

Computational Medical Physics: Current Status and Future Directions in Cancer Radiotherapy

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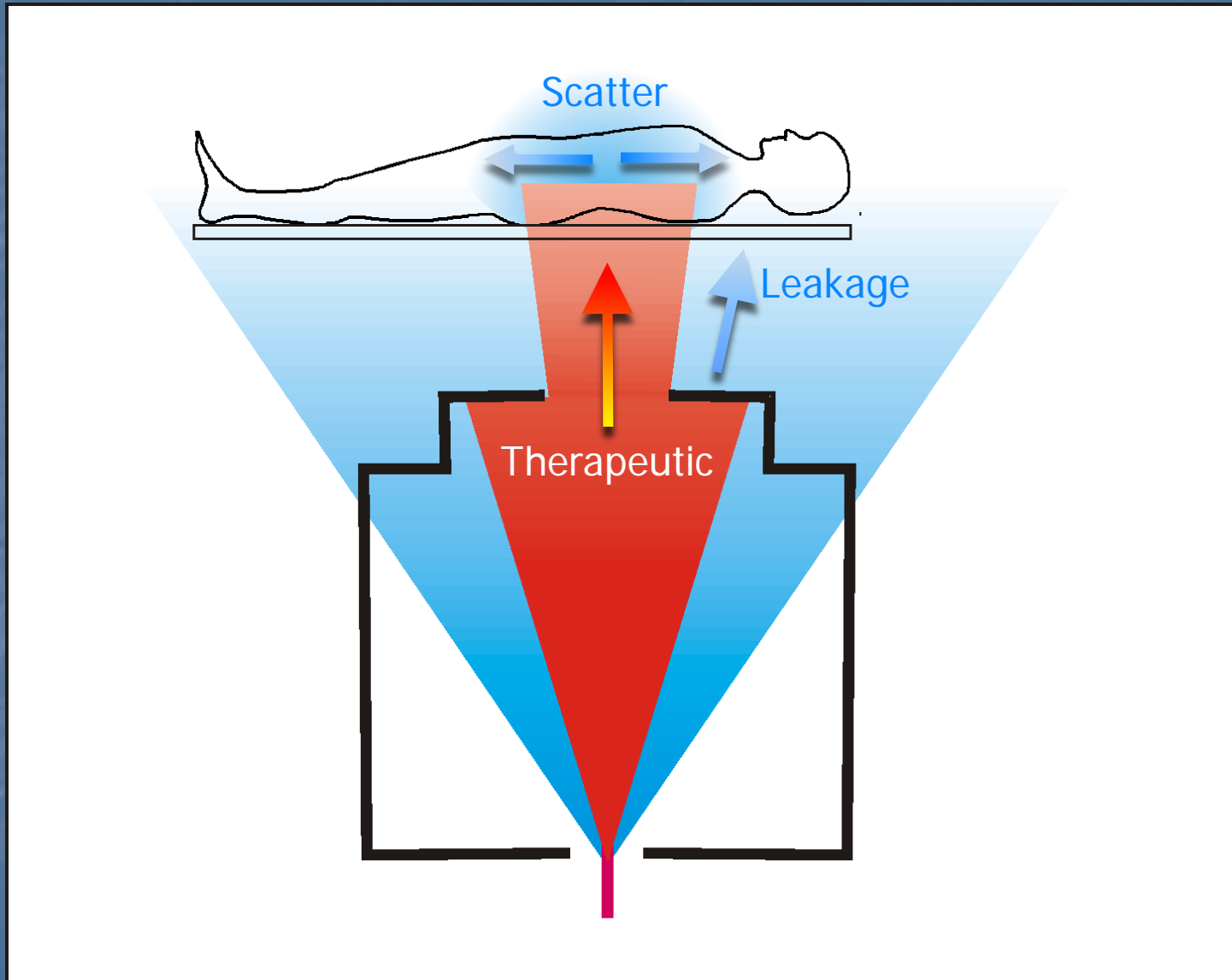


The University of Texas
Graduate School *of* Biomedical Sciences
at Houston

The Spectrum of Research: Med/Health Physics, Nucl Sci & Engr, HPC

- Radiation delivery
- Radiation dose calculation
- Radiation bioeffect calculation
- Radiation risk interpretation

Limitations in Dose Computation Capability



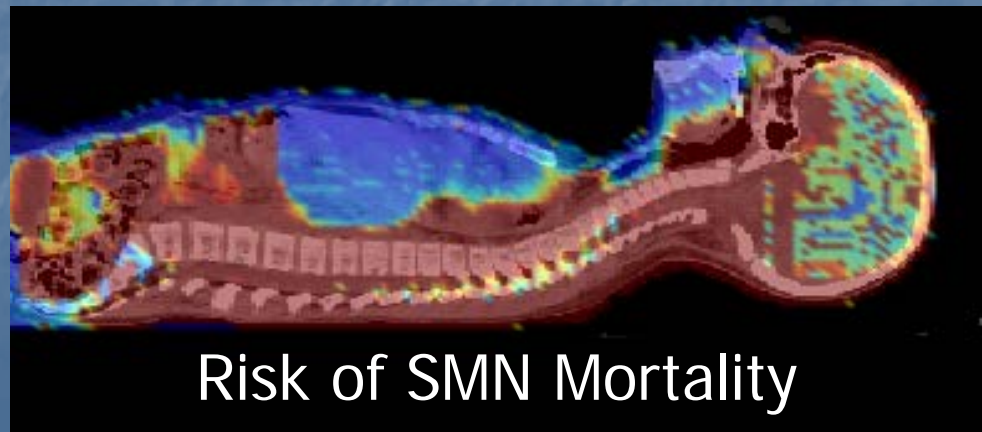
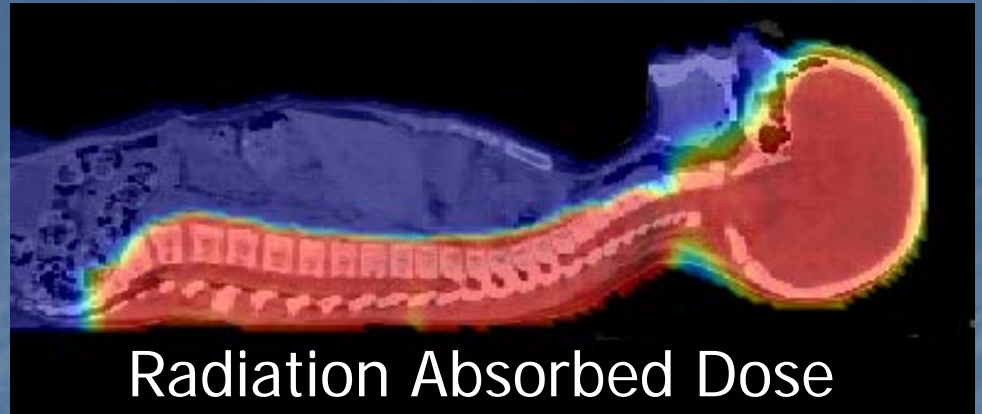
Limitations in Personalized Protection Calculations

Is "dose" enough?

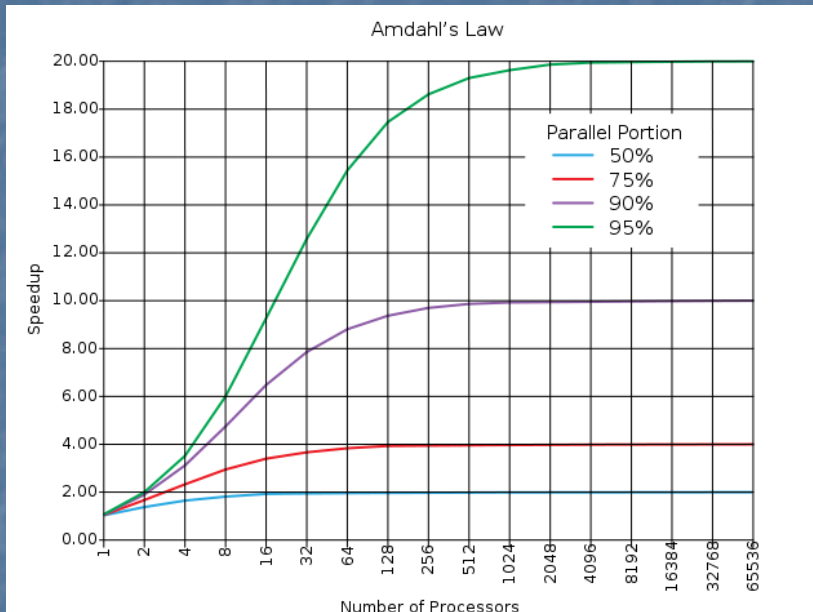
- Absorbed dose?
- Equivalent dose?
- Effective dose?
- Integral dose?
- Ambient dose equivalent?

Is "risk" enough?

- Incidence?
- Mortality?
- Absolute?
- Relative?
- Timepoint?



Amdahl's Law + Moores Law



In parallel computing to predict the theoretical maximum speedup using multiple processors

Rapidly falling cost of computing enables hospitals and clinics to use supercomputing. 8192 CPUs being assembled for MDACC.

Computational methods will play an increasingly important role in realizing the full potential of advanced radiotherapies!

Future Directions of Research

- Goals: Expand (computationally generated) evidence base for making clinical decisions and health care policy decisions.
- **Patients:** *Personalized* calculations of dose and risk to reduce incidence of late effects.
- **Staff:** Improved shielding calculation tools and novel shielding designs will reduce costs and *improve utility* of new facilities.

End