REACHING NEW HEIGHTS WITH SGRT

SURFACE GUIDED RADIATION THERAPY
SGRT COMMUNITY

Managing Change: Implementation and Standardization of SGRT

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HCA Healthcare℠

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- **I have no personal stake in or financial benefit from either of these companies.**

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Group Discussion #1

From your own experience starting up SGRT in your clinic:

- **what is the one thing that worked the best, and**
- **what was the one thing that most impeded the process of successful implementation?**

BUT first we'll warm up a little bit…….

Some context and background info

Standardization across the HCA Sarah Cannon Cancer Network

Initial State

- ~ 50 autonomous clinics
- Lack of standardization, scalability
- Lack of interconnectivity
- Software/tech management and implementation managed site-level by IT and Physics
- No formal disaster recovery

Present State

- Centrally managed, standardized, scalable OIS and other technologies
- Network-wide interconnectivity
- Standardized implementation processes and teams
- Unified policy/procedure (growing) library
- Formal disaster recovery

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Clinical experience with SGRT, from small to large networks of clinics

- 2014-2019: rapidly increased use of SGRT and evolving workflows
  - Relatively short break-in period in which many questions/issues were solved
  - Proved the accuracy and efficiency of the system across treatment techniques
- Started “Every Patient, Every Fraction” approach with stereotactic treatments
- Began research study on skin markers vs. SGRT/markerless setup for breast patients (ASTRO 2018)
- **Transitioned our first clinic (single-LINAC) to fully markerless treatments for *all patients* within that year**

Clinical experience with SGRT, from small to large networks of clinics

- 2019 to present: maximize the *efficient* and *standardized* use of SGRT
  - From a handful of SGRT systems to over 40 SGRT systems (with a small number from mixed vendors)
- Focused on the scalability and standardization of the SGRT program:
  - Systematic approach to technology purchasing and configuration
  - Adaptive approach to training and education
  - Building policy and procedures in a data-driven way (including FMEA)
  - **Setting the expectation that SGRT is our standard of care because *every patient and every radiotherapy treatment potentially benefits from this technology***

Now for real: Group Discussion #1

From your own experience starting up SGRT in your clinic:

- **what is the one thing that worked the best, and**
- **what was the one thing that most impeded the process of successful implementation?**

Is your implementation data-driven?

Potential problem:

- ***Sometimes we implement a rollout plan without considering data-driven <u>reasons</u> for our decisions.***

Example:

- ***Only implement SGRT for special procedures like DIBH.***

Efficiency benefits of SGRT for all RT treatments

- 2018 institutional study: 15 pelvic patients (~400 fx) and 19 breast patiens (~250 fx)
  - Half fractions setup with traditional skin marker-based triangulation, versus half fractions setup via SGRT patient alignment, with minimized variables
  - SGRT cohort demonstrated:
  1. ***Reduced*** (≈15-20%) and ***more consistent*** setup times
  2. ***Smaller shift magnitudes*** (based on pre-Tx IGRT), on average approximately half those following skin mark triangulation alone
  3. ***Reduction of repeat imaging*** by over 40%

Efficiency benefits of SGRT for all RT treatments

- 2023 NHS University Hospital Southampton reported **44% reduction of patient in-room time** for prostate and breast patients[1,2] with the implementation of SGRT setup
- 2023 Atrium Wake Forest reported **55% reduction of patient in-room time, 83% reduction in fractions requiring re-imaging, and elimination of skin marks/tattoos** for prostate (*full bladder*) patients[3] with SGRT/postural video
- 2023 Nature Scientific Report found SGRT patient setup both **more geometrically accurate and 18% faster** than similar set via laser alignment to skin markers[4] with 183 patients and 2303 fractions (head, thoracic, abdominal, pelvic)

Efficiency benefits of SGRT for all RT treatments

"SGRT opens the possibility to reduce the number of CBCTs while maintaining sufficient setup accuracy. The advantage is a reduction of imaging dose and overall treatment time."

Rudat, Volker, et al. Nature Scientific Reports volume 13, Article number: 17018 (2023)

Efficiency benefits of SGRT for all RT treatments

"The quality of patient positioning before [radiotherapy] treatments has been optimized by using SGRT without additional imaging dose. SGRT clearly reduced inefficiencies in the patient positioning workflow."

Qubala, Abdallah, et al. Adv Radiat Oncol. 2023 Mar-Apr; 8(2): 101105.

Accuracy benefits of SGRT in SBRT

- Besides more accurate setup leading to reduced in-room time and a reduction in repeat imaging, SGRT has also continuously demonstrated **accurate intrafraction patient positional monitoring**, leading directly to reduction of motion-induced errors.

- 2020-2021 institutional study of lung, abdomen, and pelvic SBRT:
  - 7-10% of SBRT patients are halted based on SGRT monitoring, rescanned, and typically shifted for geometric accuracy (by CBCT)

- At least one study found similar (and more detailed) results:

Accuracy benefits of SGRT in SBRT

- Heinzerling, John H., et al. "**Use of surface-guided radiation therapy in combination with IGRT for setup and intrafraction motion monitoring during stereotactic body radiation therapy treatments of the lung and abdomen**." *JACMP* 21.5 (2020): 48-55.
  - 335 SBRT fractions treated, **during which 34 fractions (25 separate patients) exhibited patient movement beyond 2 mm** (institutional tolerance), as observed using SGRT.
  - **Of these 34 fractions, 74% resulted in <u>shifts of 2 mm or greater</u> based on CBCT realignment.**

Defining a data-driven implementation of SGRT

- Does the rollout plan and intended use-case match what the data actually say about SGRT?
  - Disclaimer: I do not always side with professional guidelines on this point…
- Does the plan for education and training match the data for how new technologies, e.g. SGRT, are rolled out clinically?
- Do written policies and procedures focus on and completely address the most important areas of implementation and safety?

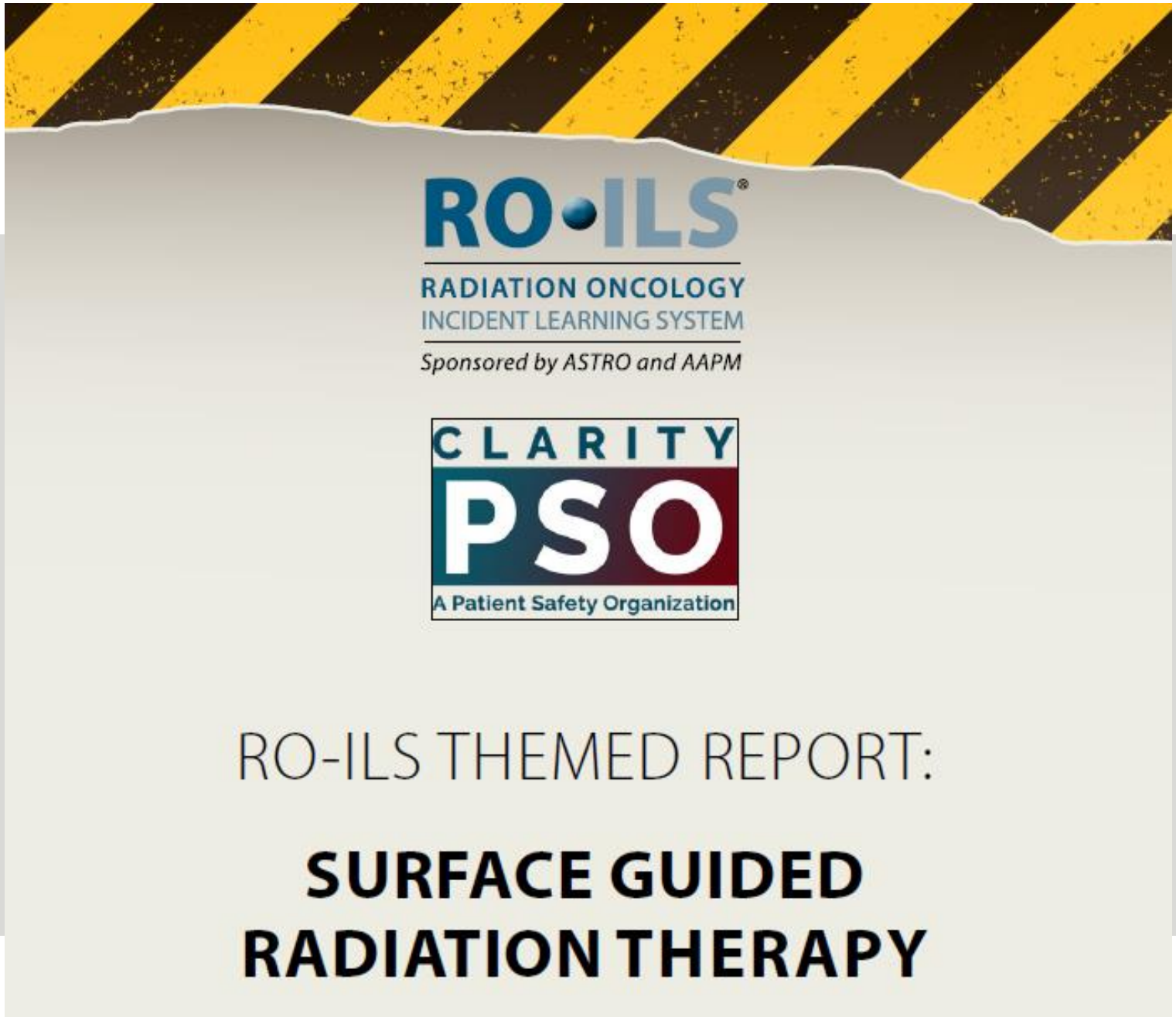
Is your implementation plan transparent with clear expectations?

Potential problem:

- ***Sometimes we implement a rollout plan without transparency to the entire treatment team, setting clear expectations and timelines.***
- ***Higher level: implementation of new technology can be dangerous!***

“Surface imaging is a tool that has the potential to be value additive and act as a safety barrier. However, its value is dependent on the way in which it is implemented, and care must be taken when implementing any new technology to prevent the introduction of new error pathways.”

RO-ILS Themed Report (2021): Surface Guided Radiation Therapy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Setting clear expectations and timelines

Particularly important for *training* and *documentation of competency*

- Is your training plan consistent, complete, and documented **for the entire team?**
- Have you established written policies and protocols **in advance of the actual clinical implementation of SGRT?**

Highly scientific models of effective and ineffective training

Group Discussion #2

From your own experience starting up SGRT in your clinic:

- **what training method or technique was most conducive to learning and retention?**
- **what training method or technique really didn't work so well?**

Highly scientific models of effective and ineffective training

School or Vendor

Highly scientific models of effective and ineffective training

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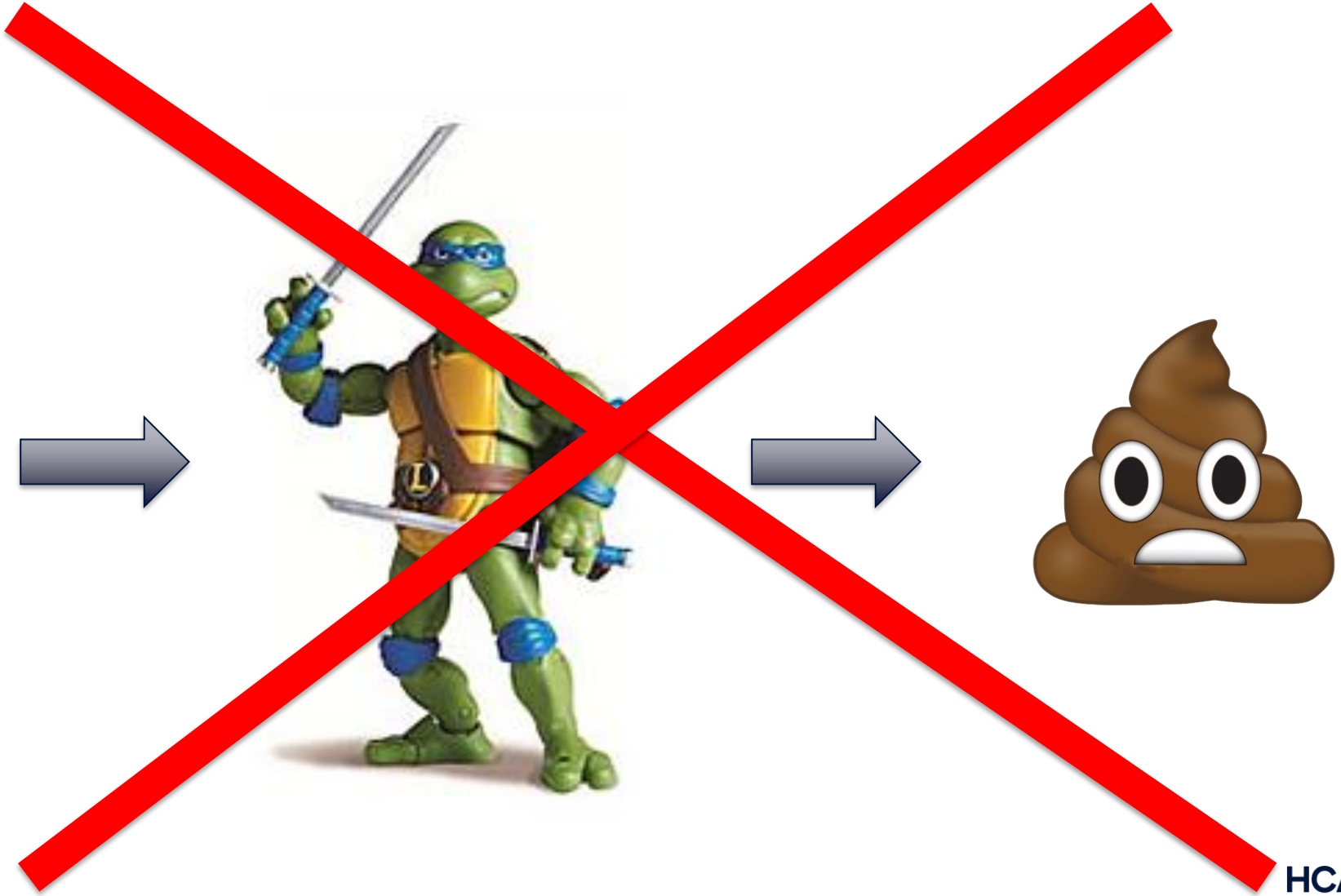
School or Vendor



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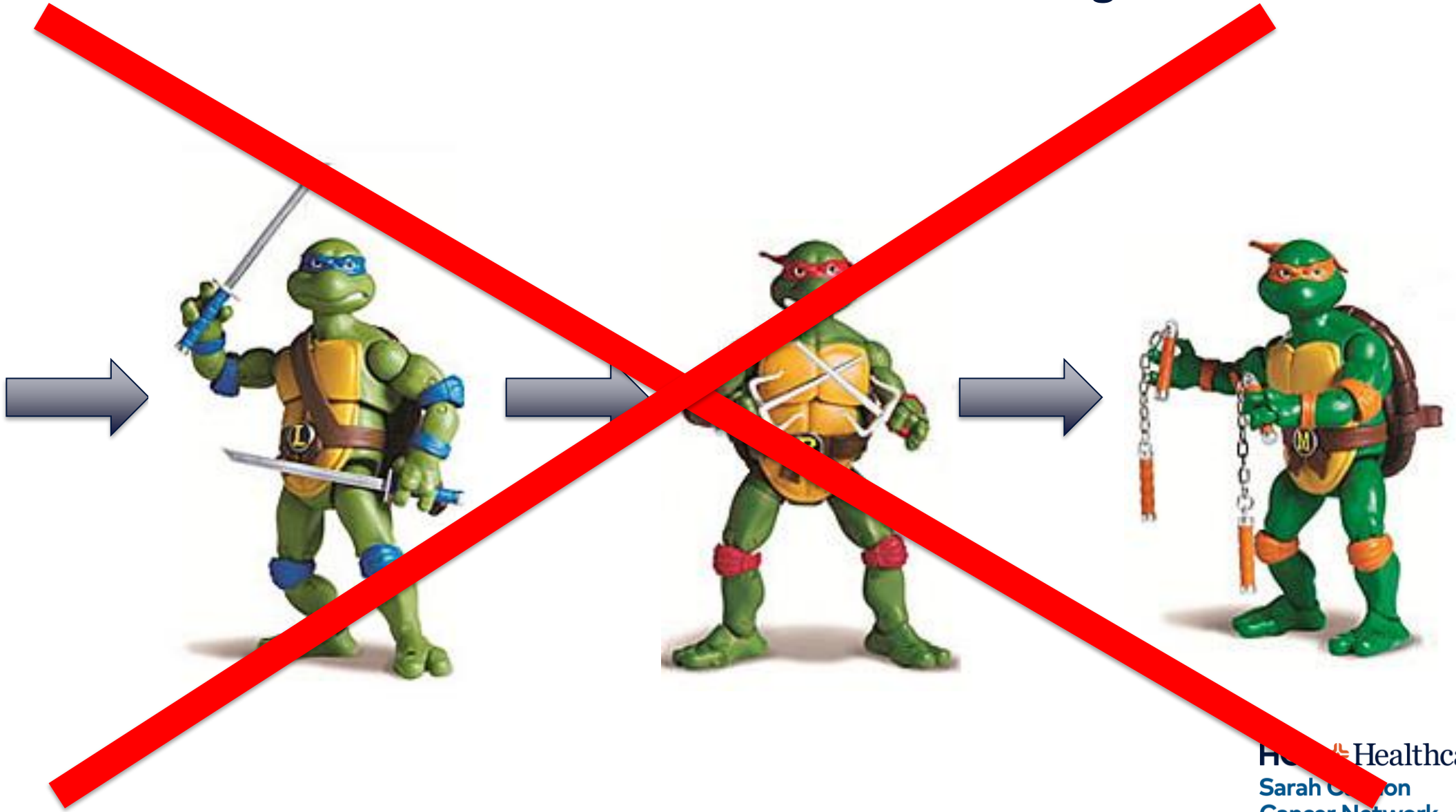
Highly scientific models of effective and ineffective training

School or Vendor



Setting clear expectations/timelines: training

"It is, of course, acknowledged that the vendors generally have well developed training programs run by experienced instructors. However, these are obviously geared to the use of the specific equipment which the particular vendor supplies. Perhaps what is required to complement these events is more training in specifically safety related topics, such as human factors, and in process flow, and related failure modes, as they apply to particular processes in a particular clinic. A multidisciplinary approach to such training might mitigate some of the communication difficulties encountered in a busy clinic environment."

- Dunscombe, P. (2012) [1]

Setting clear expectations/timelines: training

1. Trained thoroughly (including error/event procedures) in all aspects of immediate responsibilities.
2. Trained generally in the departmental procedural workflow
   - "Walk in my shoes"
3. Educated at least generally in departmental implementation of quality management
   - For when things go wrong or *almost* go wrong!
   - Incident learning system
   - Timeout/No Fly Zone/Culture of safety

Setting clear expectations/timelines: documentation

All quality management (QM) guidelines recognize that absence of clear policies and procedures is a common source of errors.

1. Creation of documentation is labor- and resource- intensive:
   - **Use QM techniques (like FMEA)** to evaluate SGRT procedures and the action points most vital for patient safety
   - Prioritize instructions by potential risks/consequences
2. Head knowledge does not always translate to real life knowledge
   - **Human and environmental factors make us forget!**
   - **Turn most vital instructions *into* real life knowledge**

Setting clear expectations/timelines: documentation

"However, it is a common observation that even when adequate documentation does exist it is not always followed. It is unlikely that failure to follow established procedures is for some malicious reason. It is more likely to be due to the procedure either having been forgotten or the significance of not following it not being fully appreciated."

- Dunscombe, P. (2012)[1]

Is your implementation process standardized and formalized (even if it evolves)?

Potential problem:

- ***Sometimes we expand to multiple machines and/or centers without standardizing the implementation plan, inadvertently creating pathways for error.***

Example:

- ***Different treatment teams develop their own unique workflows and it is not discovered until the teams cross-pollinate.***

The vital role of standardization in implementation

Virtually every publication toward safer radiotherapy highlights the need for **improved standardization** in our field:

- **RO-ILS:** “Standard operating procedures are the cornerstone of safe practice but especially when utilizing new technology.”[1]
- **ASTRO:** “Standardization is widely recognized as a means to reduce errors…Standard treatment practices and QA mechanisms, as well as associated policies and procedures, should be vetted through a review committee and required for every technique or disease site, with regular updates, as needed.”[2]
- **AAPM:** Consider the TG-100[3] approach to quality improvement. ***Where does it begin?***

The vital role of standardization in implementation

AAPM TG-100 Report:

- “One of the general results of the FMEA and associated FTA is the clear need to define site-specific treatment planning and delivery protocols that serve as the basis for simulation, planning, and treatment delivery expectations, methods, and QM procedures. **This general standardization and documentation** of the methods to be used addresses many of the most common failure modes for many of the most critical steps in the planning and delivery process, and are a crucial way to avoid training and procedure lapses.”

Standardization in the implementation of SGRT

- **Centralized and ongoing education** – have a dedicated ongoing training and education team, also involved in policy and procedure creation.
  - Emphasis on the word ***ongoing***!

"However, it is a common observation that even when adequate documentation does exist it is not always followed. It is unlikely that failure to follow established procedures is for some malicious reason. **It is more likely to be due to the procedure either having been forgotten or the significance of not following it not being fully appreciated**."

- Dunscombe, P. (2012)[1]

Standardization in the implementation of SGRT

- **Centralized and ongoing education** – have a dedicated ongoing training and education team, also involved in policy and procedure creation.
  - Emphasis on the word ***ongoing***!
- **Standardized physics, dosimetry, and therapist processes –** avoiding knowledge gaps and workarounds.
  - Requiring documented competency for everyone that uses a technology to impact a patient
- **Standardized action plans for *when things do not go as everyone expected them to go.***

Proposed implementation strategies from the RO-ILS SGRT-themed report:

1. **Process development and Updates** – “Standard operating procedures are the cornerstone of safe practice but especially when utilizing new technology.”
2. **Speed of Deployment –** Selective use, initially, to allow staff to develop experience with the SGRT system before general use.
3. **Staff training and comfort –** Consider training a specialized group of staff before expanding to all users, giving staff time to adapt to the technology.
4. **Safety Fundamentals –** “Staff need to be empowered to “Stop The Line”, whether to question a colleague or equipment.” And don’t abandon fundamental safety processes.
5. **Additive and Subtractive –** *The addition of new technology to the already complex IGRT treatment process must be approached with caution.*

Thank you!