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# Impact of the updated MRI-Guidelines: real-world data on gadolinium-based contrast agent usage in Germany

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## Background

- Magnetic Resonance Imaging (MRI) plays a crucial role in diagnosing and monitoring multiple sclerosis (MS)
- Gadolinium-based contrast agents (Gd) are administered intravenously ➔ visualize new (<6 weeks old) or active cranial or spinal lesions in T1-weighted images
- Safety concerns exist due to potential accumulation and side effects of contrast agents
- International guidelines were recently adapted (2021) ➔ limiting Gd use to cases where additional benefit is expected (confirming MS diagnoses or when no suitable reference MRI is available)

## Objectives

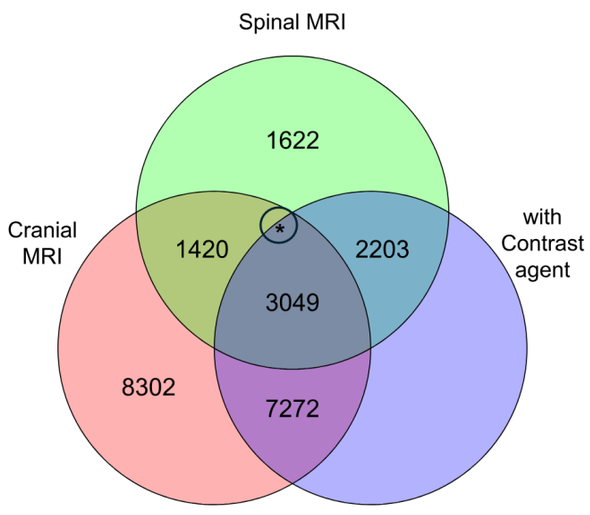
- To investigate the impact of the 2021 MAGNIMS-CMSC-NAIMS consensus recommendations on the use of MRI on Gd use

## Methods

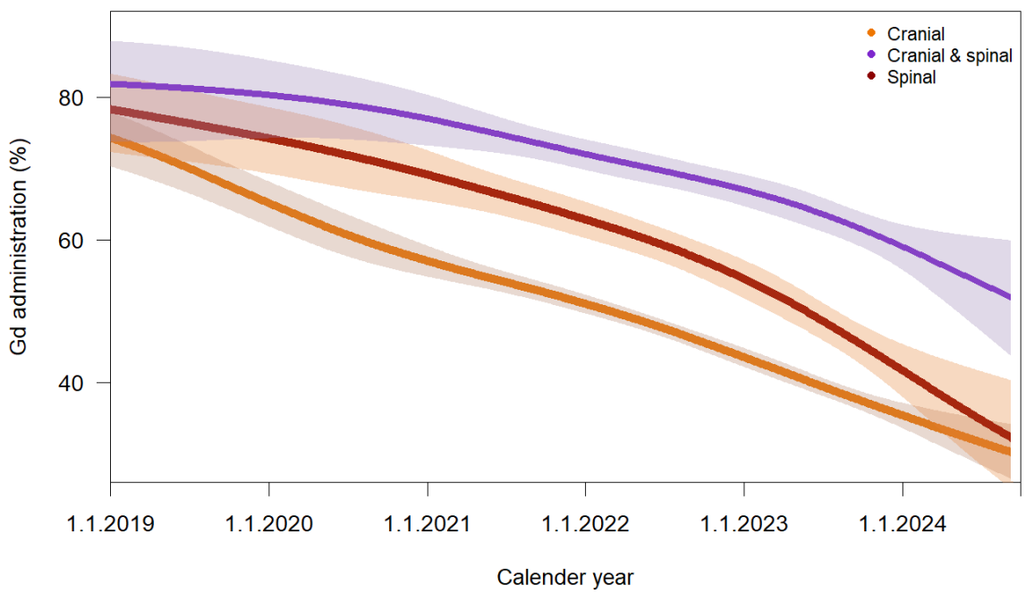
- Inclusion: patients with MS (PwMS) who underwent MRI examinations reported in the German MS Register (GMSR) since 2019
- The frequency of Gd administration was analyzed by generalized additive models with calendar year as a continuous, possibly nonlinear effect, stratified by the location, i.e. cranial / spinal / combined cranial and spinal

## Results

- Data from 12,833 PwMS who had 23,934 documented MRI visits from 2019 to 2024 ➔ 15,574 cranial only, 3,825 spinal only and 4,469 cranial + spinal combined (Fig. 1)




◀ **Figure 1.** Venn diagram of MRI examinations since January 1, 2019 by type: cranial vs. spinal separated by with vs. without contrast agent administration. *There are 66 MRI examinations in which both a cranial and a spinal MRI were performed, but Gd was only used in one type of MRI (Gd may have been given between both MRI). These rare cases were excluded from further analyses.




◀ **Figure 2.** Frequency of Gd administration in MRI examinations by type/location of examination and calendar year. The shaded areas represent the associated 95% confidence intervals.

- Early 2020 ➔ early 2024: Almost linear decrease of frequency of cranial (74.2% ➔ 41.16%, p<0.001), spinal (78.2% ➔ 39.2%, p<0.001) and combined MRI exams (81.8% ➔ 59.0%, p<0.001) with Gd use (Figure 2)
- Greatest reduction in Gd use within the first 5 years of the disease (Figure 3)
- Progression of contrast agent reduction may exhibit variability between MS centers (Figure 4)

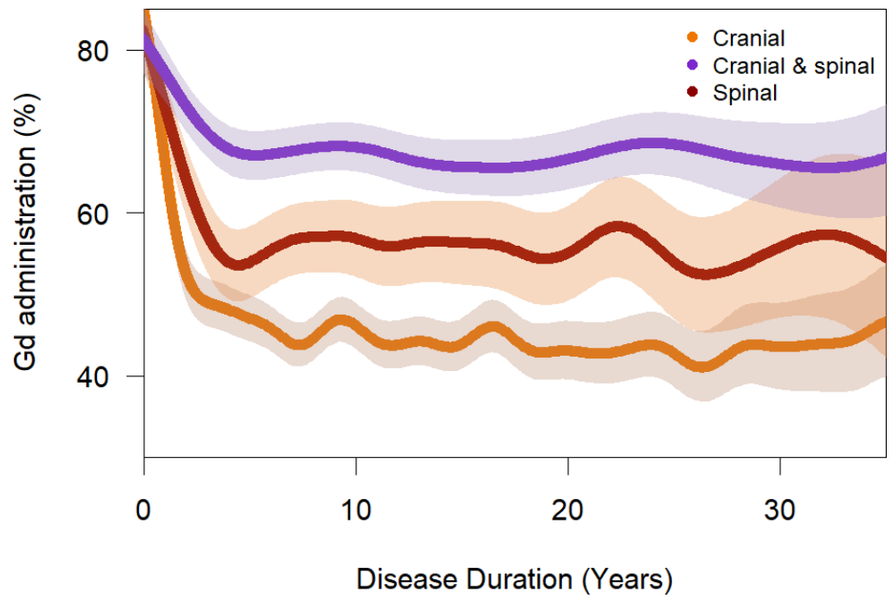



**Figure 3.** Frequency of contrast agent administration in MRI examinations broken down by type/location of examination and duration of disease. The shaded areas represent the corresponding 95% confidence intervals.

### Monitoring heterogeneity among centers

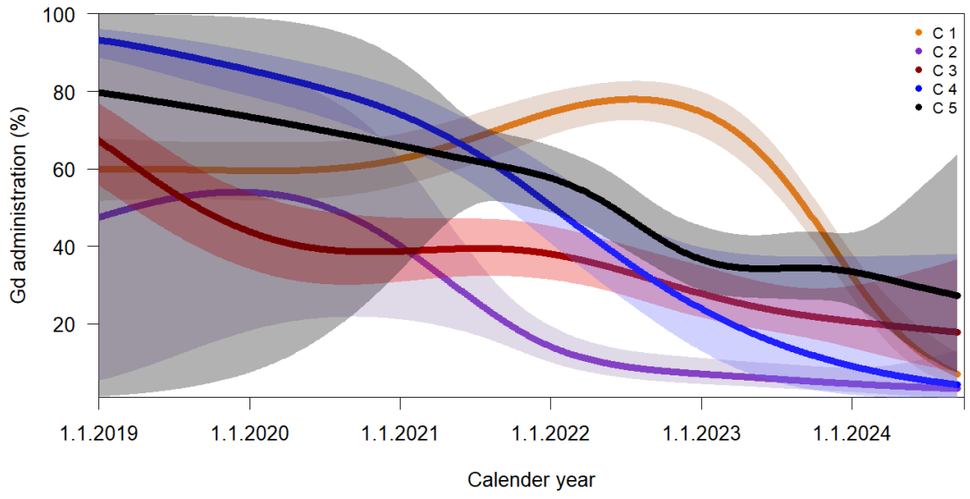



**Figure 4.** Frequency of Gd use in cranial MRI examinations on a per center level. The figure shows a sample of the 5 centers (C1-C5) with the largest amount of cranial MRI conducted. In a logistic model the heterogeneity (random effect) was found to be statistically significant (p<0.001).

## Conclusions

- Highly significant decline in the proportion of Gd administration during cranial and spinal MRI examinations from 2019 onwards
- Swift adoption of the international consensus guidelines in the German healthcare setting
- Reasons for the current use of Gd in more than 1/3 of MRI remain to be further investigated

**Declaration of interest:** Niklas Frahm is an employee of the MSFP. Moreover, he is an employee of Rostock's University Medical Center and received travel funds for research meetings from Novartis. None resulted in a conflict of interest. Melanie Peters, David Ellenberger, Maximilian Bardo and Mathia Kirstein had no personal financial interests to disclose other than being employees of the German MS Registry. Alexander Stahmann has no personal financial interests to disclose, other than being the leader of the German MS Registry, which receives (project) funding from a range of public and corporate sponsors, recently including G-BA, The German Retirement Insurance, The German MS Trust, German MS Society, Biogen, Bristol Myers Squibb, Merck, Novartis and Roche. None resulted in a conflict of interest. Peter Flachenecker has received speaker's fees and honoraria for advisory boards from Almirall, Bayer, Biogen Idec, BMS-Celgene, Coloplast, Genzyme, GW Pharma, Hexal, Janssen-Cilag, Novartis, Merck, Roche, Sanofi, Stadapharm and Teva. None resulted in a conflict of interest. Tim Friede has received personal fees for statistical consultancies (including data monitoring committees) from Actimed, Aslan, Bayer, BiosenseWebster, BMS, CSL Behring, Daiichi Sankyo, Enanta, Fresenius Kabi, Galapagos, IQVIA, Immunic, KyowaKirin, LivaNova, Minoryx, Novartis, PINK! gegen Brustkrebs, PPD, RECARDIO, Recordati, Relaxera, Roche, Servier, Viatris, Vifor, and VICO Therapeutics. Kerstin Hellwig has received speaking fees and/or institutional grant support from Bayer, Biogen, BMS, Merck Serono, Novartis, Roche, Sanofi-Genzyme, and Teva. None resulted in a conflict of interest. Dagmar Krefting has nothing to disclose. Michaela Mai is an employee of the German MS Society, federal association, which receives funding from a range of public and corporate sponsors, recently including BMG, G-BA, The German MS Trust, Biogen, BMS, Merck Serono, Novartis, Roche, Sanofi, and Viatris. None resulted in a conflict of interest. Clemens Warnke has received institutional support from Novartis, Alexion, Sanofi Genzyme, Biogen, Merck and Roche. None resulted in a conflict of interest. Uwe K. Zettl has received speaking fees, travel support and /or financial support for research activities from Alexion, Almirall, Bayer, Biogen, Bristol Myers Squibb, Janssen, Merck Serono, Novartis, Octapharma, Roche, Sanofi Genzyme, Teva as well as EU, BMBF, BMWi and DFG. None resulted in a conflict of interest. Marc Pawlitzki received honoraria for lecturing and travel expenses for attending meetings from Alexion, ArgenX, Bayer Health Care, Biogen, Hexal, Merck Serono, Novartis, Roche, Sanofi-Aventis, Takeda and Teva. His research is funded by ArgenX, Biogen, Demecan, Hexal, Horizon Merck Serono, Novartis, Roche, Viatris, Takeda and Teva