Association of Heavy Precipitation with In-Center Dialysis Treatment Absenteeism

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Introduction and Objective

- Dialysis treatment absenteeism (i.e., skipping a treatment for reasons other than hospitalization) is associated with greater risk for poor clinical outcomes.[1]
- Adverse weather (e.g., excessive rainfall or snow accumulation) may pose additional challenges to treatment attendance for dialysis patients dependent upon public transportation or ride assistance.
- We sought to examine the impact of heavy precipitation (either rain or snow) on absentee rates.

Methods

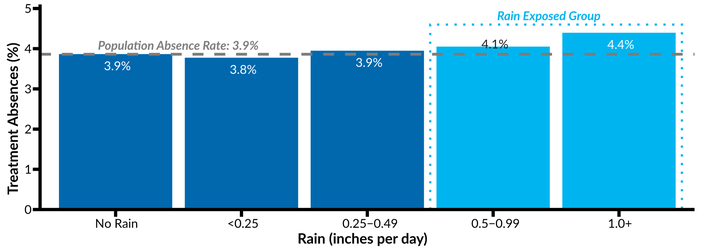
- This study retrospectively compared absentee patterns at 2,780 dialysis clinics at a kidney care organization in the United States on days with and without precipitation during the first half of 2022 (rain or snow, considered separately).
  - Rain Study Period: January 3, 2022 – July 3, 2022 (excluded June 4th due to Tropical Storm Alex and July 2nd due to Tropical Storm Colin)
  - Snow Study Period: January 3, 2022 – April 30, 2022
- Daily precipitation data was gathered from the Global Historical Climatology Network (GHCN) for weather stations near all clinics included in the analysis.
- Weather patterns and absences were considered daily for each clinic during the study periods (excluding Sundays).
- Associations were estimated using a linear mixed model with a random intercept for clinic using a zero-inflated Poisson distribution adjusted for day of the week, calendar month, and United States census region.
- The number of absences attributed to precipitation during the study period were estimated using a recycled predictions method based on observed proportion of days above the thresholds for rain or snow.

Results

Rain Analysis

Overall probability of rain during study period: 35.4%. Overall absentee rate during study period: 3.9%.

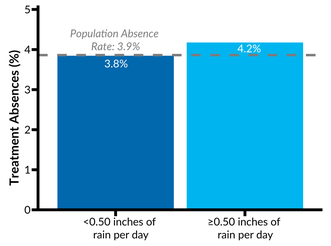
Figure 1. Absenteeism and Rain



Absenteeism is modestly greater when it rains ≥0.5 inches

1 inch = 2.54 cm

Figure 2. Absences Attributable to Rain

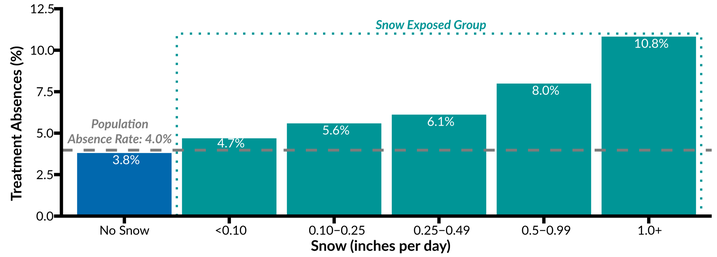


Treatment absences were 4.0% relatively greater on days with ≥0.5 inches of rain.

Snow Analysis

Overall probability of snow during study period: 7.2%. Overall absentee rate during study period: 4.0%.

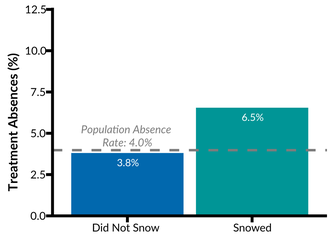
Figure 3. Absenteeism and Snow



1 inch = 2.54 cm

Absenteeism is greater when it snows.

Figure 4. Absences Attributable to Snow



Treatment absences were 52.0% relatively greater on days with snow.

Table 1. Summary of Precipitation Impact on Treatment Absences by Region

Region of US	Absentee Rates			
	Rain ≥0.5 inches (%)	% Change*	Snow (%)	% Change*
Northeast	3.1	0.0	4.8	1.6
Midwest	4.6	0.2	6.2	1.6
South	4.5	0.2	12.5	8.1
West	3.3	0.0	5.4	2.1

*percent change from baseline regional absentee rate

The relationship between snow and absenteeism was stronger for the Southern region (12.5%) than the Midwestern, Northeastern, or Western regions of the US (6.2%, 4.8%, and 5.4% respectively.

Table 2. Summary of Precipitation Impact of Treatment Absences

	Rain <0.50 inches	Rain 0.50+ inches	Did not snow	Snowed
Treatments, n	10,738,565	562,196	6,968,714	467,833
Absences, n (%)	412,906 (3.8%)	23,470 (4.2%)	265,008 (3.8%)	30,632 (6.5%)
aIRR (95% CI) [a]	-	1.04 (1.03-1.06)	-	1.52 (1.49-1.55)
Estimated absences due to precipitation [b]	-	996	-	14,208

[a] Adjusted for day of the week, calendar month, and US census region

[b] Estimated by method of recycled predictions

Conclusions

- These results suggest that weather patterns are associated with dialysis absences; snow had a greater impact compared to rain.
- Proactive rescheduling during periods of inclement weather may represent an opportunity to improve clinical outcomes and treatment adherence.
- Transit authorities that facilitate nonemergent medical transportation should ensure outreach to dialysis patients before arrival of inclement weather.

Limitations

- This was a retrospective, observational study and residual confounding likely affected the results.
- Rain and snow weather data represent 24-hour totals. We were not able to assess rain and snow during clinic operating hours or during certain shifts.
- There was likely some misclassification due to difficulty identifying treatments scheduled at a clinic on a given day using the current information in EHR databases.

References and Acknowledgements

1. Missed Hemodialysis Treatments: International Variation, Predictors, and Outcomes in the Dialysis Outcomes and Practice Patterns Study (DOPPS) Al Salmi, Issa et al. American Journal of Kidney Diseases, Volume 72, Issue 5, 634 - 643

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