Development and Validation of PROACT-RT: An Early-Warning System to Support Radiation Therapy Continuity During Severe Weather

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Background

Severe weather can disrupt access to time-sensitive cancer care, particularly for patients receiving multi-visit treatment such as radiotherapy and chemotherapy.

- Treatment interruptions and prolonged treatment time are associated with worse cancer outcomes.
- In radiation therapy, each week of treatment delay or interruption has been associated with approximately **1–3% relative reductions in disease control or survival**, depending on disease site.
- Yet health systems lack scalable, proactive approaches to identify patients at risk for weather-related disruptions and connect them with support **before treatment is missed**.

Objective: Develop and validate a proactive early-warning system that links severe-weather forecasts with scheduled radiation therapy visits to support treatment continuity.

A winter storm or flood should not determine whether a patient receives cancer treatment on time.

PROACT-RT identifies weather-related risks **early** and connects patients with resources and care teams **before treatment is missed**.

Methods

We developed PROACT-RT, a location-linked clinical informatics pipeline designed to identify patients at risk for weather-related radiation therapy disruption and enable proactive outreach before scheduled treatment visits.

Study population: Adult patients receiving radiation therapy at Dartmouth Cancer Center

Geographic setting: New Hampshire and Vermont

Figure 1. PROACT-RT workflow

1. **Electronic Health Record**
   Patient address and scheduled treatment visit
2. **NOAA Weather Forecasts**
   48-hour meteorologic forecasts
3. **Geocoding and Routing**
   Patient travel route to the treatment facility
4. **Location–Weather Linkage**
   Forecasted hazards matched to patient travel routes
5. **Hazard Threshold Assessment**
   Predefined weather-risk thresholds applied
6. **Patient Alert Triggered**
   Automated notification sent before the scheduled treatment visit

Pipeline validation: We assessed successful linkage of patient location, treatment schedule, travel route, and forecast data and tested alert delivery under predefined weather-risk scenarios.

Current Progress

- **PROACT-RT informatics pipeline developed**, integrating patient location, treatment schedule, travel route, and weather forecast data.
- **Automated patient alert workflow under active testing and refinement.**
- **Patient-facing alert content and support resources developed**, shown below.
- **Patient co-design underway** to refine hazard communication, alert language, and resource navigation, with particular attention to accessibility and populations who may be inadequately served by text-based outreach.
- **Iterative testing underway** to optimize alert timing, language, usability, and resource navigation prior to prospective pilot implementation.

Linked patient resources

Live road conditions & closures
New England 511

Rides to & from appointments
Advance Transit / Access AT

Lodging near the clinic
Maynard House

Call your care team
Reschedule, don't skip

What a delay means
Short, planned changes do not lower your odds

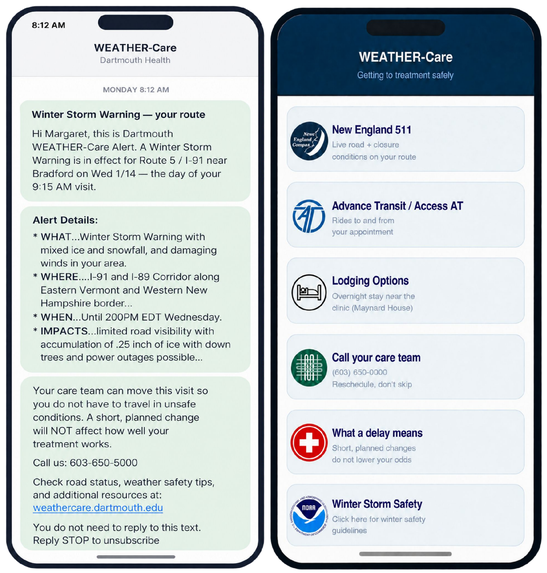


Figure 2. Patient-facing WEATHER-Care alert (left) and the resource page it links to (right).

Future Directions

Next step: prospective pilot evaluation

- Conduct a prospective pilot study during **winter 2027–2028** with approximately **45 patients** receiving radiation therapy.
- Evaluate **feasibility, acceptability, usability, and patient engagement** with PROACT-RT alerts and linked resources.
- Use patient feedback and implementation data to iteratively refine **alert timing, content, and resource navigation**.

Future research

- Evaluate whether PROACT-RT can **reduce weather-related treatment disruptions and improve treatment continuity** at scale.
- Assess **equitable reach and accessibility**, including barriers related to language, digital connectivity, transportation, and technology access.
- Adapt the platform to address **other predictable threats to cancer care delivery** beyond weather-related disruptions.

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