Emesis as a Screening Diagnostic for Low Dose Rate (LDR) Total Body Radiation Exposure


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Abstract: Current radiation disaster manuals list the time-to-emesis (TE) as the key triage indicator of radiation dose. The data used to support TE recommendations were derived primarily from nearly instantaneous, high dose rate exposures as part of variable condition accident databases. To date, there has not been a systematic differentiation between triage dose estimates associated with high and low dose rate (LDR) exposures, even though it is likely that after a nuclear detonation or radiologic disaster, many surviving casualties would have received a significant portion of their total exposure from fallout (LDR exposure) rather than from the initial nuclear detonation or criticality event (high dose rate exposure). In this work, previously published clinical data on emesis after LDR total body irradiation (TBI) is statistically re-analyzed as an illustration of the complexity of the issue and confounding factors. This previously published data includes 107 patients who underwent TBI up to 10.5 Gy in a single fraction delivered over several hours at 0.02 to 0.04 Gy/min. Estimates based on these data for the sensitivity of emesis as a screening diagnostic for low dose rate radiation exposure range from 57.1% to 76.6%, and the estimates for specificity range from 87.5% to 99.4%. Though the original data contain multiple confounding factors, the evidence regarding sensitivity suggests that emesis may have limited reliability for LDR exposures.

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