# QUANTIFYING GADOLINIUM WASTE AND IDENTIFYING AREAS FOR WASTE REDUCTION

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# PURPOSE

- Create a process map to identify areas where gadolinium is currently wasted
- Quantify how much gadolinium is wasted at AHWFB
- Contribute to the generalizable knowledge and encourage a greater focus on conservation of GBCA's among radiologists



Hypothesis: this exercise will reveal opportunities to improve gadolinium utilization and minimize unnecessary waste, with associated cost savings

# BACKGROUND

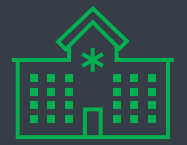
- Gadolinium-based contrast agents (GBCA's) are the primary intravenous contrast agents used in MRI studies due to a combination of safety and efficacy.
- GBCA's are primarily excreted through the kidneys, entering the wastewater system predominantly within the first 24 hours after administration.
- Environmental contamination also occurs through improper disposal and lack of recycling systems.
  - Notably GBCA's are largely resistant to standard wastewater treatment processes, which allows for their persistence in aquatic ecosystems.

# METHODS

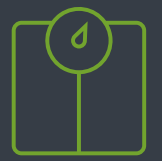
MRI technicians were instructed to dispose of used GBCA vials, syringes, and power injectors in collection bins instead of their usual disposal for 5 weeks.



Bins were placed in three separate MRI facilities targeting 6 total MRI scanners.



The waste from each vial was collected into a single container and weighed, then divided by the published weight of gadolinium (1.3g/ml) to give a ml quantity of waste. Injectors and syringes were recorded according to their measured ml amounts.





The collected waste was then disposed of according to the usual procedures.

# RESULTS

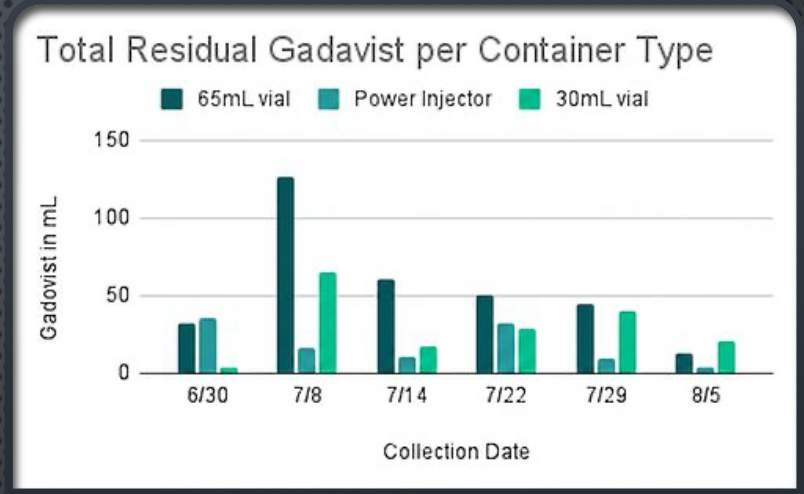
Average of 122.8 mL of GBCA wasted/week across 6 MRI scanners

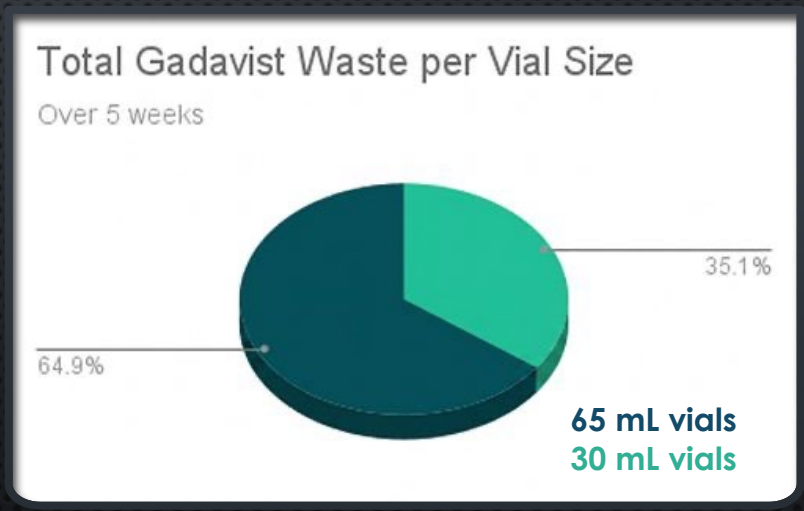
More waste was consistently seen with use of the 65mL vials (2.53mL vs 2.25 mL)

Using the Mann U Whitney analysis, there was a Z-score of 8.8566, with a P-value <0.00001 demonstrating significant difference in the waste between the 65mL and 30mL vial sizes

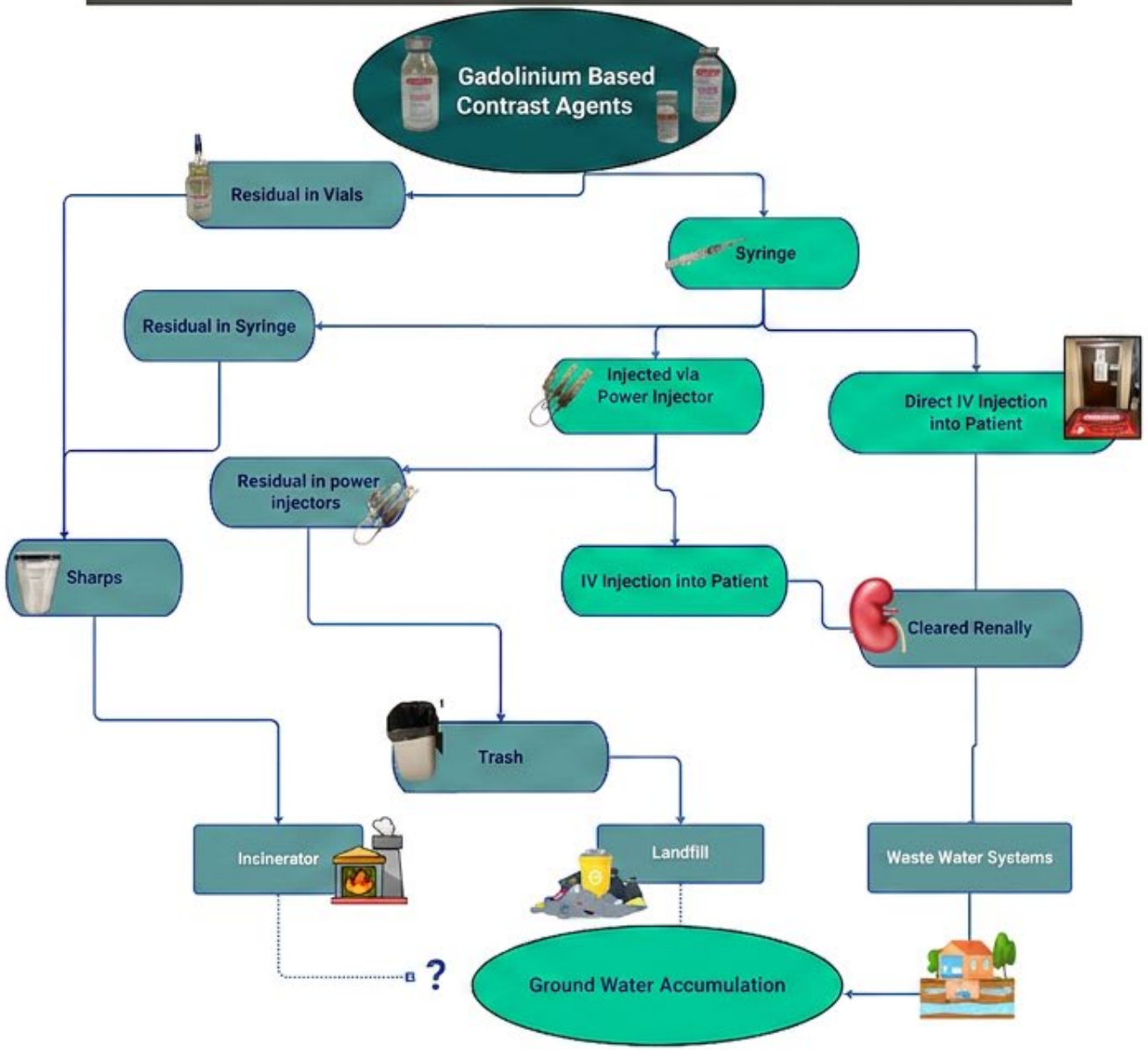
Sporadic large waste was noted as outliers to typical procedure – these scenarios included patients canceling the procedure after gadolinium had been pulled into a syringe, or bottles expiring before full usage

* Notably, even with "fully used" vials, there was always a minimum residual despite best efforts to extract via syringe due to limitations with manufacturing design of the vials



# FATE OF GADOLINIUM IN MRI




| | |
|---|---|
| | Starting Gadolinium Contrast Agent |
| | Ready to Use Gadavist |
| | Used Gadavist or Waste Products |
| | Dispozal Method/Tract |
| | Final Destination |
| ..... | Unproven Final Destination/Connection |
| ——— | Known Connection/Path |

# CONCLUSION

- While standard procedures minimize gadolinium waste, there are areas for improvement and future exploration.
- These include but are not limited to:
  - manufacturer vial optimization
  - recycling unused GBCA
  - discovery of fate and breakdown of incinerated GBCA versus GBCA sent to the landfill
  - improving compliance with existing procedures

