Richard Frank, CMO, SI GP

**SIEMENS**
**Healthineers**

# Quantitative
# Imaging Workshop
# XIV

**Prevent Cancer Foundation**
**Hilton McLean Tysons Corner**
**2017 Oct 2,3**

# Enablers for Population Health
# Lung Cancer Screening

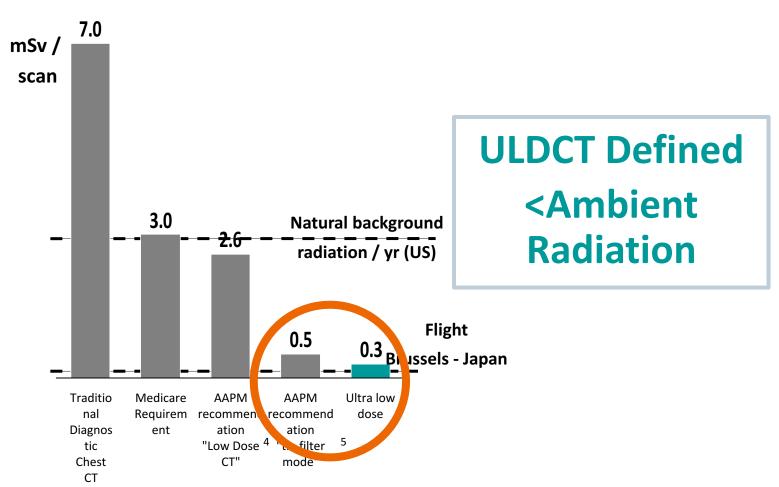**Diagnostic Accuracy**

**Minimal Dose**

**Acceptable Cost**

**Standardization QA, Training**
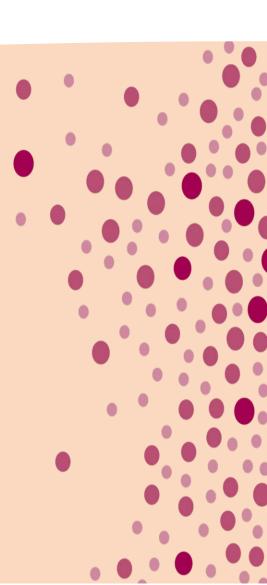
# Define ULDCT-LCS Innovation Reduces Dose

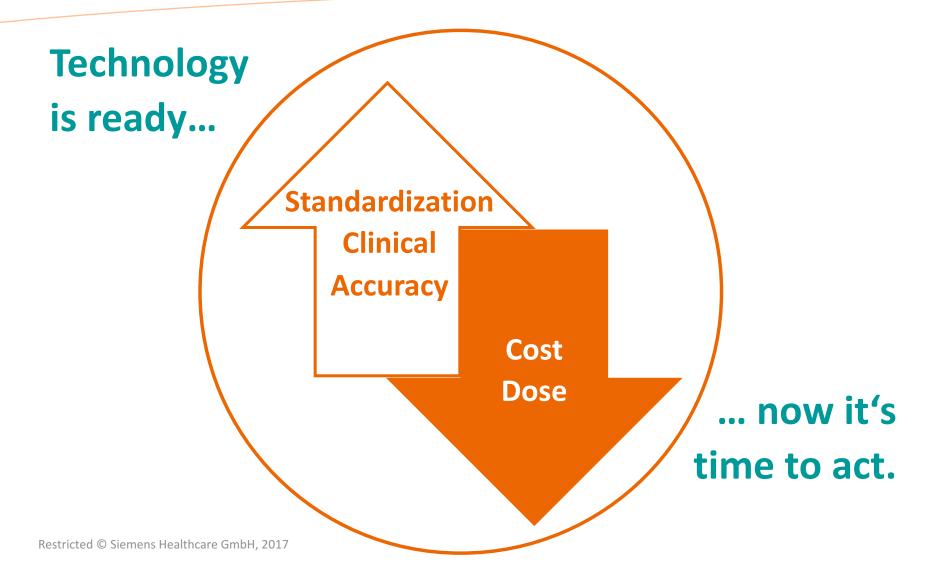# Elements of a LCS Coverage Strategy

- False (+)
  - Ongoing learnings from *cohort* studies
  - 3D standard (learnings from NELSON)

- CAD
  - Quantitation
  - Standardization
  - Longitudinal RoG >, < cross-sectional LCS threshold

- Dose Efficiency
  - Dose for quality; Pop'n health, *shared decision-making*
  - context; ambient radiation, intercontinental flights
  - ULDCT definition

- Long term; LNT theory of radiation risk – CISNET

**SIEMENS**
**Healthineers**

**Technology is ready…**

Standardization
Clinical
Accuracy

Cost
Dose

**… now it's time to act.**

# The Birth of the Illegitimate Linear No-Threshold Model

## An Invalid Paradigm for Estimating Risk Following Low-dose Radiation Exposure

Jeffry A. Siegel, PhD,* Charles W. Pennington, MS, MBA,† Bill Sacks, PhD, MD,‡
and James S. Welsh, MS, MD, FACRO§

**Abstract:** This paper examines the birthing process of the linear no-threshold model with respect to genetic effects and carcinogenesis. This model was conceived >70 years ago but still remains a foundational element within much of the scientific thought regarding exposure to low-dose ionizing radiation. This model is used today to provide risk estimates for cancer resulting from any exposure to ionizing radiation down to zero dose, risk estimates that are only theoretical and, as yet, have never been conclusively demonstrated by empirical evidence. We are literally bathed every second of every day in low-dose radiation exposure due to natural background radiation, exposures that vary annually from a few mGy to 260 mGy, depending upon where one lives on the planet. Irrespective of the level of background exposure to a given population, no associated health effects have been documented to date anywhere in the world. In fact, people in the 1940s that collectively support the existence of a dose-rate threshold at a total dose of 50 R (500 mGy, 1 R = 10 mGy. Note: the conventional unit of the Roentgen (R) was used in the original literature but for consistency, we will use the modern SI unit of the mGy in this paper). This paper then examines the initial application of the LNT model to radiation carcinogenesis, spear-headed by Edward Lewis in 1957. Finally, the inappropriate use of the LNT model to estimate cancer risk that may be associated with low-dose radiation exposures, particularly for patients undergoing medical imaging studies, is discussed.

## BIRTH OF THE LNT MODEL OF RADIATION