Cancer Care Ontario

Radiation Treatment Quality Based Procedures (RT-QBP)

Lung RT-QBP Working Group Meeting

JANUARY 30, 2019

Ontario
Cancer Care Ontario

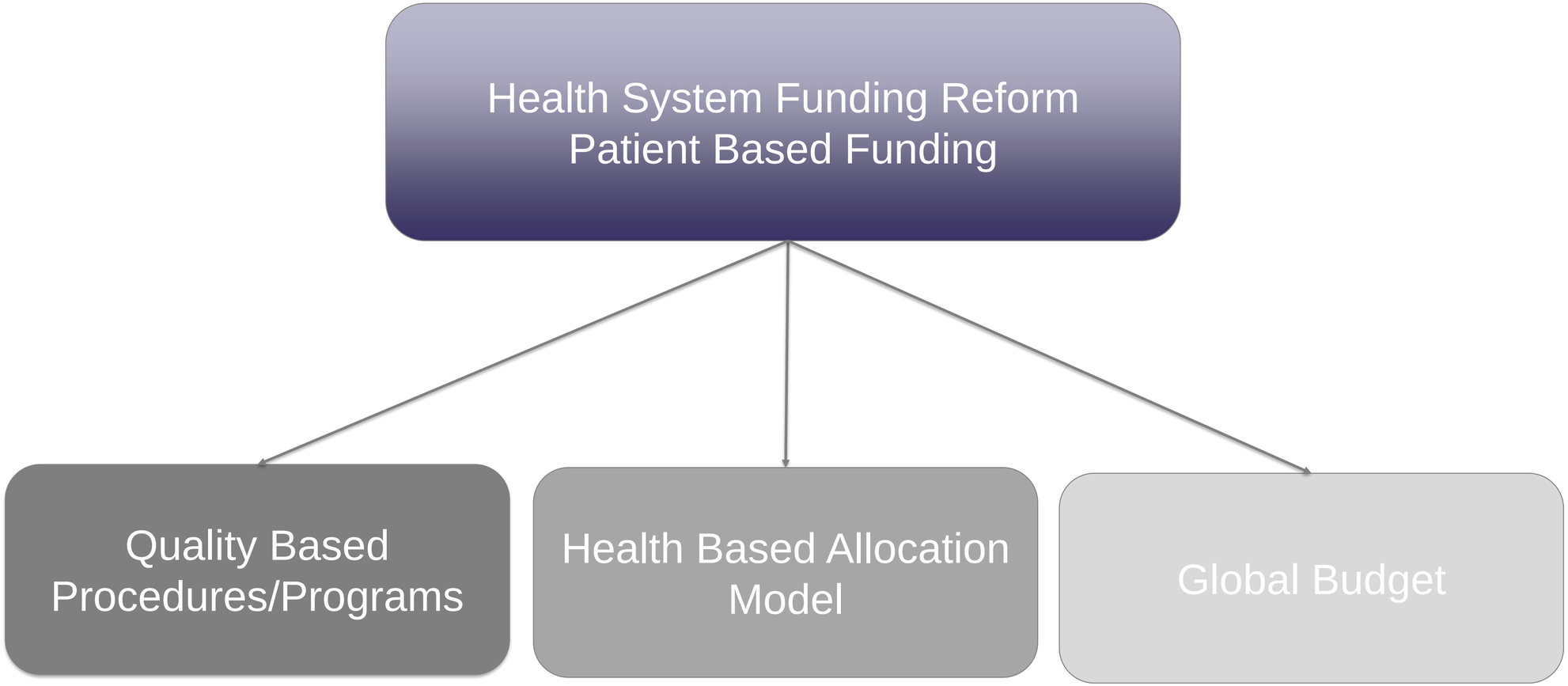
Objectives for Today

Lung RT-QBP Working Group Meeting:

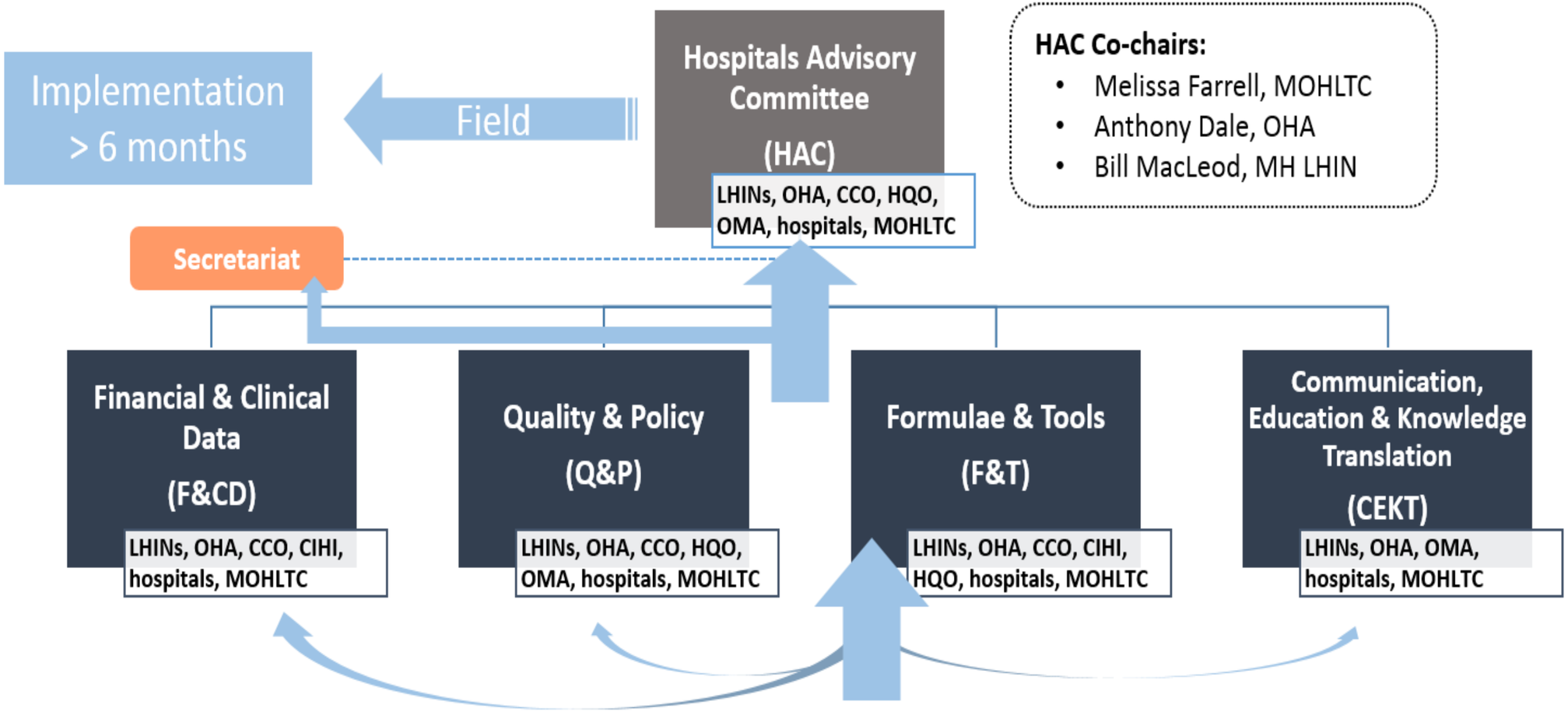
- To provide an introduction to Health System Funding Reform (HSFR)
- To review Lung RT-QBP protocols for consideration
- To review Lung RT-QBP quality metrics for consideration
- To review the Micro Costing and Infrastructure and Equipment funding approach
- To provide an update on Psychosocial Oncology (PSO)
- QBP Timelines and Next steps

Introduction to Health System Funding Reform (HSFR)

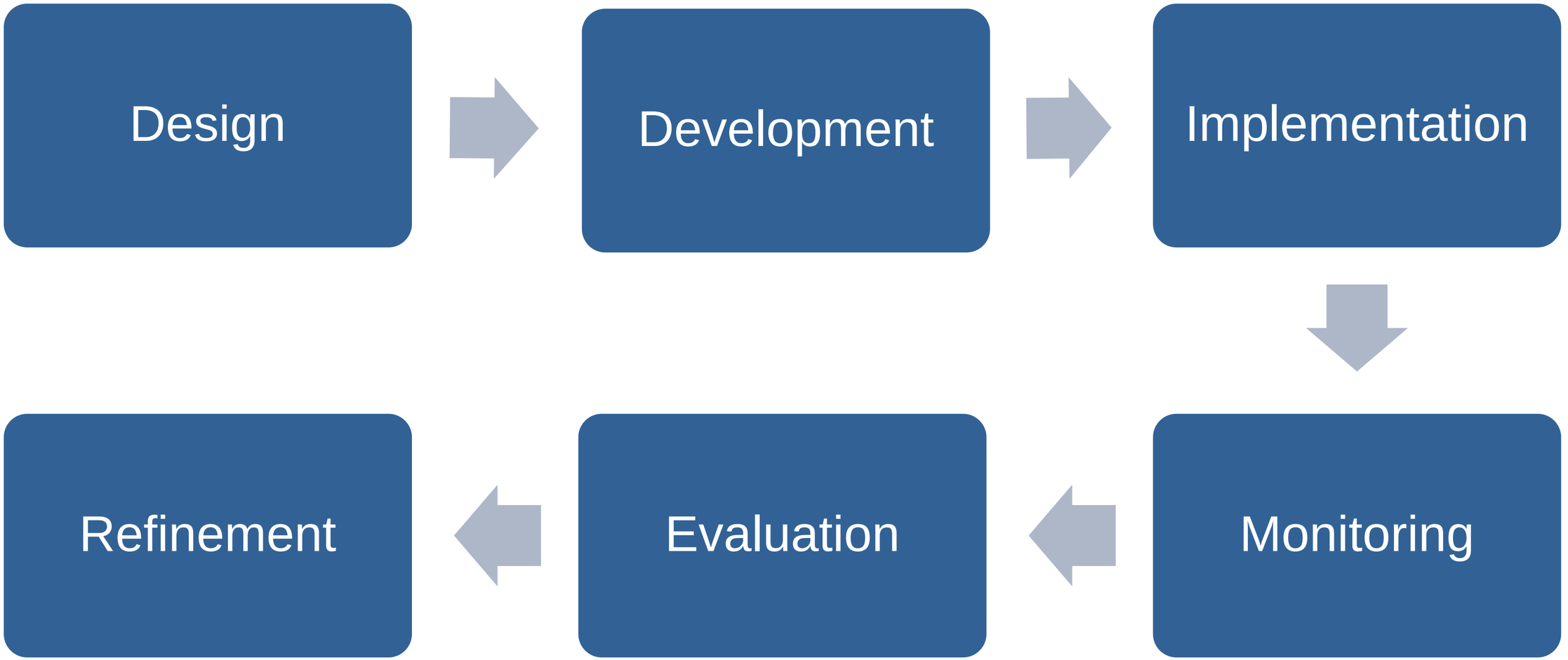
Health System Funding Reform (HSFR)



HSFR Governance- Current



Path to a QBP- Life Cycle



Path to a QBP- Development & Implementation Activities

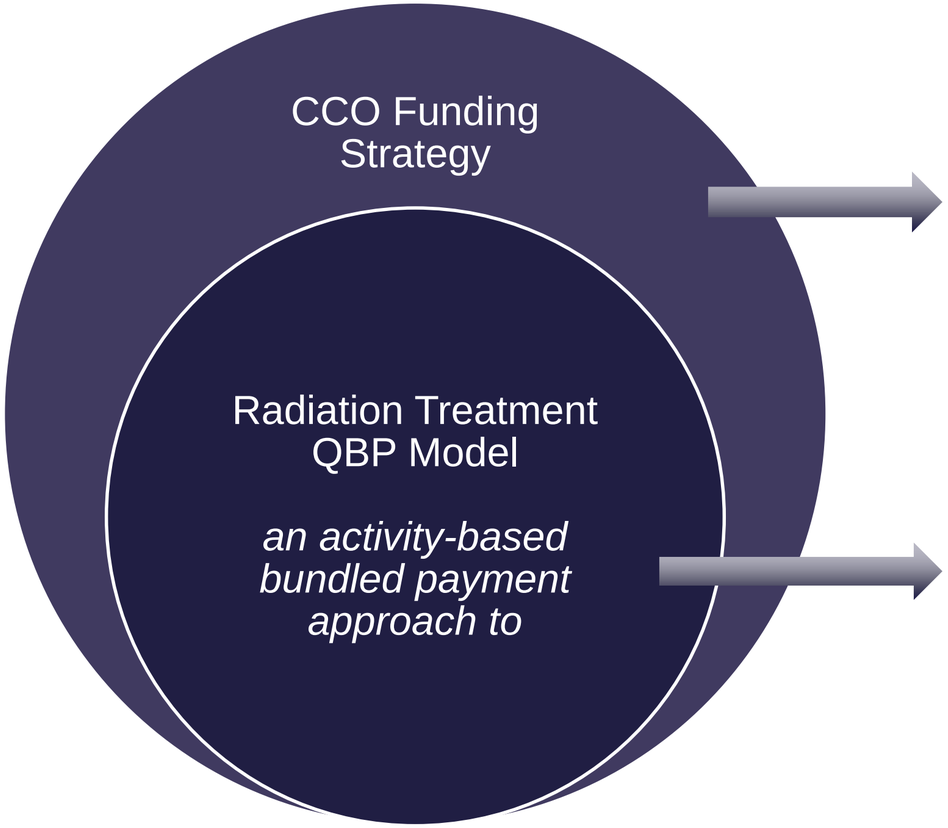
Hospital & Stakeholder Engagement & Knowledge Transfer

Health System Funding Reform Governance

Radiation Treatment Overview

Radiation Treatment QBP Overview

- **Vision: Implement a new funding model that will drive consistent, equitable, and high-quality care for patients being treated with radiation**



- Cancer treatment is typically one of, or a combination of, three modalities Cancer Surgery, Systemic Treatment QBPs have been completed
- Completing the third modality, RT-QBP will:
  - Allow CCO to better coordinate the up-stream care elements, which could lead to a diagnostic-type QBP for cancer patients in the future
  - Control areas of overlap and potential duplication of funding during treatment phases (i.e. patients requiring concurrent chemo/radiation therapy)
  - Lead to more integrated approaches to post hospital care, such as a community care QBP for cancer patients

- Improve patient outcomes and experiences
- Align with best practices based on clinical evidence and expert consensus
- Improve appropriateness of care and reduce variation in care
- Facilitate efficient use of resources, increase both the transparency and accountability of resource utilization
- Increase accessibility to services including new technologies to ensure that Ontarians receive high quality and safe radiation treatment services, regardless of where they reside in the province

Scope and Outline for RT-QBP

Ontario Health System Funding Reform:

Shift to patient-based funding

Scope: Ambulatory Care Radiation Treatment

Activities related to direct patient care at all radiation treatment facilities

Goal: Implement a new episode-based funding model which:

-Ensures funding follows the patient

-Reduces inequities in funding

- Ties funding to evidence-informed practice

The following are **in scope** for now:

- All in-scope adult and pediatric volumes
- In-patient & Out-patient activities
- Benign (where appropriate)
- Costs associated with ongoing maintenance of radiation equipment and associated software/hardware
- Systemic Treatment by ROs (hormones)
- Psychosocial support
- Clinical Trials (fund as per standard of care)

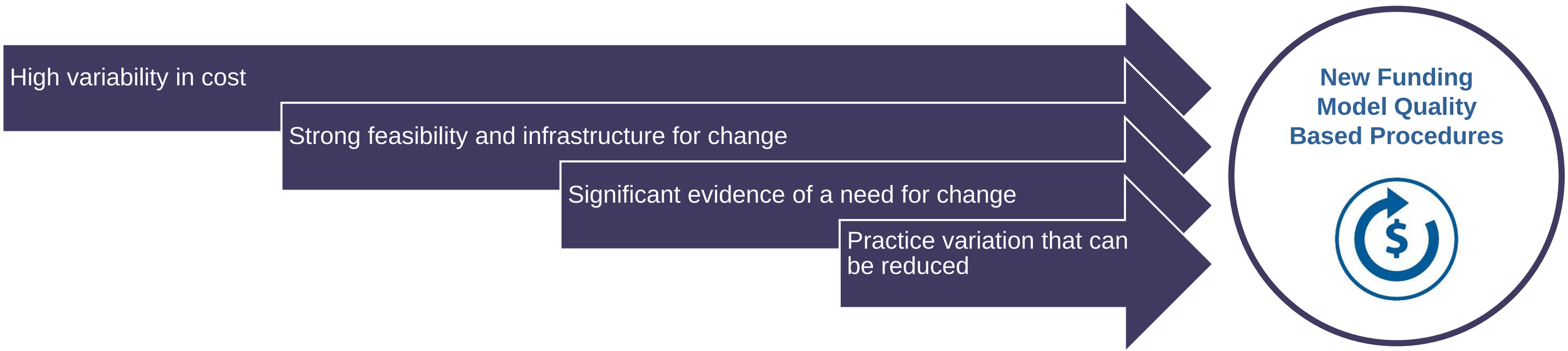
The following are **out of scope** for now:

- Physician Compensation
- Home Care
- Laboratory & diagnostic imaging
- Ontario non-OHIP activity: Any procedure that is completed for an Ontario resident who does not have a valid Ontario Health Insurance Plan (OHIP) or where funding is provided from a source other than OHIP
- Out-of-province/country activity: Any procedure that is completed for a non-Ontario resident.

Data Source: ALR (Linkage to others as required- OHIP, NACRS, DAD, etc.)

Evidence for the Radiation Treatment QBP

Radiation Treatment is well aligned with the MOHLTC's framework for developing a Quality Based Procedures (QBP) Funding Model



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Radiation Treatment Overview

Previous Lifetime Model

LIFETIME PER CASE FUNDING

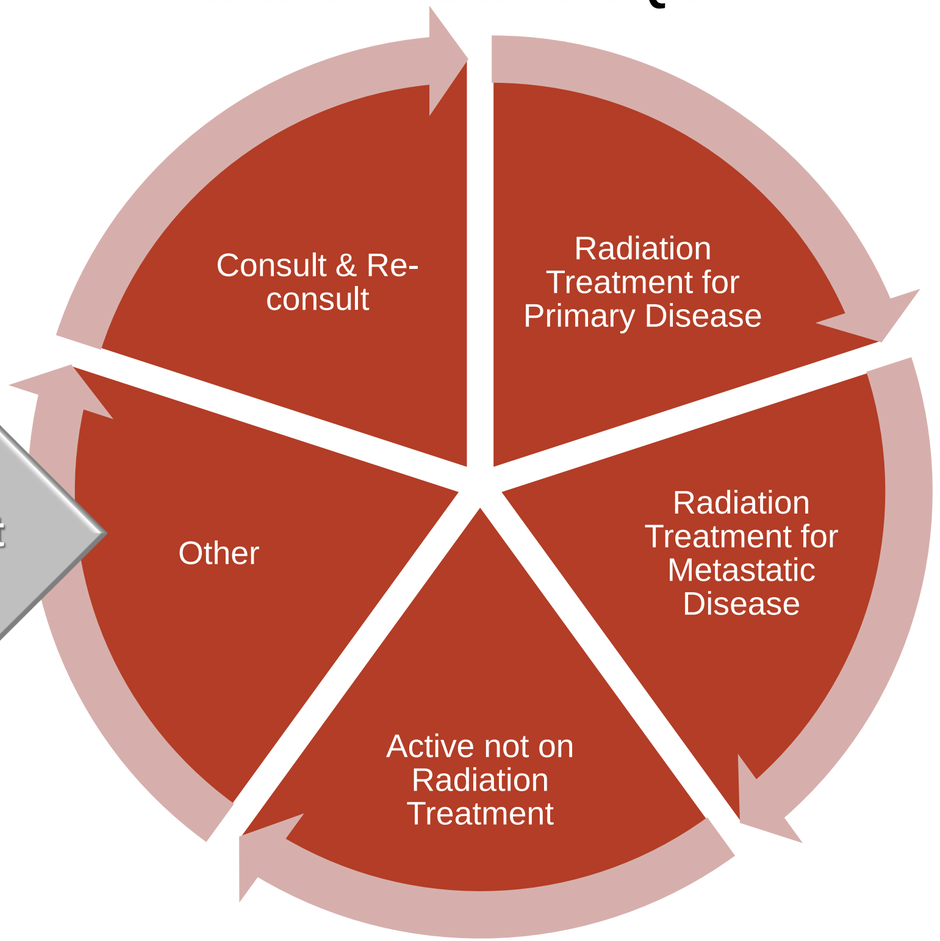
CCO funding C1R

PCOP per visit Funding

Hospital base

Carve-out

Radiation Treatment QBP



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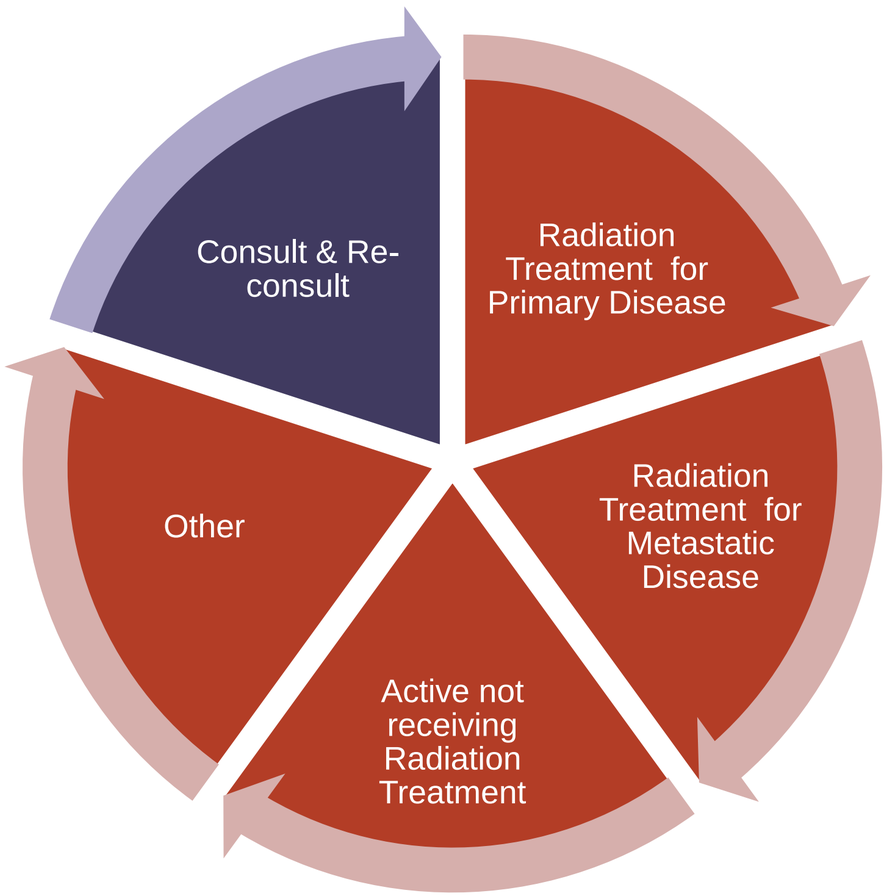
Consultations for Radiation Treatment



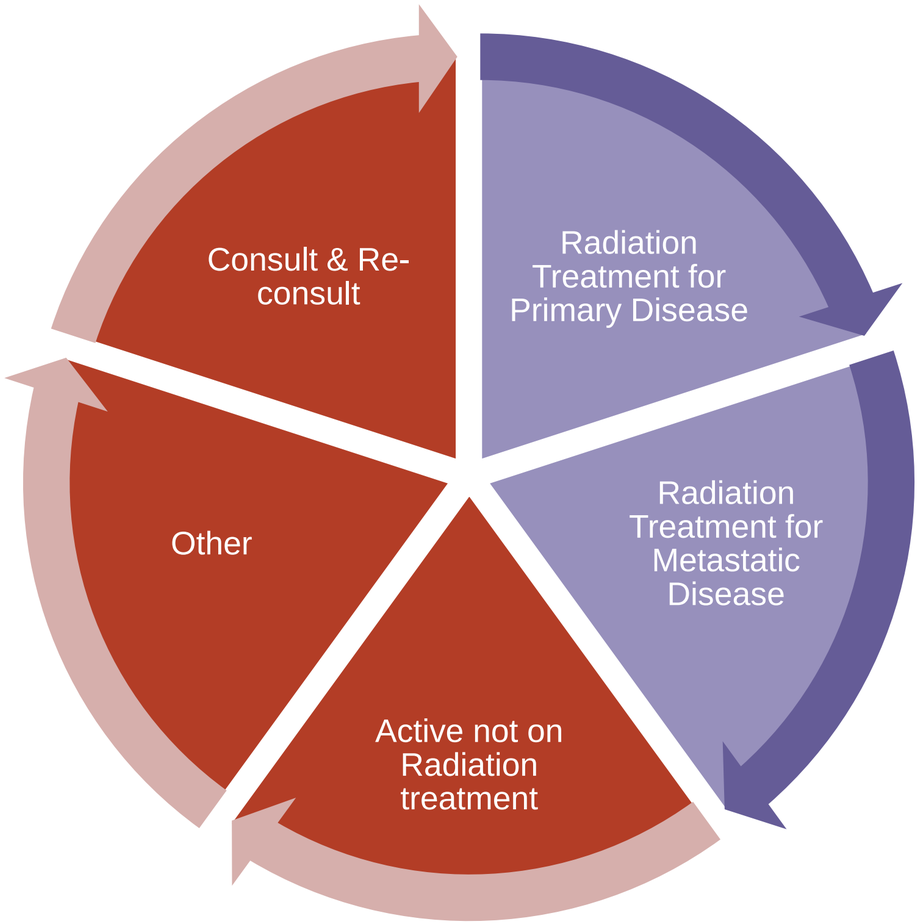
Data

Patient visits:
- Initial consultation
- Decision to treat

Activities:
- Patient education
  - Individual and group education session
- Psychosocial Supportive Care
- Support for patient decision-making

Price

Radiation Treatments for Primary and Metastatic Diseases



Data **Evidence**

Treatment to Primary Disease
& Treatment for Metastatic Disease

Includes:

- # of Radiation Treatment Visits
- # of Ambulatory Clinic Visits
- Nursing Time
- Radiation Therapist & Planner Time
- Medical Physics Time
- HDR sources
- Supplies (immobilization, contrast, etc.)
- # of Review visits during treatments (1/week)
- Follow-up visits post-treatment

Multiple Price Points

Radiation Treatment Pricing

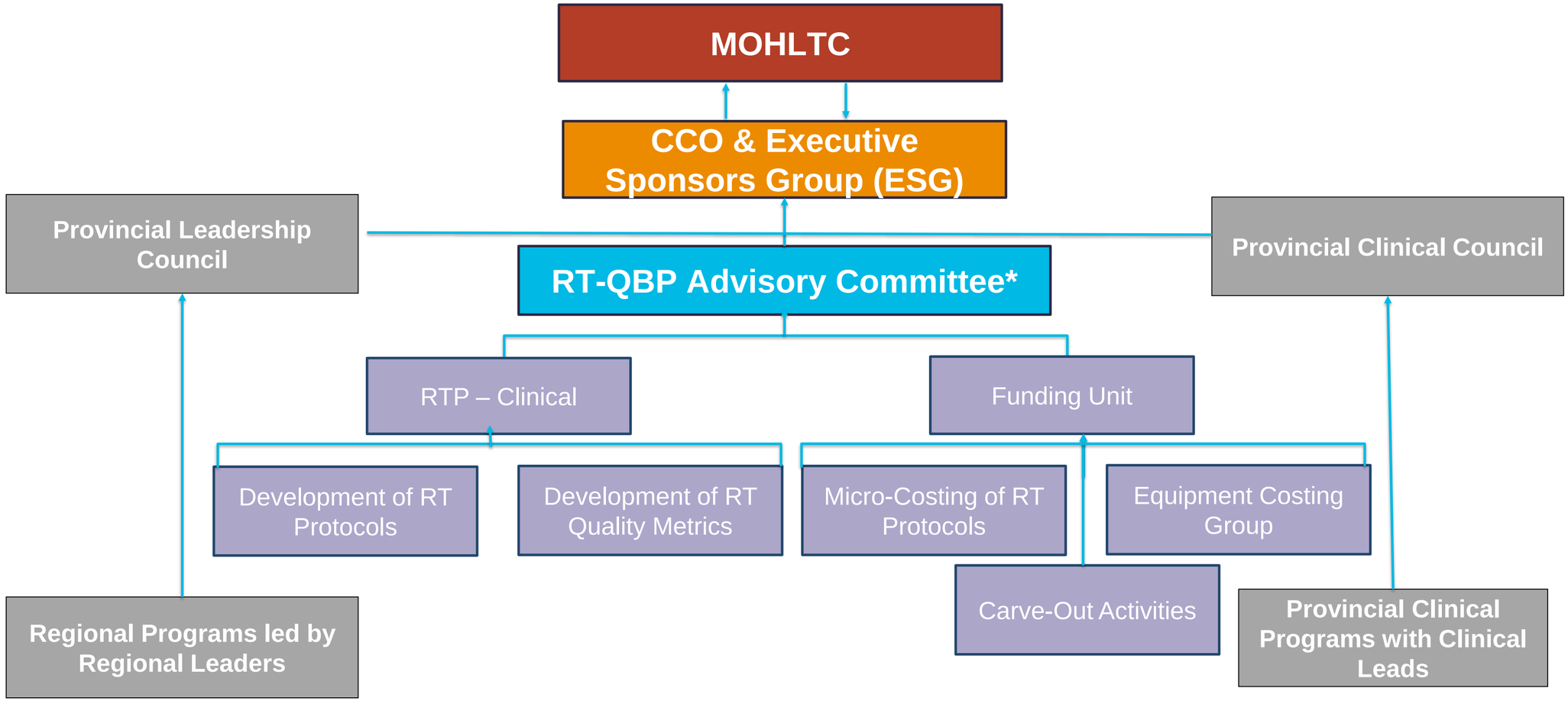
Activity Based Costing approach based on model published by RTP and Pharmacoeconomic unit at University of Toronto

- The Activity Based Costing (ABC) approach breaks processes down into activities that consume resources to deliver each unit of output
- Cost drivers such as time or patient load are identified for each resource within each activity

Source: Yong et al Current Oncol 23(3) e228-238, 2016

RT-QBP Governance

The RT-QBP CCO Project Team is involved all levels



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**Membership includes administrative and clinical leadership from all regions*
***Working groups will have cross member representation and will report into the Radiation Treatment Advisory Committee which will report into the Project Team Committee.*
****Additional time limited working groups will be established as the QBP evolves*

Overview of RT-QBP Committee and Group Membership

Overview of RT-QBP Committee and Group Memberships

	Advisory Committee	Disease Specific Working Group	Disease Specific Expert Panel Group
Purpose	- Provides ongoing advice and counsel to CCO on the development and implementation of the RT-QBP, with particular focus on the development of the clinical handbook	- Provides advice on clinical best practice, feedback and expertise on the selection of disease site Radiation Treatment Protocols, review quality metrics and provide input on RT resources to guide costing development	- Provide advice to the RT-QBP Clinical Lead and expertise in completing preliminary work on data analysis, quality metrics and literature scans specific to the disease site
Meeting Frequency	- In-person or teleconference every 6 weeks to 8 weeks including 1-2 in person meetings	- 1-2 full day, in-person or teleconference meetings - Members may be asked to review information via email and provide their feedback	- 2-3 teleconference meetings - Members may be asked to review information via email and provide their feedback
Membership Process	- Selected based on a nomination from each region's RVP or RCC Director	- Selected based on a nomination from each region's RVP or RCC Director	- Selected by the RT-QBP Clinical Lead - RVPs and RCC Directors will be informed of Expert Panel members via email
Reporting Structure	- Reports to CCO and the Executive Sponsors Group via the RT-QBP Project Team	- Reports to the Advisory Committee via the RT-QBP Project Team	- Reports to the RT-QBP Clinical Lead

- Lung RT-QBP Expert Panel Members:
  - Alison Ashworth
  - Jean-Pierre Bissonnette
  - Michael Brundage
  - Stewart Gaede
  - Margaret Hart
  - Andrea Shessel
  - Alex Sun
  - Anand Swaminath
  - Yee Ung
  - Brian Yaremko

Lung Working Group Membership

Lung RT-QBP Working Group Members:

Name	Hospital
Ming Pan	Windsor Regional Hospital
Brian Yaremko	London Health Sciences Centre
Stewart Gaede	London Health Sciences Centre
Paule Charland	Grand River Hospital
Daniel Glick	Grand River Hospital
Anand Swaminath	Jurvaniski Cancer Centre
Xia Wu	Trillium Health Partners
Julia Giovinazzo	Trillium Health Partners

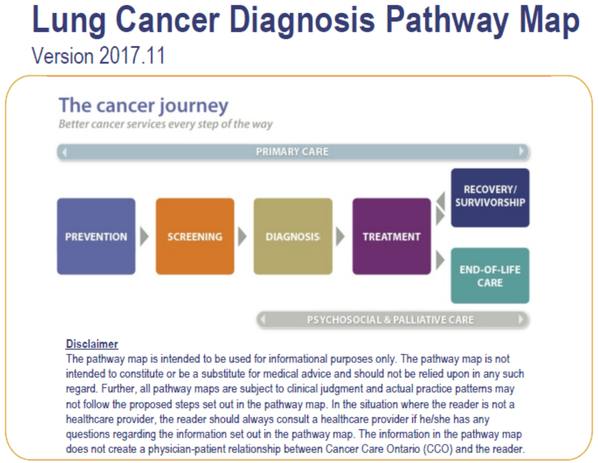
Name	Hospital
Brenda Schultz	Sunnybrook Health Sciences Centre
Alex Sun	Princess Margaret Hospital
Andrea Shessel	Princess Margaret Hospital
Michael Ryan	Southlake Regional Health Centre
Daria Comsa	Southlake Regional Health Centre
Medhat El Mallah	Lakeridge Health
Aaron Vandermeer	Lakeridge Health
Kit Tam	Kingston Health Sciences Centre
Andrew Kerr	Kingston Health Sciences Centre

Name	Hospital
Robert MacRae	The Ottawa Hospital
Dan La Russa	The Ottawa Hospital
Fred Youn	Royal Victoria Regional Health Centre
Madeline Ng	Royal Victoria Regional Health Centre
Denise Blanchette	Health Sciences North
Brandon Disher	Health Sciences North
Mellissa Linke	Thunder Bay Regional Health Sciences Centre
Kevin Ramchandar	Thunder Bay Regional Health Sciences Centre

Evidence-based sources for RT protocols

Evidence-based sources for RT protocols

- Existing literature
- CCO Guidelines (i.e. PEBC Guidelines)
- NCCN guidelines
- ASTRO, ASCO and ESMO guidelines
- Radiotherapy dose fractionation 2nd ed. UK
- Provincial and RCC-specific data
- iPort
- Clinical expertise from Lung Expert Panel



Lung Cancer Diagnosis Pathway Map

Version 2017.11

The cancer journey

Better cancer services every step of the way

PRIMARY CARE

PREVENTION | SCREENING | DIAGNOSIS | TREATMENT | RECOVERY/ SURVIVORSHIP | END-OF-LIFE CARE

PSYCHOSOCIAL & PALLIATIVE CARE

Disclaimer

The pathway map is intended to be used for informational purposes only. The pathway map is not intended to constitute or be a substitute for medical advice and should not be relied upon in any such regard. Further, all pathway maps are subject to clinical judgment and actual practice patterns may not follow the proposed steps set out in the pathway map. In the situation where the reader is not a healthcare provider, the reader should always consult a healthcare provider if he/she has any questions regarding the information set out in the pathway map. The information in the pathway map does not create a physician-patient relationship between Cancer Care Ontario (CCO) and the reader.

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Guideline 7-3 Version 3

A Quality Initiative of the
Program in Evidence-Based Care (PEBC), Cancer Care Ontario (CCO)

Treatment of Patients with Stage III (N2 or N3) Non-Small Cell Lung Cancer

A. Swaminath, E.T. Vella, K. Ramchandar, A. Robinson, C. Simone, A. Sun, Y.C. Ung, K. Yasufuku, P.M. Ellis, and the Lung Cancer Disease Site Group

Report Date: September 7, 2017

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ıout the PEBC and the most current version of all reports, please visit the
e at http://www.cancercare.on.ca/ or contact the PEBC office at:
27-4322 ext. 42822 Fax: 905 526-6775 E-mail: ccopgi@mcmaster.ca

Practical Radiation Oncology (2018) **8**, 245-250

CME ASTRO

practical radiation oncology
pro
www.practicalradonc.org

NCCN National Comprehensive Cancer Network®

NCCN Guidelines Version 5.2018
Non-Small Cell Lung Cancer

NCCN Guidelines Index
Table of Contents
Discussion

PRINCIPLES OF RADIATION THERAPY

General Principles (see Table 1. Commonly Used Abbreviations in Radiation Therapy)

- Determination of the appropriateness of radiation therapy (RT) should be made by board-certified radiation oncologists who perform lung cancer RT as a prominent part of their practice.
- RT has a potential role in all stages of NSCLC, as either definitive or palliative therapy. Radiation oncology input as part of a multidisciplinary evaluation or discussion should be provided for all patients with NSCLC.
- The critical goals of modern RT are to maximize tumor control and to minimize treatment toxicity. A minimum technologic standard is CT-planned 3D-CRT.[1]
- More advanced technologies are appropriate when needed to deliver curative RT safely. These technologies include (but are not limited to) 4D-CT and/or PET/CT simulation, IMRT/VMAT, IGRT, motion management, and proton therapy (https://www.astro.org/Daily-Practice/Reimbursement/Model-Policies/Model-Policies/). Nonrandomized comparisons of using advanced technologies versus older techniques demonstrate reduced toxicity and improved survival.[2-4] In a prospective trial of definitive chemo/RT for stage III NSCLC (RTOG 0617), IMRT was associated with a nearly 60% decrease (from 7.9% to 3.5%) in high-grade radiation pneumonitis and similar survival and tumor control outcomes despite a higher proportion of stage IIIB and larger treatment volumes compared to 3D-CRT;[5] as such, IMRT is preferred over 3D-CRT in this setting.
- Centers using advanced technologies should implement and document modality-specific quality assurance measures. The ideal is external credentialing of both treatment planning and delivery such as required for participation in RTOG clinical trials employing advanced technologies. Useful references include the ACR Practice Parameters and Technical Standards (http://www.acr.org/~/media/ACR/Documents/PGTS/toc.pdf).

Early-Stage NSCLC (Stage I, selected node negative Stage IIA)

- SABR (also known as SBRT) is recommended for patients who are medically inoperable or who refuse to have surgery after thoracic surgery evaluation. SABR has achieved primary tumor control rates and overall survival, comparable to lobectomy and higher than 3D-CRT in nonrandomized and population-based comparisons in medically inoperable or older patients.[6-11]
- SABR is also an appropriate option for patients with high surgical risk (able to tolerate sublobar resection but not lobectomy [eg, age ≥75

Special Article

Palliative thoracic radiation therapy for non-small cell lung cancer: 2018 Update of an American Society for Radiation Oncology (ASTRO) Evidence-Based Guideline

Benjamin Moeller MD, PhD [a,*], Ehsan H. Balagamwala MD [b], Aileen Chen MD [c], Kimberly M. Creach MD [d], Giuseppe Giaccone MD, PhD [e], Matthew Koshy MD [f], Sandra Zaky MD, MS [g], George Rodrigues MD, PhD, FASTRO [h]

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Received 6 February 2018; accepted 19 February 2018

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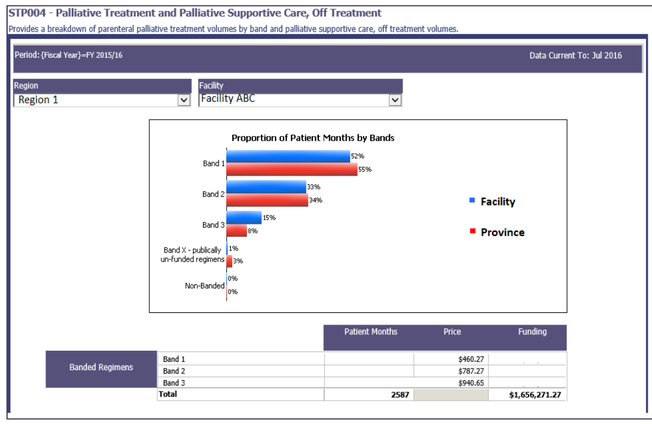

STP004 - Palliative Treatment and Palliative Supportive Care, Off Treatment

Provides a breakdown of parenteral palliative treatment volumes by band and palliative supportive care, off treatment volumes.

Period: (Fiscal Year)=FY 2015/16 — Data Current To: Jul 2016

Region: Region 1 — Facility: Facility ABC

Proportion of Patient Months by Bands

Band 1 52% 55%
Band 2 33% 34%
Band 3 15% 8%
Band X - publically un-funded regimens 1% 3%
Non-Banded 0% 0%

Facility
Province

		Patient Months	Price	Funding
Banded Regimens	Band 1		$460.27	-
	Band 2		$787.27	-
	Band 3		$940.65	-
	Total	2587		$1,656,271.27

Non-Small Cell Lung Cancer (NSCLC)

Proposed Treatment Protocols

Proposed Treatment Protocols for NSCLC

RT Protocol Long Form	RT Protocol Short Form	Proposed Range (Gy)	Number of Fractions	Dose per Fraction (Gy)
Definitive RT				
Definitive RT +/- Chemo	LUNG_NSCLC_+/- CHEMO	60 - 70	30 - 35	2 - 2.3
Definitive RT_Hypo +/- Chemo	LUNG_NSCLC_HYPO_+/- CHEMO	40 - 60	15 - 20	2.5 - 4

Proposed Treatment Protocols for NSCLC

RT Protocol Long Form	RT Protocol Short Form	Proposed Range (Gy)	Number of Fractions	Dose per Fraction (Gy)
Pre-operative				
Pre-operative_RT +/- Chemo	LUNG_NSCLC_PRE-O_+/- CHEMO	45 – 66	25 – 33	1.8 – 2.1
Post-operative (PORT)				
Post--operative_RT +/- Chemo	LUNG_NSCLC_PO_+/- CHEMO	44 – 66	22 – 33	1.8 – 2.1

Proposed Treatment Protocols for NSCLC & SCLC

RT Protocol Long Form	RT Protocol Short Form	Proposed Range (Gy)	Number of Fractions	Dose per Fraction (Gy)
SBRT	LUNG_SBRT_SINGLE LUNG_SBRT_FRAC	15 - 35 30 - 62	1 3 - 8	15 - 35 6-18

Proposed Treatment Protocols for NSCLC & SCLC

RT Protocol Long Form	RT Protocol Short Form	Proposed Range (Gy)	Number of Fractions	Dose per Fraction (Gy)
Short Course (for both small cell, non small cell)				
Short Course	LUNG_SHORT_1	8 – 17	1 – 2	8 – 10
	LUNG_SHORT_2	18 – 24*	3	6 – 8
	LUNG_SHORT_3	20 – 39	5 – 13	3 – 4
Brachy				
Brachytherapy[#]	LUNG_BRACHY_SINGLE	10	1	10
	LUNG_BRACHY_FRAC	14 – 28	2 – 4	7

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*0-7-21 protocol
[#]Based on dose/fractionation used at Juravinski Cancer Centre and Cancer Centre of Southeastern Ontario

Small Cell Lung Cancer (SCLC)

Proposed Treatment Protocols

Proposed Treatment Protocols for SCLC

RT Protocol Long Form	RT Protocol Short Form	Proposed Range (Gy)	Number of Fractions	Dose per Fraction (Gy)
Limited Stage	LUNG_SCLC_LTDSTAGE	40 - 66	15 - 33	1.5 - 3
Limited Stage BID	LUNG_SCLC_LTDSTAGE_BID	43 - 45 BID	30	1.5
Extensive Stage	LUNG_SCLC_EXTSTAGE	17 – 66	2 - 33	2-10
Prophylactic Cranial Irradiation (PCI)*	LUNG_SCLC_PCI	20 - 30	5 - 15	2 - 3

***Note for Funding Unit:** Hippocampal avoidance-This needs to be costed in manner that reflects this may become a standard of care, although currently in clinical trials*

Other Lung Cancers

Proposed Treatment Protocols

Other Lung Cancers Proposed Treatment Protocols

Protocol Long Form	RT Protocol Short Form	Proposed Range (Gy)	Number of Fractions	Dose per Fraction (Gy)
Thymoma-Standard Fractionation	LUNG_THYMOMA_STD	40 – 66	15 – 33	1.8 – 2
Thymoma SBRT Single Fraction	LUNG_THYMOMA_SBRT_SINGLE	15 - 35	1	15 - 35
Thymoma SBRT Fractionated	LUNG_THYMOMA_SBRT_FRAC	30 - 62	3 - 8	6-18
Mesothelioma Standard Fractionation	LUNG_MESO_STD	40 – 60	15 – 30	2 – 3
Mesothelioma SBRT	LUNG_MESO_SBRT	21 – 30	3 – 5	7 – 10

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Quality Metrics Development

Quality Metrics Development

01 Infrastructure

02 Pre-Treatment Phase

03 Imaging and Planning Phase.

04 Quality Assurance Phase

05 Treatment Phase

06 Post-Treatment Phase.

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Quality Metrics

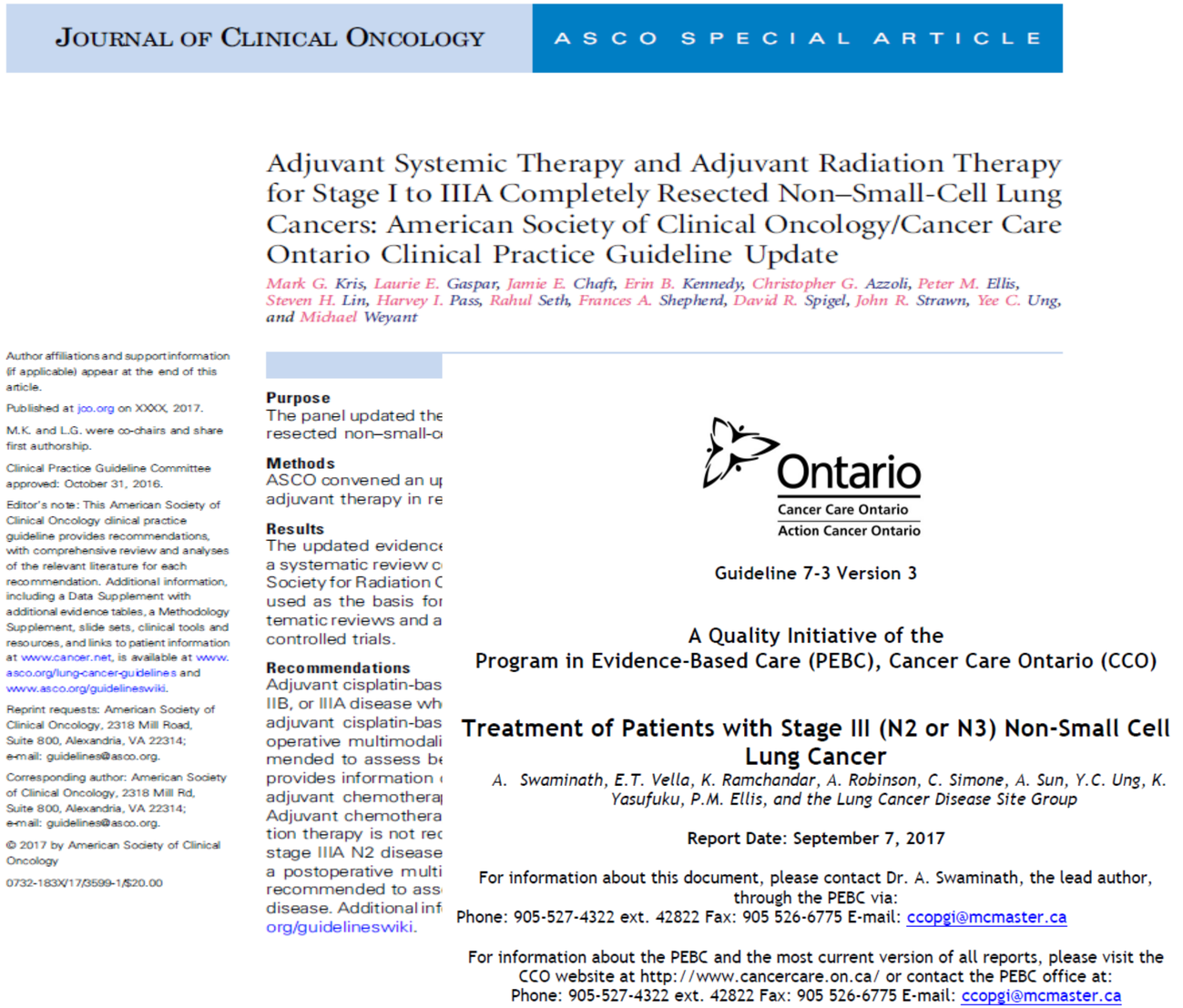
Examples of quality metrics that will apply across all disease sites:

- Peer Review QA
- Physics and Therapy QA
- Etc…

Examples of quality metrics that may be disease site specific:

- Treatment imaging – may be disease specific
- Cardiac avoidance for breast cancer

*Please note-quality metrics apply to definitive treatment, unless otherwise specified



JOURNAL OF CLINICAL ONCOLOGY | ASCO SPECIAL ARTICLE

Adjuvant Systemic Therapy and Adjuvant Radiation Therapy for Stage I to IIIA Completely Resected Non–Small-Cell Lung Cancers: American Society of Clinical Oncology/Cancer Care Ontario Clinical Practice Guideline Update

Mark G. Kris, Laurie E. Gaspar, Jamie E. Chaft, Erin B. Kennedy, Christopher G. Azzoli, Peter M. Ellis, Steven H. Lin, Harvey I. Pass, Rahul Seth, Frances A. Shepherd, David R. Spigel, John R. Strawn, Yee C. Ung, and Michael Weyant

Author affiliations and support information (if applicable) appear at the end of this article.

Published at jco.org on XXXX, 2017.

M.K. and L.G. were co-chairs and share first authorship.

Clinical Practice Guideline Committee approved: October 31, 2016.

Editor's note: This American Society of Clinical Oncology clinical practice guideline provides recommendations, with comprehensive review and analyses of the relevant literature for each recommendation. Additional information, including a Data Supplement with additional evidence tables, a Methodology Supplement, slide sets, clinical tools and resources, and links to patient information at www.cancer.net, is available at www.asco.org/lung-cancer-guidelines and www.asco.org/guidelineswiki.

Reprint requests: American Society of Clinical Oncology, 2318 Mill Road, Suite 800, Alexandria, VA 22314; e-mail: guidelines@asco.org.

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0732-183X/17/3599-1/$20.00

Purpose
The panel updated the
resected non–small-c

Methods
ASCO convened an u
adjuvant therapy in re

Results
The updated evidence
a systematic review c
Society for Radiation C
used as the basis for
tematic reviews and a
controlled trials.

Recommendations
Adjuvant cisplatin-bas
IIB, or IIIA disease wh
adjuvant cisplatin-bas
operative multimodali
mended to assess be
provides information
adjuvant chemothera
Adjuvant chemothera
tion therapy is not rec
stage IIIA N2 disease
a postoperative multi
recommended to ass
disease. Additional inf
org/guidelineswiki.

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Guideline 7-3 Version 3

A Quality Initiative of the
Program in Evidence-Based Care (PEBC), Cancer Care Ontario (CCO)

Treatment of Patients with Stage III (N2 or N3) Non-Small Cell Lung Cancer

A. Swaminath, E.T. Vella, K. Ramchandar, A. Robinson, C. Simone, A. Sun, Y.C. Ung, K. Yasufuku, P.M. Ellis, and the Lung Cancer Disease Site Group

Report Date: September 7, 2017

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For information about the PEBC and the most current version of all reports, please visit the CCO website at http://www.cancercare.on.ca/ or contact the PEBC office at:
Phone: 905-527-4322 ext. 42822 Fax: 905 526-6775 E-mail: ccopgi@mcmaster.ca

CCO Cancer Care Ontario

Proposed Quality Metrics - NSCLC

Proposed Quality Metrics – NSCLC

Overarching quality metrics in lung cancer

- Institutional policies and guidelines should be developed for lung cancer treatment **outlining:**
  1. Pre-Treatment assessment and documentation
  2. CT Simulation Protocols (and MRI Simulation where indicated) and Planning Protocols including dose targets and constraints
  3. QA strategies
  4. Treatment Protocols to include frequency of imaging and image matching strategies
  5. Post Treatment Follow-up

Proposed Quality Metrics – NSCLC

Pre-Treatment Phase

Documentation of:

- Current disease, medical co-morbidities, performance status, weight loss
- Medical and family history, results of physical at consultation (where appropriate)
- Smoking history
- Radiation therapy contra-indications and post-operative complications
- Pathology (as appropriate)
- Metastatic Work-up as per Institutional protocols including PET scan
- Obtaining informed consent

Proposed Quality Metrics – NSCLC

Pre-Treatment Phase

The following should be considered:

- Radiation oncology input as part of a multidisciplinary evaluation or discussion should be provided for the following groups of patients:
  - all patients with stage III NSCLC
  - patients with early-stage disease who are medically inoperable
  - post-operative cases with suspicion of residual disease
  - patients who refuse surgery, or are high-risk surgical candidates
  - patients with stage IV disease that may benefit from local therapy

- Other pre-treatment procedures and planning should be done in accordance with the DPM Lung Cancer Diagnosis Pathway Map (Nov 2017)
  https://www.cancercareontario.ca/sites/ccocancercare/files/assets/LungDiagnosisPathwayMap.pdf

Continued on next page

Proposed Quality Metrics – NSCLC

Pre-Treatment Phase

The following should be considered (continued):

- For patients with cardiac implantable electronic devices (CIEDs) such as pacemakers and defibrillators, institutional policy should exist to outline:
  - care of patients pre- and post- treatment
  - a CIED evaluation frequency for patients with a cumulative incident device dose of radiation that exceeds 5Gy
  - consideration on whether an evaluation should be performed at intervals during the radiation course
  - details on the management of patients undergoing radiation therapy by personnel from both radiation therapy and the CIED clinic

- As per the following 2017 consensus statement developed by the Heart Rhythm Society (HRS) and 11 collaborating societies. https://www.heartrhythmjournal.com/article/S1547-5271(17)30453-8/fulltext

Proposed Quality Metrics – NSCLC

Pre-Treatment Phase

The following should be performed:

- An appropriately timed (</= 4 weeks) before radiation and technically adequate PET/CT imaging for staging should be performed.
- Imaging of the brain, thorax and bone prior to start of treatment, in accordance to CCO's Lung Imaging Guideline: https://www.cancercareontario.ca/en/guidelines-advice/types-of-cancer/3201
- Pulmonary function test before start of treatment if not previously done in radically treated cases

	Staging Non-Small Cell Lung Cancer			
12.	MRI Brain	To rule out metastasis	NICE 2011 1.3.27 Ref 4	Offer patients with features suggestive of intracranial pathology, CT of the head followed by MRI if normal, or MRI as an initial test.
13.	CT Brain	If MRI not possible	NICE 2011 1.3.27 Ref 4	Offer patients with features suggestive of intracranial pathology, CT of the head followed by MRI if normal, or MRI as an initial test.
14.	CT Thorax and upper abdomen	If previous inadequate or outdated	ACR Ref 7	Indicated CT chest with or without contrast through adrenal glands.
15.	MRI Thorax	Not Indicated routinely	NICE 2011 1.3.6 Ref 4	Magnetic resonance imaging (MRI) should not routinely be performed to assess the stage of the primary tumour (T-stage) in NSCLC.
16.	MRI Thorax	For patients with superior sulcus tumors or chest wall invasion	NICE 2011 1.3.7 Ref 4	MRI should be performed, where necessary to assess the extent of disease, for patients with superior sulcus tumours.
17.	PET/CT	Where curative resection is being considered	CCO 2007 Ref 5	Prospective studies have found that PET detects unexpected distant metastases in up to 15% of patients, which may lead to changes in patient management
18.	Bone scan **Note:** Bone scan may not be necessary if PET scan was performed	If suspected metastasis	NICE 2011 1.3.28 Ref 4	An X-ray should be performed in the first instance for patients with localized signs or symptoms of bone metastasis. If the results are negative or inconclusive, either a bone scan or an MRI scan should be offered.
19.	X-ray bone	Stage M1b disease	NICE 2011 1.3.28 Ref 4	An X-ray should be performed in the first instance for patients with localized signs or symptoms of bone metastasis. If the results are negative or inconclusive, either a bone scan or an MRI scan should be offered.

As per CCO's Lung Imaging Guideline:
https://www.cancercareontario.ca/en/guidelines-advice/types-of-cancer/3201

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Proposed Quality Metrics – NSCLC

Pre-Treatment Phase

- The following CCO, ASTRO and ESMO guidelines should be considered in decisions on patient management:

Role of Adjuvant RT in NSCLC after surgery (2015) – See **Appendix A** https://www.ncbi.nlm.nih.gov/pubmed/25957185	Definitive and Adjuvant Radiotherapy in Locally Advanced NSCLC: ASCO Clinical Practice Guideline Endorsement of the ASTRO Guideline https://www.ncbi.nlm.nih.gov/pubmed/25944914
Definitive RT in Locally Advanced NSCLC (2015) – See **Appendix B** https://www.ncbi.nlm.nih.gov/pubmed/25957184	Early and locally advanced NSCLC: ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-up https://www.ncbi.nlm.nih.gov/pubmed/28881918
Palliative RT in NSCLC (2018) – See **Appendix C** https://www.ncbi.nlm.nih.gov/pubmed/29625898	Adjuvant Systemic Therapy and Adjuvant Radiation Therapy for Stage I to IIIA Completely Resected NSCLC: ASCO/CCO Clinical Practice Guideline Update https://www.ncbi.nlm.nih.gov/pubmed/28437162
Treatment of Patients with Stage III (N2 or N3) NSCLC https://www.cancercareontario.ca/en/guidelines-advice/types-of-cancer/43311	

Proposed Quality Metrics - NSCLC

Pre-Treatment Phase - Discussion Question:

- Should there be psychosocial oncology quality metrics included in Pre-Treatment for lung cancer? I.e.
  - ❑ Nutrition
  - ❑ Speech and swallowing evaluation therapy and dysphagia prevention +/- G tube insertion
  - ❑ Audiogram (especially if cisplatin based, chemotherapy planned)

Proposed Quality Metrics – NSCLC

Imaging and Planning Phase

The following should be considered with regards to RT simulation, planning and delivery:

- Simulation should be performed using CT scans obtained in the RT treatment position with appropriate immobilization devices. IV contrast with or without oral contrast is recommended when possible for better target/organ delineation for patients with central tumours or nodal disease.

- An appropriately timed (</= 4 weeks) before radiation and technically adequate PET/CT imaging for target volume delineation should ideally be performed as part of the radiotherapy treatment planning process for lung cancer.

- Tumour and organ motion, especially owing to breathing, should be assessed or accounted for at simulation. 4D-CT is considered the equipment of choice for patients who are receiving curative treatment.

Continued on next page

Proposed Quality Metrics – NSCLC

Imaging and Planning Phase

The following should be considered with regards to RT simulation, planning and delivery (continued):

- PET findings must be taken into account for treatment volume segmentation (according to current institutional practice).

- Photon beam energy should be individualized based on the anatomic location of the tumours and beam paths.

- Tissue heterogeneity correction and accurate dose calculation algorithms are recommended that account for buildup and lateral electron scatter effects in heterogeneous density tissues.

Proposed Quality Metrics – NSCLC & SCLC

Imaging and Planning Phase

- Institutional guidelines should be developed on target volumes , prescription dose and normal tissue dose constraints. The table of dose-volume constraints listed here is an example.

- DVH for the following organs should be part of the published plan: lung, heart, esophagus, and spinal cord. Consider to include Liver, major vessels, stomach, brachial plexus, and proximal bronchial tree, where appropriate

- For additional dose-volume constraints, QUANTEC guidelines should be reviewed. https://www.redjournal.org/issue/S0360-3016(10)X0002-5 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4041542/

Table 5. Normal Tissue Dose-Volume Constraints for Conventionally Fractionated RT with Concurrent Chemotherapy*

OAR	Constraints in 30–35 fractions
Spinal cord	Max ≤50 Gy
Lung	V20 ≤35%–40%†; MLD ≤20 Gy
Heart**	V50 ≤25%; Mean ≤20 Gy
Esophagus	Mean ≤34 Gy; Max ≤105% of prescription dose; V60 ≤17%; contralateral sparing is desirable
Brachial plexus	Median dose ≤69 Gy

Vxx = % of the whole OAR receiving ≥xx Gy.

*These constraints represent doses that generally should not be exceeded. Because the risk of toxicity increases progressively with dose to normal tissues, a key principle of radiation treatment planning is to keep normal tissue doses "as low as reasonably achievable" while adequately covering the target. The doses to any given organ at risk should typically be lower than these constraints, approaching them only when there is close proximity to the target volume.

†Use V20 <35%, especially for the following: elderly ≥70 years, taxane chemotherapy, and poor PFTs (such as FEV1 or DLCO <50% normal). Use more conservative limits with a diagnosis or radiologic evidence of idiopathic pulmonary fibrosis (IDP)/usual interstitial pneumonia (UIP) (the tolerance of these patients is lower though not well characterized).

Example table taken from NCCN guidelines
https://www.nccn.org/professionals/physician_gls/pdf/nscl.pdf

Proposed Quality Metrics – NSCLC

Quality Assurance Phase

QA of treatment plans:

- QA of all treatment plans shall be performed by a medical physicist and radiation therapist, as per institutional guidelines.

Peer Review:

- As per CCO Lung Radiation Oncology Peer Review Guidance Document

https://www.cancercareontario.ca/en/node/56286

Proposed Quality Metrics – NSCLC

Treatment Phase

The following should be considered:

- Adaptive re-planning should be considered if there is significant change in lung volume, pleural effusion, tumour, or change in breathing pattern.

- Daily image guidance procedures should be performed. E.g. daily cone-beam CT.

- Other treatment procedures and planning should be done in accordance with the NSCLC Treatment Pathway Map (Nov 2017) https://www.cancercareontario.ca/sites/ccocancercare/files/assets/NSCLCTreatmentPathwayMap_0.pdf

Proposed Quality Metrics – NSCLC

Post-Treatment Phase

The following should be considered:

- For NSCLC, no recommendation can be made in relation to positron emission tomography (PET)/CT.
- Any new and persistent or worsening symptom warrants the consideration of a recurrence, especially: constitutional symptoms, pain, neurological symptoms, and respiratory symptoms.
- The selective use of PET is recommended when recurrence is suspected.

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Continued on next page

Table 1. Evaluations and intervals for routine surveillance of lung cancer survivors after curative-intent therapy.

	NSCLC	SCLC
Clinical visit evaluations	Medical history, physical exam and chest imaging	Medical history, physical exam and chest imaging
Clinical visit frequency	Years 1-2: every 3 months Year 3: every 6 months Years 4+: annually[I]	Years 1-2: every 3 months Year 3: every 6 months Years 4+: annually[I]
Medical imaging modality	LDCT[II] or MnDCT[III] without contrast may be a reasonable option over chest x-ray for detection of pulmonary lesions	Diagnostic CT without contrast may be a reasonable option over chest x-ray for detection of pulmonary lesions[II] Diagnostic CT with contrast is suggested to detect recurrence in mediastinal lymph nodes[I]
Surveillance imaging frequency	Year 1: 3, 6 and 12 months post-treatment Year 2: every 6 months (18 and 24 months post-treatment) Years 3+: annually[III]	Year 1: 3, 6 and 12 months post-treatment Year 2: every 6 months (18 and 24 months post-treatment) Years 3+: annually[I]
Medical imaging when recurrent disease or new disease is suspected	Diagnostic chest CT with contrast plus upper abdomen scan is suggested to detect local recurrence or new primary lung cancer[I] If patient is symptomatic, imaging modality specific to patient's symptoms is recommended[I]	Diagnostic chest CT with contrast plus upper abdomen scan is suggested to detect local recurrence or new primary lung cancer[I] If patient is symptomatic, imaging modality specific to patient's symptoms is recommended[I]

[I] Based on consensus of expert opinion.
[II] Based on extrapolation data from the National Lung Screening Trial (5,6).
[III] Based on a MnDCT vs. chest x-ray cohort study (4).
Abbreviations: LDCT, low-dose computed tomography; MnDCT, minimal-dose computed tomography; NSCLC, non-small cell lung cancer; SCLC, small cell lung cancer.

As per CCO PEBC Guideline: https://www.cancercareontario.ca/en/guidelines-advice/types-of-cancer/261 [46]

Proposed Quality Metrics – NSCLC

Post-Treatment Phase

The following should be considered (continued):

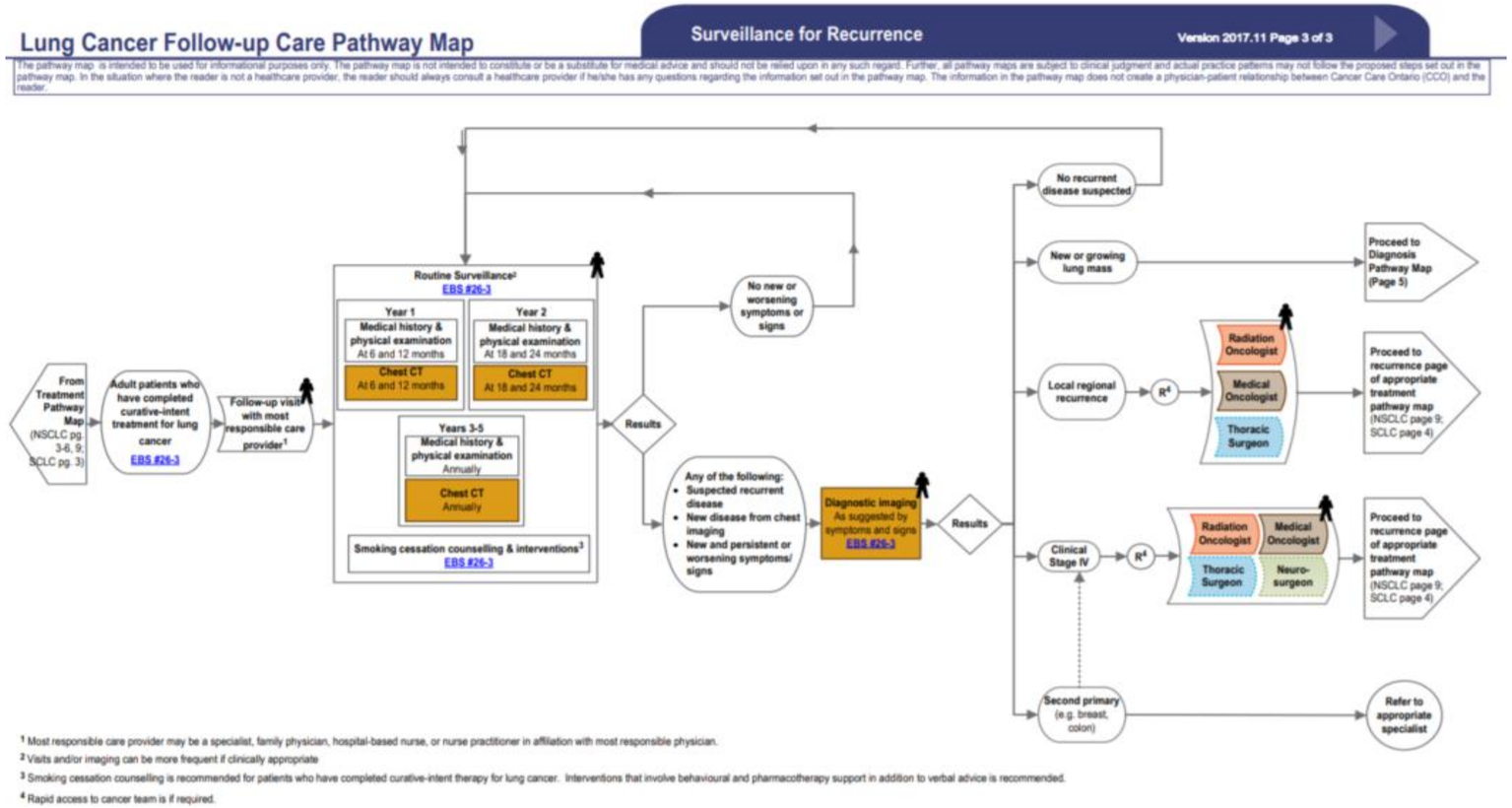
- Health care professionals need to aid lung cancer survivors in handling these symptoms to improve quality of life (QoL): Constitutional issues, long-term chemotherapy, radiation and surgery effects.
- For lung cancer survivors who have completed curative-intent therapy, surveillance is required and may be provided by specialists, family physicians or hospital-based nurses.
- Smoking cessation counselling is recommended for patients who have completed curative intent therapy. Interventions that involve behavioural and pharmacotherapy support in addition to verbal cessation advice is recommended.

- As per CCO's PEBC guideline "*Follow up and surveillance of Curatively Treated Lung Cancer Patients*" https://www.cancercareontario.ca/en/guidelines-advice/types-of-cancer/261
- Additional guidelines that could be referenced include ESMO guidelines "*Early and locally advanced NSCLC: ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-up*" https://www.ncbi.nlm.nih.gov/pubmed/28881918

Proposed Quality Metrics – NSCLC

Post-Treatment Phase

- As per CCO guidelines (DPM Lung Cancer Follow-up Care Pathway Map) https://www.cancercareontario.ca/sites/ccocancercare/files/assets/LungFollow-upCarePathwayMap.pdf



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Proposed Quality Metrics - SCLC

Proposed Quality Metrics – SCLC

Quality metrics in SCLC

In general these are the same as in NSCLC with the following additions:

- In limited stage SCLC thoracic XRT should ideally be done within the 1st or 2nd cycle of chemotherapy

Micro Costing Activities

Funding Activities

Disease Site Specific Protocol Confirmation

- Disease Site Expert Panel Group and Disease Site Working Group will develop and confirm all disease site protocols for the RT-QBP

HR Resource Data Collection

- The Funding Unit will work with the following groups to complete preliminary work on HR related costing inputs for disease-site specific radiation treatment protocols:
  - Physics Professional Advisory Committee (PPAC)
  - Radiation Therapy Professional Advisory Committee (RThPAC)
  - RCC Director
- The preliminary work will be reviewed with the Disease Site specific Working Group and Advisory Committee for feedback and approval

Infrastructure and Equipment Use

- The Funding Unit will work with members of the Infrastructure and Equipment Working Group to complete preliminary work on costing inputs and data collection for infrastructure and equipment use for radiation treatment (e.g. minor equipment, major equipment, patient specific supplies)
- The preliminary work will be reviewed with Disease Site specific Working Group and Advisory Committee for feedback and approval

Micro Costing Working Group

Name	Hospital
Miller MacPherson	The Ottawa Hospital
Stephen Breen	Sunnybrook Health Sciences Centre
David Jaffray	Princess Margaret Hospital
Daniel Letourneau	Princess Margaret Hospital
Ernest Osei	Grand River Hospital
Jeff Richer	Windsor Regional Hospital
Raxa Sankreacha	Trillium Health Partners
John L. Shreiner	Kingston Health Sciences Centre
Ivan Yeung	Southlake Regional Health Centre
Colleen Dickie	Princess Margaret Hospital

Name	Hospital
Gaylene Medlam	Trillium Health Partners
David McConnell	Thunder Bay Regional Health Sciences Centre
Margaret Hart	CCO
Julie Renaud	The Ottawa Hospital
Christine Black	Lakeridge Health
Brendee Pidgeon	Royal Victoria Regional Heath Centre
James Loudon	Southlake Regional Health Centre
Steve Russel	Sunnybrook Health Sciences Centre
Patti Marchand	Lakeridge Health
Chris Kwong	Royal Victoria Regional Health Centre

Name	Hospital
Jackson Chan	Hamilton Health Sciences Centre
Kit Tam	Kingston Health Sciences Centre
Elen Moyo	Princess Margaret Hospital
Sara Kaune	Grand River Hospital
Jeffrey Richer	Windsor Regional Hospital
Janice Stewart	Sunnybrook Health Sciences Centre
Catherine Cotton	Southlake Regional Health Centre
Andrea Dorcherty	Thunder Bay Regional Health Sciences Centre
Sara Zammit	Hamilton Health Sciences Centre

Infrastructure & Equipment Working Group Members

Name	Hospital
Sophie Foxcroft	CCO
Eric Gutierrez	CCO
Julia Monakova	CCO
Konrad Leszczynski	Health Sciences North
Miller MacPherson	The Ottawa Hospital
Kyle Malkoske	Royal Victoria Hospital
David McConnell	Thunder Bay Regional Health Sciences Centre
Katharina Sixel	Lakeridge Health
Janice Stewart	Sunnybrook Health Sciences Centre
Julie Renaud	The Ottawa Hospital
Ivan Yeung	Southlake Regional Health Centre

Psychosocial Oncology (PSO)

Timelines

Clinical Development Timelines

High Level RT-QBP Gantt-Clinical Development Activities

QBP completion ★ QBP go-live in RCCs ★

Fiscal Year	FY 2018-19				FY 2019-20				FY 2020-21				FY 2021-22			
Fiscal Year Quarters	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Phase 1																
GU	■	■	■	■												
Breast	■	■	■	■												
Gastrointestinal		■	■	■	■											
Lung		■	■	■	■											
Sarcoma		■	■	■	■											
Head & Neck		■	■	■	■											
CNS (primary)		■	■	■	■											
CNS (brain mets)		■	■	■	■											
Clinical Handbook Development			■	■	■	■	■									
Phase 2																
Skin			■	■	■	■										
Peds			■	■	■	■										
Endocrine			■	■	■	■										
Gynecological Cancers				■	■	■	■									
Hematology				■	■	■	■									
Bone Mets				■	■	■	■									
Other / Ongoing Discussion					■	■	■									
Clinical Handbook Development					■	■	■	■								
Additional Working Groups																
Physics Plan Check Group			■	■	■	■										
Equipment Costing Group				■	■	■	■									
Others as needed					■	■	■									
Reporting Working Group							■	■	■	■	■	■	■	■	■	■
Operations and Implementation							■	■	■	■	■	■	■	■	■	■
6 Months for Hospitals Prior to Implementation											■	■				

Notes / Assumptions

Clinical disease sites timeline estimates are based on progress with the first four disease sites underway and include all activities up to the completion of the patient level data review with the funding team

Timeline Reference	
Q1	Apr 1 - Jun 30
Q2	Jul 1 - Sep 30
Q3	Oct 1 - Dec 31
Q4	Jan 1 - Mar 31

Next Steps

- Incorporate feedback from today's discussion and distribute the finalized Lung RT-protocols and quality metrics to the group

- Present final proposed treatment protocols and quality metrics to QBP Advisory Committee for approval

- Share approved protocols and other relevant information with CCO's Funding team for costing

Objectives for Today

Lung RT-QBP Working Group Meeting:

- To provide an introduction to Health System Funding Reform (HSFR)
- To review Lung RT-QBP protocols for consideration
- To review Lung RT-QBP quality metrics for consideration
- To review the Micro Costing and Infrastructure and Equipment funding approach
- To provide an update on Psychosocial Oncology (PSO)
- QBP Timelines and Next steps

THANK YOU!

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Appendix A: ASTRO Guidelines - Adjuvant radiation therapy in locally advanced non-small cell lung cancer

KQ4: What are the indications for adjuvant postoperative radiation therapy for the curative-intent treatment of locally advanced non-small cell lung cancer?

Statement A. Phase 3 studies and meta-analyses of PORT in completely resected (R0) LA NSCLC with N2 disease suggest that its addition to surgery does not improve overall survival but may improve local control when compared with observation strategies.

Statement B. Phase 3 studies and meta-analyses of PORT in completely resected (R0) LA NSCLC with N0-1 disease demonstrate inferior survival when compared with observation strategies; therefore, PORT therapy for this patient population is not routinely recommended.

Statement C. Because level 1 evidence supports the administration of adjuvant chemotherapy for completely resected (R0) LA NSCLC based on improvements in overall survival compared with patients on observation, any PORT therapy should be delivered sequentially after chemotherapy in order not to interfere with standard of care chemotherapy.

Statement D. For patients receiving adjuvant PORT for R0 disease, conventionally fractionated doses in the range of 50 Gy to 54 Gy (in 1.8-2.0 Gy/day) should be used.

Statement E. Patients with microscopic residual (R1) primary disease (ie, positive margin) and/or microscopic (ie, extracapsular extension) nodal disease may be appropriate candidates for PORT (given either concurrently or sequentially with chemotherapy) with conventionally fractionated doses in the range of 54 Gy to 60 Gy (in 1.8-2.0 Gy/day fraction size) to improve local control.

Statement F. Patients with gross residual primary and/or macroscopic nodal (R2) disease of LA NSCLC may be appropriate candidates for PORT (given either concurrently or sequentially with chemotherapy) with conventionally fractionated doses of at least 60 Gy (in 1.8-2.0 Gy/day fraction size) to improve local control.

KQ5: When is neoadjuvant radiation therapy before surgery indicated for the curative-intent treatment of locally advanced non-small cell lung cancer?

Statement A. There is no level 1 evidence recommending the use of induction radiation therapy (or chemoradiation therapy) followed by surgery for patients with resectable stage III NSCLC.

Statement B. In those patients who are selected for a trimodality approach, preoperatively planned lobectomy (as opposed to pneumonectomy) based on best surgical judgment is preferable because it was associated with survival benefit in the exploratory post-hoc INT 0139 analysis.

Statement C. No definitive statement can be made about best patient selection criteria for the trimodality therapy, although no weight loss, female gender, and 1 (vs more) involved nodal station were associated with improved outcome in INT 0139.

Statement D. The ideal preoperative radiation therapy dose is currently not known; however, a minimum of 45 Gy should be delivered consistent with the INT 0139 trial.

Statement E. Preoperative conventionally fractionated doses up to 60 Gy may be associated with reasonable mediastinal clearance rates, although no significant correlation with improved overall survival has been demonstrated.

Note: This is a not a comprehensive list. For more details, please refer to the individual guidelines.

https://www.ncbi.nlm.nih.gov/pubmed/25957185

Appendix B: ASTRO Guidelines - Definitive radiation therapy in locally advanced non-small cell lung cancer

KQ1: What is the ideal external beam dose fractionation for the curative-intent treatment of locally advanced non-small cell lung cancer with radiation therapy alone?

Statement A. Radiation therapy alone has been shown to be superior to observation strategies or chemotherapy alone for LA NSCLC in terms of overall survival but at the cost of treatment-related side effects such as esophagitis and pneumonitis.

Statement B. Radiation therapy alone may be used as definitive radical treatment for patients with LA NSCLC who are ineligible for combined modality therapy (ie, due to poor performance status, medical comorbidity, extensive weight loss, and/or patient preferences) but with a tradeoff of survival for improved treatment tolerability.

Statement C. In the context of conventionally fractionated radiation therapy, a minimum dose of 60 Gy is recommended to optimize important clinical outcomes such as local control.

Statement D. Altered fractionation schedules that have been explored in the medical literature include hyperfractionation (lower dose per fraction over the standard treatment duration), accelerated fractionation (conventional fraction size and same total dose, given in a shorter period of time), accelerated hyperfractionation (combination of these 2), and hypofractionation (higher dose per fraction and fewer fractions).

Statement E. Specific altered fractionation schemes that have been investigated in various comparative effectiveness research investigations (including randomized controlled trials) include 45 Gy/15 fractions (hypofractionation), 69.6 Gy/58 fractions BID (hyperfractionation), 54 Gy/36 fractions TID over 12 consecutive days (CHART, accelerated hyperfractionation), and 60 Gy/40 fractions TID (CHARTWEL, accelerated hyperfractionation).

KQ2: What is the ideal external beam dose fractionation for the curative-intent treatment of locally advanced non-small cell lung cancer with chemotherapy?

Statement A. The standard thoracic radiation therapy dose fractionation for patients treated with concurrent chemotherapy is 60 Gy given in 2 Gy once daily fractions over 6 weeks.

Statement B. Dose escalation beyond 60 Gy with conventional fractionation has not been demonstrated to be associated with any clinical benefits including overall survival.

Statement C. Hyperfractionated radiation therapy regimens that do not result in acceleration of the treatment course, even though the total nominal radiation therapy dose may be modestly increased, do not appear to improve outcomes compared with conventionally fractionated therapy.

Statement D. The optimal thoracic radiation therapy regimen for patients receiving sequential chemotherapy and radiation therapy is not known; however, results from the CHARTWEL and HART phase 3 studies suggest that increasing the biologic equivalent dose by using accelerated hyperfractionated radiation therapy may be of benefit following induction chemotherapy in locally advanced non-small cell lung cancer.

Statement E. Although the impact of increasing the predicted biologic equivalent dose via accelerated radiation therapy regimens is not clear, further study of accelerated hypofractionated regimens is of interest to optimize the therapeutic ratio of treatment, particularly in the context of advanced imaging, radiation therapy planning, and treatment delivery.

Note: This is a not a comprehensive list. For more details, please refer to the individual guidelines.

https://www.ncbi.nlm.nih.gov/pubmed/25957184

Appendix B: ASTRO Guidelines - Definitive radiation therapy in locally advanced non-small cell lung cancer

KQ3: What is the ideal timing of external beam radiation therapy in relation to systemic chemotherapy for the curative-intent treatment of locally advanced non-small cell lung cancer?

Statement A. There is phase 3 evidence demonstrating improved overall survival, local control, and response rate associated with concurrent chemoradiation when compared against sequential chemotherapy followed by radiation.

Statement B. There is no proven role for the routine use of induction chemotherapy prior to chemoradiation therapy, although this treatment paradigm can be considered for the management of bulky tumors to allow for radical planning after chemotherapy response.

Statement C. There are no phase 3 data specifically supporting the role for consolidation chemotherapy after chemoradiation therapy for the improvement of overall survival; however, this treatment is still routinely given to manage potential micrometastatic disease particularly if full systemic chemotherapy doses were not delivered during radiation therapy.

Statement D. For patients that cannot tolerate concurrent chemoradiation therapy, sequential chemotherapy followed by radical radiation has been shown to be associated with an overall survival benefit when compared to radiation therapy alone.

Statement E. The ideal concurrent chemotherapy regimen has not been determined; however, the 2 most common regimens (cisplatin/etoposide and carboplatin/paclitaxel) are the subject of a completed phase 3 clinical trial (NCT01494558).

Note: This is a not a comprehensive list. For more details, please refer to the individual guidelines.

https://www.ncbi.nlm.nih.gov/pubmed/25957184

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Appendix C: ASTRO Guidelines - Palliative thoracic radiation therapy for non-small cell lung cancer

2018 updated ASTRO guidelines: **KQ: What is the role of chemotherapy administered concurrently with radiation for the palliation of LC?**

- Incurable stage III NSCLC - In the management of patients with stage III NSCLC deemed unsuitable for curative therapy but who are (1) candidates for chemotherapy, (2) have an Eastern Cooperative Oncology Group (ECOG) PS of 0 to 2, and (3) have a life expectancy of at least 3 months, administration of a platinum-containing chemotherapy doublet concurrently with moderately hypofractionated palliative thoracic radiation therapy is recommended over treatment with either modality alone

- Stage IV NSCLC - In the palliative management of patients with stage IV NSCLC, routine use of concurrent thoracic chemoradiation is not recommended. This practice should remain primarily reserved for clinical trials or multi-institutional registries.

Note: This is a not a comprehensive list. For more details, please refer to the individual guidelines

https://www.ncbi.nlm.nih.gov/pubmed/29625898