Gadolinium Deposition:
What We Know and Don't Know,
A Research Roadmap Workshop

No Evidence of Harm!

What is GDD?

What is GAP?

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PATIENT	Patient #
	Hospital
	Country
	Diagnosis
	Treatment
	Comorbidities
GBCA	Age at first GBCA injection
	Age at first enhanced MR scan
	Progressive #eMRI scan
	GBCA type (unconfounded)
	GBCA type (confounded)
	Number injections
	Total GBCA Volume recorded
MR SETUP	B0 (Tesla)
	Vendor
	Coil
	Coil channels
	Gradient strenght
	SE or GRE
	2DFT or 3DFT
	TR (ms)
	TE (ms)
	Flip angle
	TI (ms)
	Slice thk (2D)
	Slab thickness (3D)
	Voxel volume
	FOV
	Matrix
	NEX/averages
	Receiver bandwidth
MR MEASURES	DN to Pons Ratio First scan
	DN to Pons Ratio Last scan
	T1 relaxometry
	..
	..
	..
	..
	..
	..

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February 15-16, 2018 – Bethesda (MD)

Conflicts of Interest

Bayer Healthcare-Speaker Agreement.

Dose-Dependent Effects (chronic exposure)?

Long-Term Retention and Gd^{+++} Deposition

Cumulative amount of deposited gadolinium

To reach a threshold for toxicity (if any)

Increased Risk at threshold dose

Time Challenges the hypotheses

Predictable effect

If any: rare events of patients with symptoms after very high cumulative doses

Exposure Effects (idiosyncratic reaction)?

No Gd^{+++} Deposition

No threshold dose (in clinical range)

Gadolinium/GBCA - Drug Interactions

Gadolinium/GBCA – Protein binding

Gadolinium/GBCA and Immune system

Unpredictable effect

If any: rare events of patients with symptoms after exposure to GBCA (immune sensitization is theoretically possible)

Big data to increase
epidemiological signal to noise ratio

OPPORTUNITIES:

Identifications of vulnerable patients

Differences between GBCA molecules? Large datasets with unconfounded exposure and clinical / imaging outcome

Body symptoms/signs in CNS disease patients

Neurological symptoms/signs in NON-CNS disease patients

Gadolinium tissue topographic distribution (intra / extracellular in brain, skin, bone, liver etc.) – biosamples –
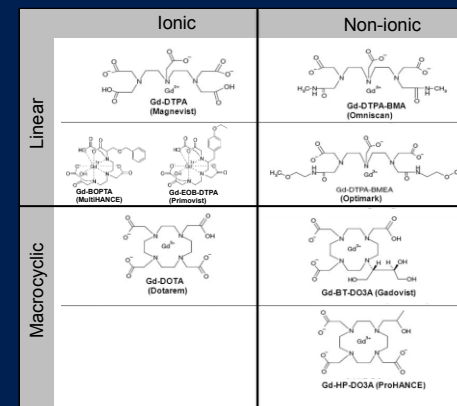
PITFALLS:

Data validation among centers, institutions, national registries

Systematic Errors

Disease-Related Effects introduced by the pathological processes and treatments (especially in the scenario of long-term dose-dependent effects of gadolinium deposition)

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International and European Gadolinium Retention Evaluation Consortia I-GREC & E-GREC
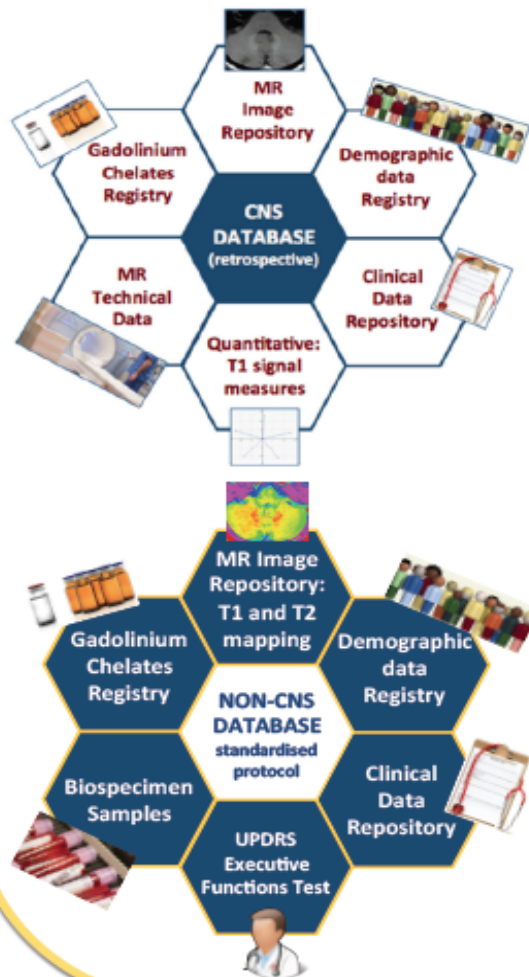
✧ Multi-center MR image repository

✧ Gad Retention Clinical data repository

✧ Demographic registry

✧ Bio-banking repository

✧ International Database for Big data mining

✧ Gateway to resource utilization

✧ Scientific consultation of Regulatory agencies

✧ Epidemiology Resource

✧ Source of Clinical Guidelines

www.igrec.net

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Quattrocchi et al. ESMRMB 2016
Quattrocchi & Van der Molen Radiology 2017