metrics with anatomically and physiologically relevant parameters, including treatment response and outcome, and the use of such metrics in research and patient care.

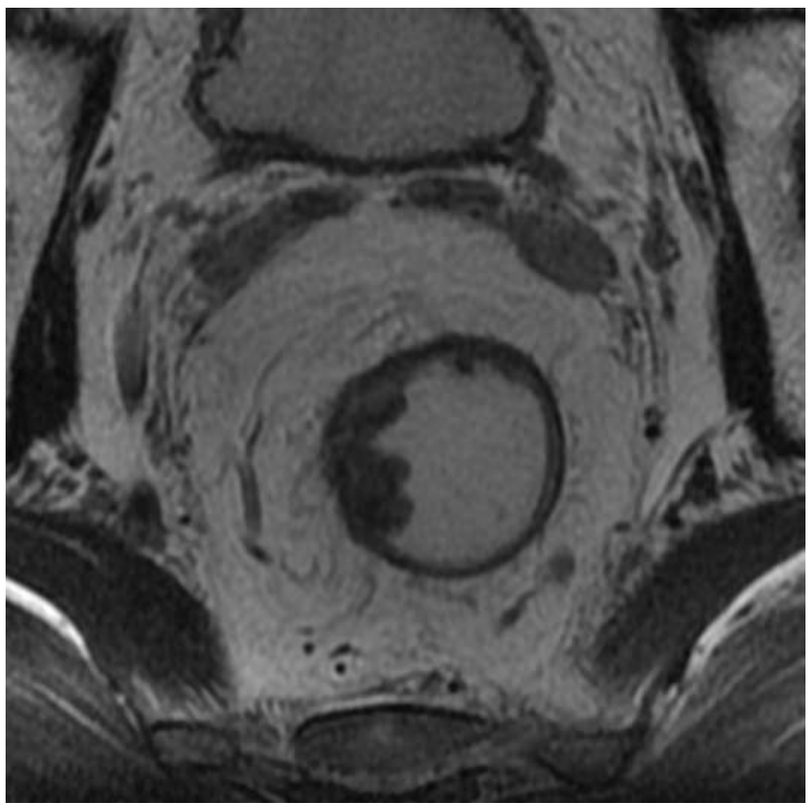


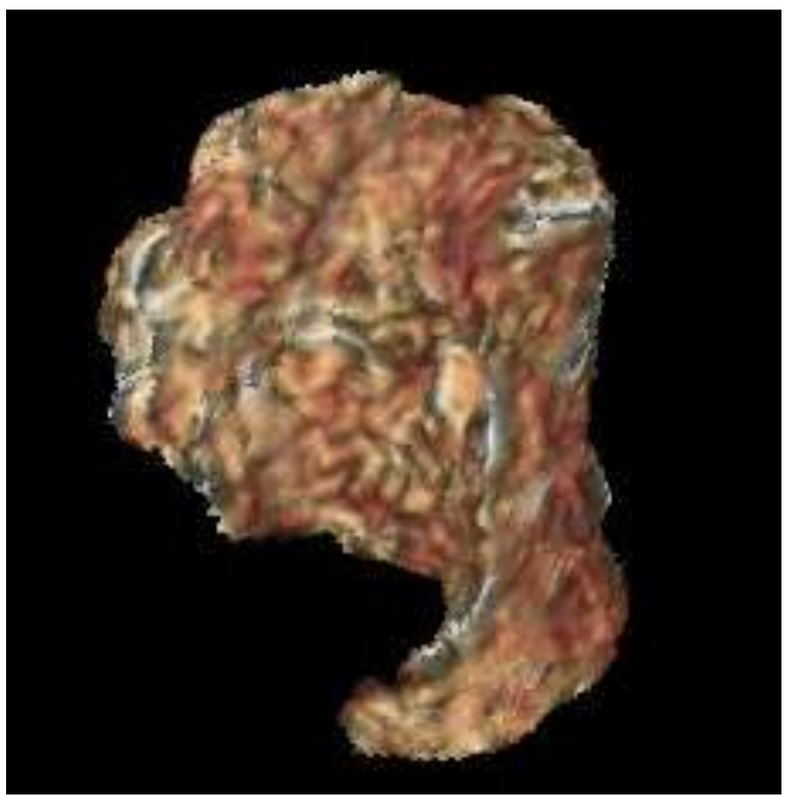
Extraction of quantifiable features from medical images (i.e. oncologic imaging)

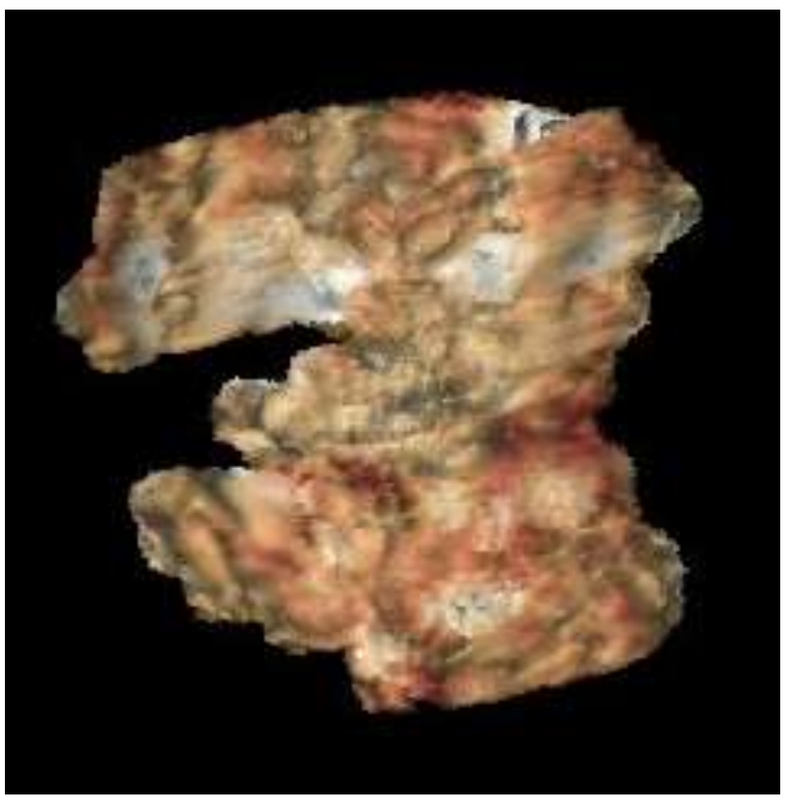
- Volume (vital vs non-vital tumor tissue)
- Contrast enhancement (tumor neo-angiogenesis)
- Diffusion wighted Imaging (tumor cellularity)
- MR spectroscopy (metabolite composition)
- PET (metabolic activity)
- Ultrasound - Elastosonography (tissue elasticity)

Measurable oncologic biomarker: tumor volume





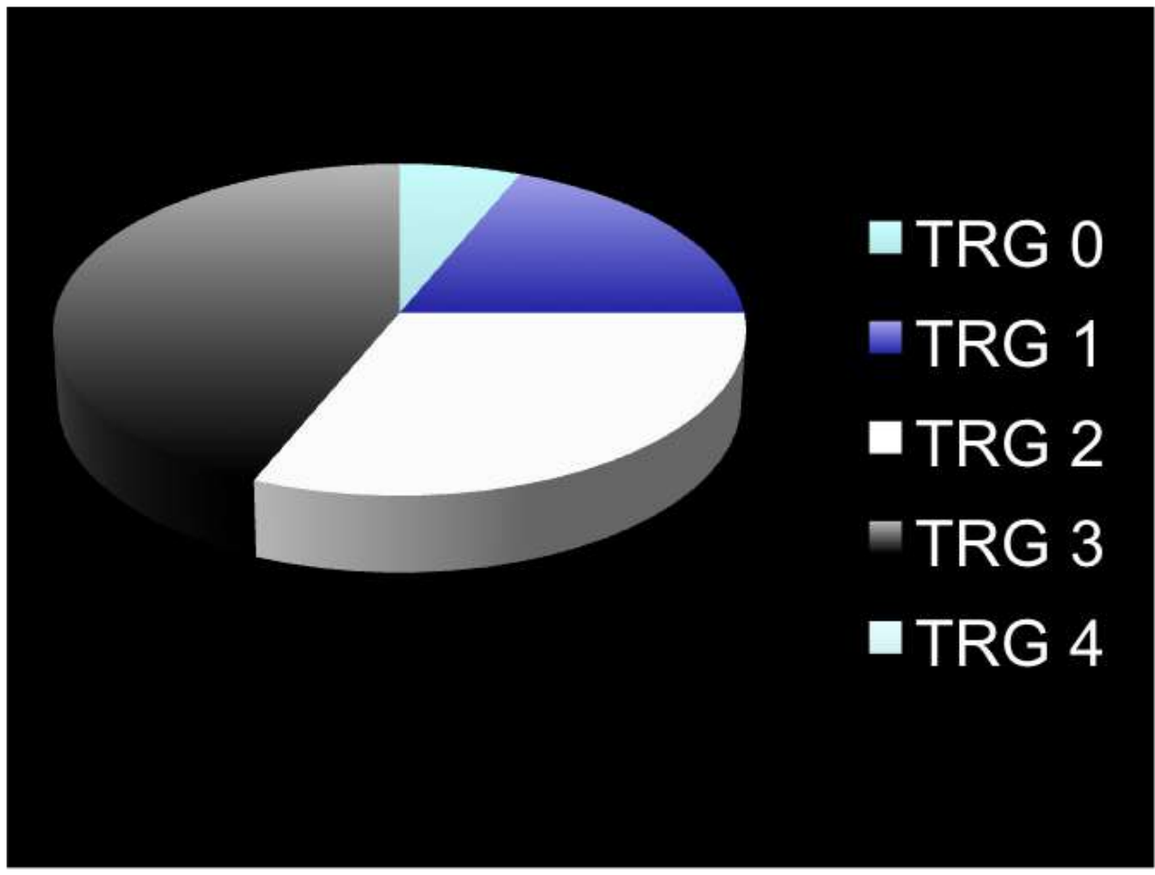




New diagnostic strategy
Identification of patients responder vs non-responder to chemo- and radio-therapy

Tumor Rregression Grade - Dworak

0. No regression
1. Predominantly tumor with significant fibrosis and/or vasculopathy
2. Predominantly fibrosis with scattered tumor calls (slightly recognizable histologically)
3. Only scattered tumor cells in the space of fibrosis with/without acellular mucin
4. No vital tumor cells detectable



TRG 4 correlate with a tumor volume reduction >80%

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Magnetic Resonance Imaging 30 (2012) 1234–1248

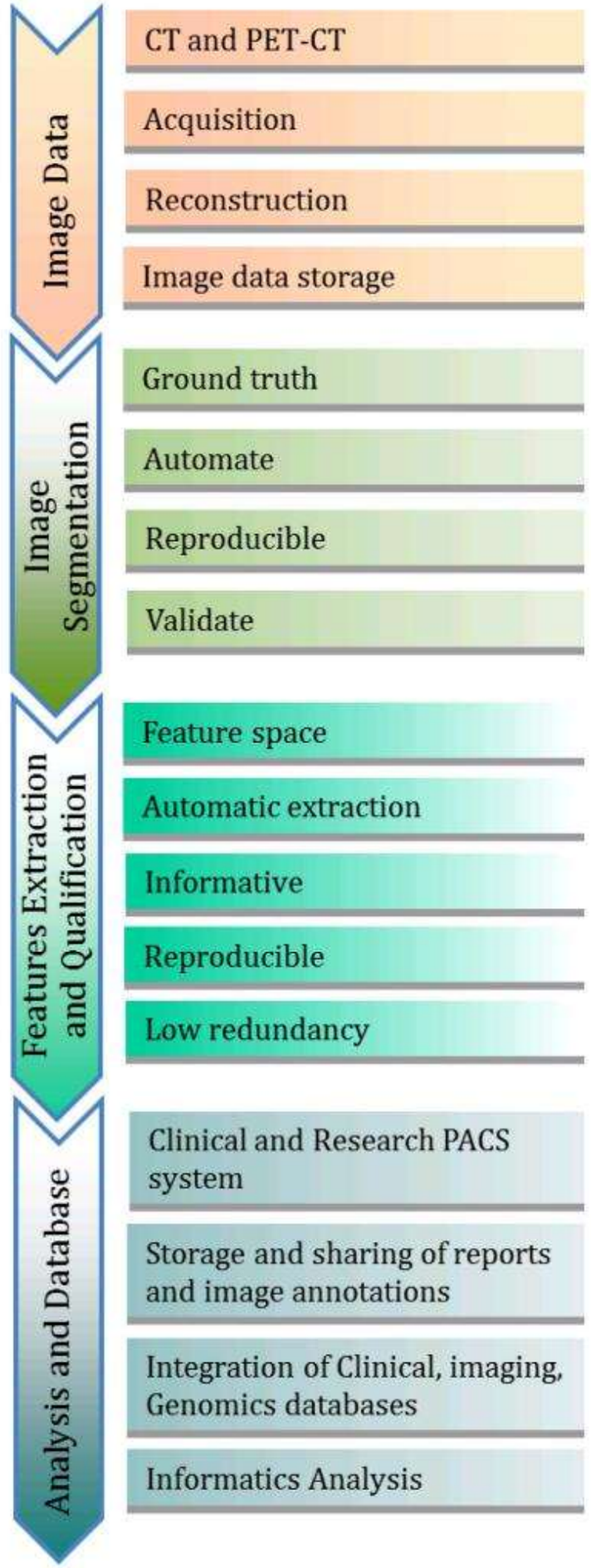
MAGNETIC RESONANCE IMAGING

Radiomics: the process and the challenges

Virendra Kumar[a], Yuhua Gu[a], Satrajit Basu[b], Anders Berglund[c], Steven A. Eschrich[c], Matthew B. Schabath[d], Kenneth Forster[e], Hugo J.W.L. Aerts[f,h], Andre Dekker[f], David Fenstermacher[c], Dmitry B. Goldgof[b], Lawrence O. Hall[b], Philippe Lambin[f], Yoganand Balagurunathan[a], Robert A. Gatenby[g], Robert J. Gillies[a,g,*]

Radiomics

“Radiomics” refers to the extraction and analysis of large amounts of advanced quantitative imaging features with high throughput from medical images.



Mission Statement
ESR Working Group on Imaging Biobanks

European Society of Radiology

MISSION

Horizon 2020 and the Big Data issue

- **To promote the development of imaging biobanks and intelligent tools (CAD) for the analysis and processing of imaging biomarkers.**

- **To promote the standardisation, validation and benchmarking of the imaging data included in those biobanks.**

- **To stimulate the linking and integration of existing (national and regional) image data repositories.**

- **To stimulate the link between imaging biobanks and traditional biobanks through the development of standards.**

- **To explore the economical, ethical/legal issues for the management of imaging biobanks.**

European Commission

RESEARCH & INNOVATION

Health

HORIZON 2020

Personalised medicine starts with the patient.

However, rather than having a unique treatment for each individual person, patients can be sub-divided into groups based on their individual biological genetic and genomic characteristics.

By this stratification of patients, medical interventions can be tailored to be more effective and have fewer undesirable side effects for this particular group, than the currently dominating "one size fits all" medical approach.

European Alliance for Personalised Medicine

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