
PATIENT CENTERED CARE
ePROs Monitoring in Thoracic Surgery and Oncology Patients
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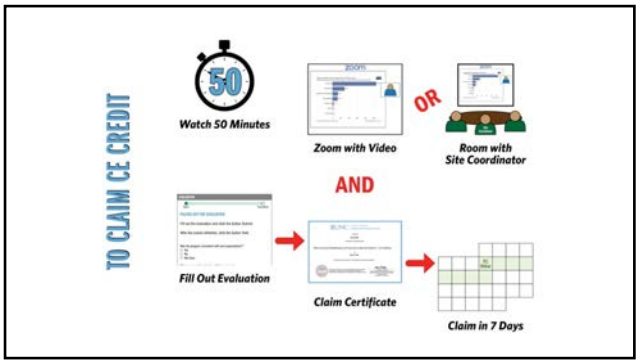
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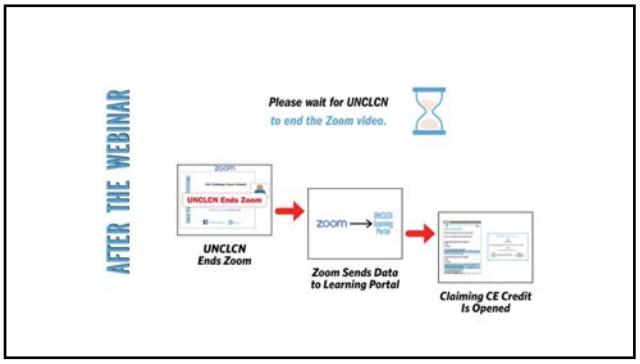
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PATIENT CENTERED CARE
Live Webinar
Gita Mody, MD, MPH
ePROs Monitoring in Thoracic Surgery and Oncology Patients
July 12

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OUR PRESENTER

Gita Mody, MD, MPH

Dr. Gita Mody is an Adjunct Assistant Professor at the UNC Gillings School of Global Public Health with the Public Health Leadership Program. She received her M.D. at Washington University School of Medicine in St. Louis and received her M.P.H. in Clinical Effectiveness from the Harvard School of Public Health. As an Assistant Professor in the UNC Department of Surgery and Director of Thoracic Surgical Oncology, her clinical expertise is in caring for lung cancer patients, who are amongst the most vulnerable and underserved groups in North Carolina. Her major research interest is in optimizing quality of life and other patient-centered outcomes in patients with chronic illness through studying the implementation of digital health and other complex interventions. Her training in comparative effectiveness research, patient-reported outcomes measurement, and implementation science are synergistic, and she is well-versed with experimental and pragmatic study designs. Her current and prior work is funded through grants from the National Heart, Lung and Blood Institute (NHLBI) , American College of Surgeons (ACS), and the Thoracic Surgery Foundation (TSF). She is passionate about global equity in health and actively engages in training the next generation of clinical-scientists from low-resourced settings through her work in the Malawi Cancer Outcomes Research Program.

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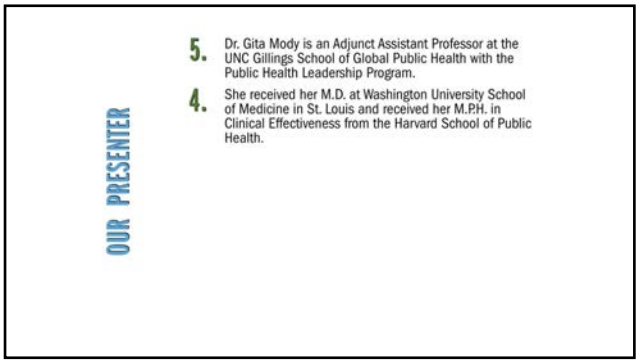
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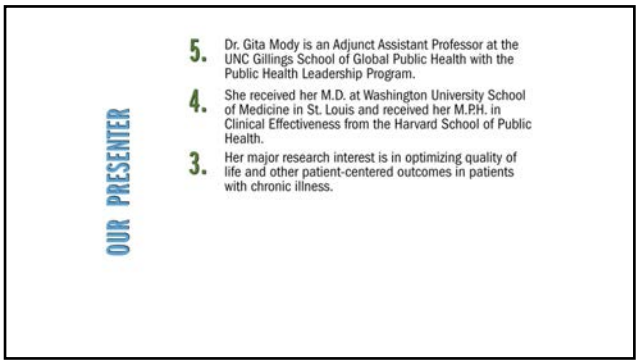
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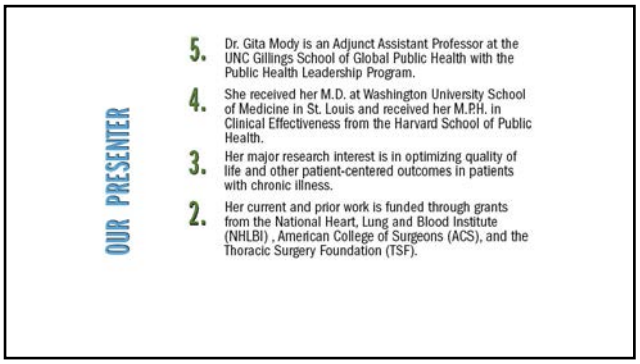
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ePRO is the abbreviation for "electronic Patient-Reported Outcome".

True 0%0

False 0%0

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ePROs Monitoring in Thoracic Surgery and Oncology Patients

UNC Lineberger Cancer Network Webinar | July 12, 2023

Gita N. Mody, MD MPH
Assistant Professor of Surgery
Director of Thoracic Surgical Oncology
UNC Department of Surgery
Lineberger Comprehensive Cancer Center

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Disclosures

Research funding and advisor for Sivan Ltd.

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Objectives

1. **Describe symptom burden of thoracic surgical and oncologic conditions and treatments**
2. Review reasons and methods for patient-reported outcomes monitoring
3. Discuss implementation of PRO monitoring in thoracic patients' survivorship care

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Thoracic surgery

- Thoracic surgery includes the esophagus, mediastinum, trachea and chest wall.

Image credit: Adobe Stock (licensed)

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Chest diseases treated with surgery

- Emphysema
- Dysphagia
- Gastroesophageal reflux disease
- Tumors of the lung, esophagus, chest wall, mediastinum
- Tracheal anomalies
- Diaphragm disease
- End-stage lung disease requiring transplantation
- Benign chest wall abnormalities

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Types of thoracic surgery

- Approaches
  - Open
  - Minimally invasive
    - Video Assisted Thoracoscopic Surgery (VATS)
    - Robotic Assisted Thoracoscopic Surgery (RATS)
    - Uniportal thoracoscopic surgery
- Procedures
  - Pulmonary resection
    - Wedge resection
    - Segmentectomy
    - Lobectomy
    - Pneumonectomy
  - Thymectomy
  - Diaphragm plication and repair
  - Chest wall resection
  - Lymph node biopsy
  - Decortication and Pleurodesis
  - Esophagectomy
  - Paraesophageal hernia repair

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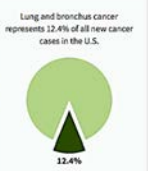
Lung Cancer Statistics

	Common Types of Cancer	Estimated New Cases 2021	Estimated Deaths 2021
1.	Breast Cancer (Female)	281,550	43,600
2.	Prostate Cancer	248,530	34,130
3.	Lung and Bronchus Cancer	235,760	131,880
4.	Colorectal Cancer	149,500	52,980
5.	Melanoma of the Skin	106,110	7,180
6.	Bladder Cancer	83,730	17,200
7.	Non-Hodgkin Lymphoma	81,560	20,720
8.	Kidney and Renal Pelvis Cancer	76,080	13,780
9.	Uterine Cancer	66,570	12,940
10.	Leukemia	61,090	23,660



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Lung Cancer Statistics

- 1 in 5 cancer deaths 
- Average age at diagnosis: **70 years**
- New lung cancer **cases and deaths are decreasing**
  - Reduction in smoking
  - Earlier detection
  - Treatment advances

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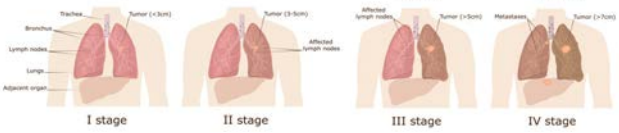
Stages of Lung Cancer

Of new cases, **17%** are diagnosed with local disease, **22%** at regional state, and **56%** with distant disease.



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What is the most common treatment for early-stage lung cancer?

Surgery	0% 0
Radiation	0% 0
Observation	0% 0

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Majority of Early-Stage Lung Cancer Patients Undergo Surgical Therapy

76.7% of those with Stage I disease

83.8% of those with Stage II disease

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Lung resection

- Employed for diagnosis, treatment, and palliation of lung cancer and other thoracic conditions.
- >80,000 lung resection procedures are performed annually in the United States.
- Pulmonary lobectomy is increasing by 1.7% per year.

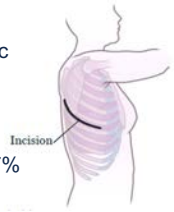

Image credit: Memorial Sloan Kettering Cancer Center

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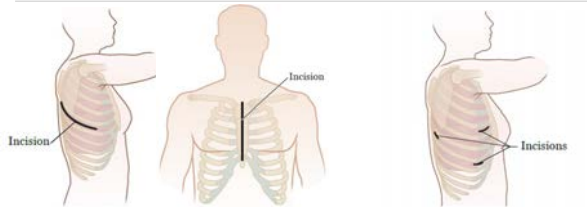
Approaches to lung resection



open surgery minimally invasive surgery

Image credit: Memorial Sloan Kettering Cancer Center

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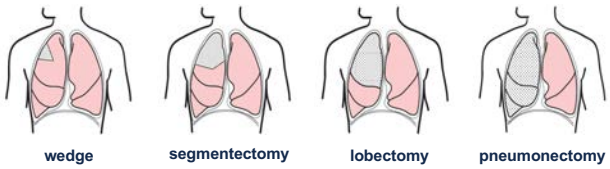
Extent of lung resection



wedge segmentectomy lobectomy pneumonectomy

Image credit: Memorial Sloan Kettering Cancer Center

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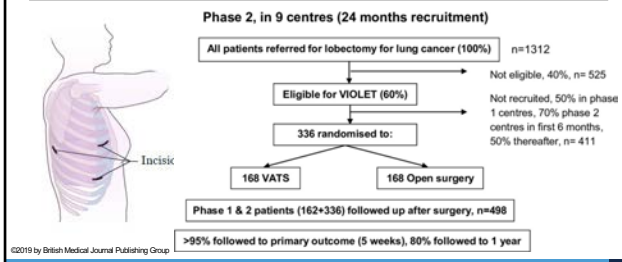
VIOLET establishes minimally invasive thoracic surgery for early-stage lung cancer resection



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VIOLET demonstrates improved QOL for patients with VATS

Study design:

- cT1-3, N0-1 and M0 lung cancer
- 56 months, 503 participants

QOL results:

- less pain on VAS
- less analgesic consumption
- better physical function (EORTC QLQ-C30)
- improved global health status

Clinical results:

- fewer complications
- no difference in serious adverse events
- hospital stay was shorter (4 vs 5 days)
- lower 1 year readmission rates (29.0% vs. 35.9%)
- Similar PFS (HR 0.74, 0.43 to 1.27; p=0.27)
- Similar OS (HR 0.67, 0.32 to 1.40; p=0.282)

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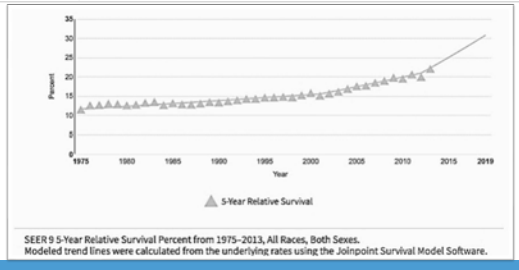
Survival among patients with lung cancer is improving



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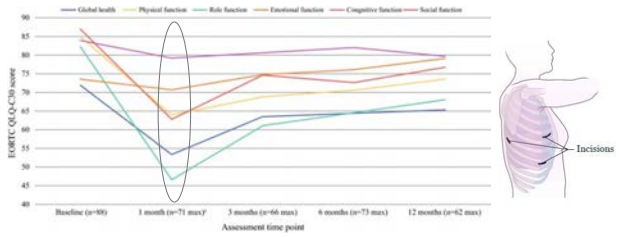
Lung cancer surgery patients experience deficits in Health-Related Quality of Life



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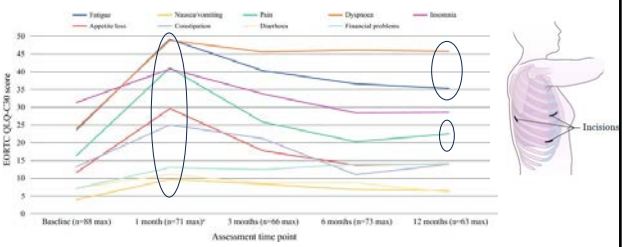
Symptom burden is high in lung cancer surgery patients.



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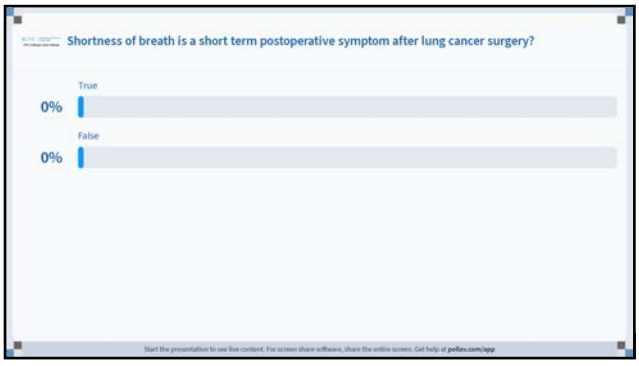

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Audience question

- Shortness of breath is a short term postoperative symptom after lung cancer surgery?
  - A. True
  - B. False

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Lung cancer surgery patients' HRQOL priorities

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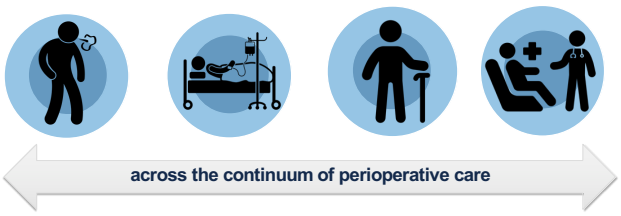
When should HRQOL be measured?



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Thoracic surgery patients report gaps between preop expectations and postop HRQOL

- 10 semi-structured interviews with elderly patients
- 1 year after thoracic surgery

- Unexpected duration of physical recovery time
- Eventual return to baseline physical function
- Improvement in emotional HRQOL

Mody GN, Bennett A, Irani M, Kerwin C, Jakitsch M, Frain L. Geriatric patient experience after thoracic surgery- how to help older patients expect the unexpected. Presented by Mody G at ISOQOL 27th Annual Conference, October 2020.

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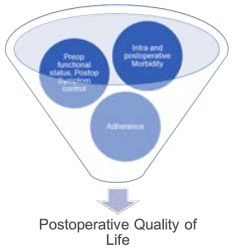
Quality of Life experiences after thoracic surgery are multifactorial

- How do the outcomes thoracic surgery patients experience contribute to their postoperative quality of life?
- How do the expectations of patients contribute to their postoperative quality of life?



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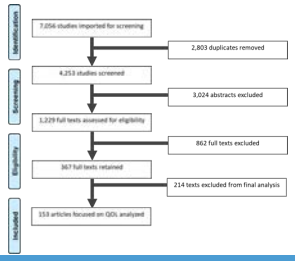
Systematic review on HRQOL after lung cancer surgery identified numerous publications



Dr. Aurelie Merlo, PGY 6

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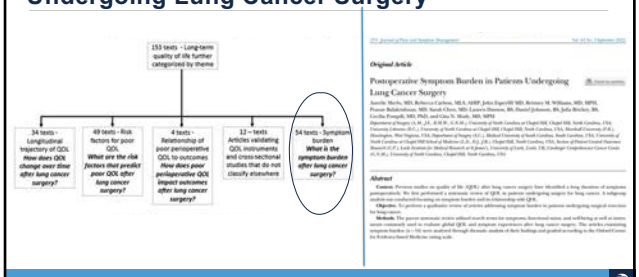
Postoperative Symptom Burden in Patients Undergoing Lung Cancer Surgery



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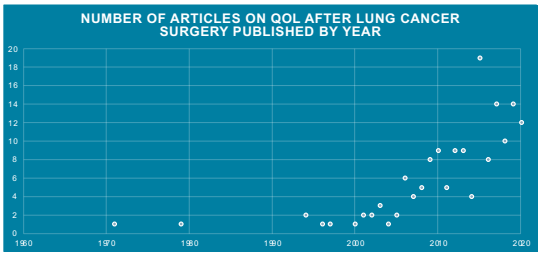
Publication rate is increasing



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Measurement approaches vary

Quality of Life Outcome Measures and Frequency Used in the 54 Included Articles

SF-36 or SF-12	12
EORTC QLQ-C30 or LC-13	11
Hospital Anxiety and Depression Score	11
Subjective data	6
Acceptance of Illness Scale; American Thoracic Society Questionnaire; Athens Insomnia Scale; Baseline Dyspnea Index; Breathlessness Questionnaire; Brief Fatigue Inventory; Brief Pain Inventory; Center for Epidemiologic Studies – Depression Scale; Control Preferences Scale; Coping Inventory; Decisional Conflict Scale; Douleur Neuropathique 2 or 4; Experiences in Close Relationships Scale II; Functional Assessment of Cancer Therapy – Lung; General Sleep Disturbance Scale; Godin Leisure Time Exercise Questionnaire; Herth Hope Questionnaire; Impact of Event Scale; Karnofsky Performance Scale; Lee Fatigue Scale; Leeds Assessment of Neuropathic Symptoms and Signs; Leicester Cough Questionnaire; Lung Cancer Symptom Questionnaire; MD Anderson Symptom Inventory; Medical Coping Modes Questionnaire; Medical Outcomes Study Social Activity Limitations Scale and Symptom Assessment Scale; Mental Adjustment to Care Scale; Mini-Mental State Examination; Multidimensional Scale of Perceived Social Support; Multidimensional Fatigue Symptom Inventory–Short Form; Numeric Rating Scale; Patient-Reported Outcomes Measurement Information System Tools; Perceived Family Support Scale; Physical Activity Questionnaire; Picker Patient Experience; Pittsburg Sleep Quality Index; Posttraumatic Growth Inventory; Post Traumatic Stress Disorder Checklist Civilian Version; Profile of Moods Questionnaire; Self-Administered Comorbidity Questionnaire-19; Self-Efficacy Scale; Stress Thermometer; Social Support Scale; State-Trait Anxiety Inventory; Symptom Distress Scale; Toronto Mindfulness Scale; Veterans RAND 12-Item Health Survey; Visual Analogue Scale; 12-item World Health Organization Disability Assessment Schedule 2.0	<5

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Key findings

1. Symptom burden is high before and after surgery.
2. Pain, dyspnea, cough, fatigue, depression, anxiety are most studied symptoms.
3. Pre-surgery symptoms are a risk factor for symptom acuity and persistence after surgery.
4. Symptom burden is a predictor of postoperative QOL.

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Objectives

1. Describe symptom burden of thoracic surgical and oncologic conditions and treatments
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Who should report on HRQOL?

- Patients at risk for lung cancer
- Comparison of Health Utility Scores for common postoperative conditions

Table 2—Patients' Perception of Possible Outcomes of Lung Surgery as Represented by Utility Scores

Outcomes	Utility Score* (95% CI)
Pneumonia requiring 2 wk of hospitalization	0.81 (0.74–0.88)
Atelectasis requiring bronchoscopic therapy	0.80 (0.72–0.88)
Ventilator dependence for 2 d	0.78 (0.08–0.54)
Ventilator dependence for 7 d	0.74 (0.06–0.82)
Ventilator dependence for 15 d	0.66 (0.57–0.75)
Ventilator dependence for 30 d	0.56 (0.40–0.66)
Permanent ventilator dependence with estimated survival of 6 mo	0.10 (0.04–0.16)
Acute myocardial infarction	0.40 (0.40–0.50)
Can walk only two city blocks without stopping	0.48 (0.40–0.56)
Current activity level reduced by half	0.44 (0.37–0.51)
Oxygen dependence	0.33 (0.20–0.40)
1 mo of nursing home placement followed by a one-block walking limitation (because of dyspnea)	0.30 (0.23–0.37)
Need assistance with activities of daily living	0.19 (0.13–0.25)
Limited to bed to chair existence	0.17 (0.11–0.23)
Progressive lung cancer	0.17 (0.10–0.24)
Permanent nursing home placement	0.16 (0.10–0.22)

*Utility scores range from 0 representing death to 1 representing perfect health.

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Who should report on postoperative HRQOL?

Clinician-reported Outcomes

Patient-reported Outcomes

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Patient-Reported Outcome Measure (PROM)

- Measurement based on report that comes directly from patient about status of patient's health condition without amendment or interpretation of patient's response
  - New FDA guidance in 2020


Guidance for Industry
Patient-Reported Outcome Measures: Use in Medical Product Development to Support Labeling Claims

50

What is a Patient-Reported Outcome (PRO)?

Based on a report that comes **directly from the patient** about the status of the patient's health condition without amendment or interpretation of the patient's response

- Developed with patient and clinician input
- Evidence of psychometric testing for validity and reliability

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PROs are a Significant Piece of the Pie

Complementing ACS NSQIP with PROs will give us the full picture of surgical quality improvement

ACS NSQIP

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Is it a PROM? Questions to ask:

- **Low bar**
  - Does it measure a health concept appropriate for direct patient report?
  - Does it measure perceptions of how a patient feels or functions, beliefs about a health concept, or experience?
- **Higher Bar**
  - Were items or instrument developed with patient and clinician input?
  - Psychometric, validity, reliability evidence?

"Setting a low bar helps us to consistently exceed our expectations."

Image credit: Cartoonstock.com

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Why does measuring PROs matter?

"For patients, there is much more to success than alive or dead, complication, no complication.

How often have we heard 'They said my hip replacement went well, **but I am now housebound**,' or 'He says I have a good flow rate in my bypass graft, **but I still get pain after 10 metres**."

Vallance-Owen, BMJ 2008

Image credit: Adobe Stock (licensed)

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How to measure PROs?

PRO (tool):	PROM (instrument)
Symptoms:	St. George's Respiratory Questionnaire (SGRQ)
Functional status:	Patient-Reported Functional Status (PRFS)
Health-Related Quality of Life:	EORTC QLQ-C30
Self-efficacy for managing condition:	PROMIS Self-Efficacy

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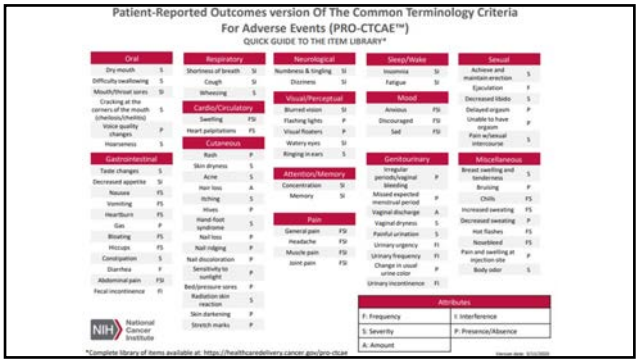

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Theoretical Model for ePRO Mechanism

ePRO detects concerning symptom

Provider receives an alert

Provider contacts patient

1. Reassurance on expected recovery
2. Complication detected
3. Symptom management

- Reduced symptom burden
- Fewer readmissions and emergency department visits
- Increased survival

57

What is a electronic PRO monitoring?

Collects PROs on repeated intervals via:

Paper

Kiosk

Tablet

Home phone (IVR)

Phone call

- Delivers PROs to clinicians
  - Alerts (email, Epic, text message)
  - Symptom reports

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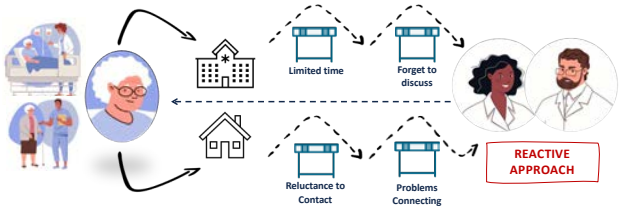
Standard Approach to Postoperative Symptom Monitoring



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Alternative: Systematic Post-discharge Symptom Monitoring using ePROs

Slide courtesy of Dr. Ethan Basch

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Collection of Patient-Reported Outcomes (PROs) can be done remotely and in real-time.

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Evidence for PRO effectiveness in advanced oncology

- PROTECT was a multicenter cluster randomized trial.
- To evaluate ePRO symptom monitoring vs. a usual care control group
- Community oncology practices in the US national network of the Alliance for Clinical Trials in Oncology were invited to participate.
  - Consecutively approach and enroll up to 50 adults with any type metastatic cancer receiving treatment with chemotherapy, targeted oral therapy, and/or immunotherapy if they understood English, Spanish, or Mandarin.
    - Patients with indolent lymphoma or acute leukemia or who were receiving hormonal monotherapy were excluded.

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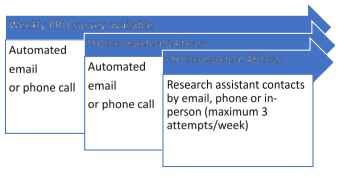
Lung cancer patients undergoing PRO monitoring within the PROTECT study

- Adults ≥18 years old
- Advanced/metastatic disease
- Systemic therapy at community oncology sites
- Weekly PRO-CTCAE survey
- Opportunity for write-in symptoms
- Automated system (+reminders)
- Alerts for severe, very severe or increasing symptoms
- 3-month satisfaction survey

Weekly electronic PRO survey delivery and reminder schedule.



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Baseline characteristics of patients with lung cancer v. patients with other cancer types

	Lung cancer (n=118)	Other cancers (n=475)	p value
Age (mean, sd)	64.4 (9.9)	61.9 (11.9)	0.03
ECOG score (n, %)			0.002
0	41 (34.7%)	211 (44.5%)	
1	59 (50.0%)	218 (46.0%)	
2	14 (11.9%)	44 (9.3%)	
3	4 (3.4%)	1 (0.2%)	
Comorbidities^ (n,%)			0.02
0-1	67 (56.8%)	323 (68.0%)	
2-4	51 (43.2%)	152 (32.0%)	
Education			0.06
Up to 8th	2 (2%)	8 (1.7%)	
9th to 11th	12 (10%)	23 (4.9%)	
High School/GED	39 (33%)	134 (28.8%)	
Some College	39 (33%)	131 (28.2%)	
Associates Degree	5 (4%)	34 (7.3%)	
College Degree	12 (10%)	79 (17.0%)	
Advanced Degree	8 (7%)	56 (12.0%)	

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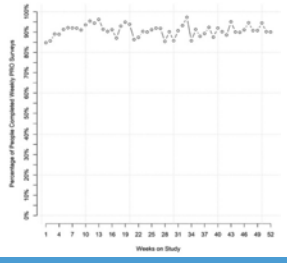
Demographics of lung cancer patients choosing IVR for PRO monitoring

	IVR (n=47)	Web-based (n=71)	p value
Age (mean, sd)	65.28 (9.59)	63.87 (10.13)	0.45
Gender (n, %)			0.563
Male	18 (38.3%)	31 (43.7%)	
Female	29 (61.7%)	40 (56.3%)	
Education*			0.009
Up to 8th	1 (2.2%)	1 (1.4%)	
9th to 11th	8 (17.4%)	4 (5.6%)	
High School/GED	21 (45.7%)	18 (25.4%)	
Some College	12 (26.1%)	27 (38.0%)	
Associates Degree	2 (4.3%)	3 (4.2%)	
College Degree	0 (0.0%)	12 (16.9%)	
Advanced Degree	2 (4.3%)	6 (8.5%)	
Prior computer/device use			< 0.001
Never	17 (36.2%)	2 (2.8%)	
Ever (once a week to daily)	30 (63.8%)	69 (97.2%)	
Prior email use			< 0.001
Never	26 (55.3%)	5 (7.0%)	
Ever (once a week to daily)	21 (44.7%)	66 (93.0%)	
Prior internet use			< 0.001
Never	21 (44.7%)	2 (2.8%)	
Ever (once a week to daily)	26 (55.3%)	69 (97.2%)	

*1 missing response

65

Weekly PRO survey completion for long-term monitoring between visits



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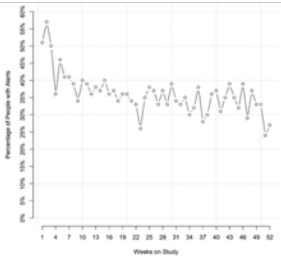
Concerning symptoms were commonly captured by PRO monitoring in patients with lung cancer



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Concerning symptoms were commonly captured by PRO monitoring in patients with lung cancer

Symptom Type	% (n = 118)	Mean continuous duration (weeks)*	Mean reported weeks**
Pain	83.1%	2.87	8.3
Reduced Activity	58.5%	1.98	4.99
Diarrhea	51.7%	1.34	3.51
Reduced Appetite	51.7%	1.16	2.28
Dyspnea	50.8%	2.02	5.28
Constipation	47.5%	1.07	2.20
Nausea	48.3%	1.28	3.65
Fallen	43.2%	1.23	2.55
Insomnia	39.0%	1.29	3.89
Depression	37.3%	1.58	4.93
Vomiting	22.0%	1.06	2.27
Financial Toxicity***	15.3%	n/a	n/a

*Mean continuous duration is calculated as the average number of consecutive weeks a concerning symptom was reported, per patient.
**Mean reported weeks is calculated as the total number of weekly records a concerning symptom was reported, averaged over the number of patients who reported such a symptom.
*** Financial Toxicity was collected every 6 weeks

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Weekly PRO survey write-in symptoms by lung cancer patients.

69

Alerts to providers for concerning symptoms led to intervention

Intervention	n	% (n=1470)*
Coached patient to self-manage or treat symptoms	270	18.4%
Prescribed or changed medications (supportive drugs and/or cancer treatment)	162	11%
Expedited a clinic appointment	68	4.6%
Ordered imaging and/or laboratory test(s)	28	1.9%
Referred to the emergency department	11	0.7%
Planned to address concern at next clinic visit	281	19.1%

*More than one intervention may have been taken per alert.

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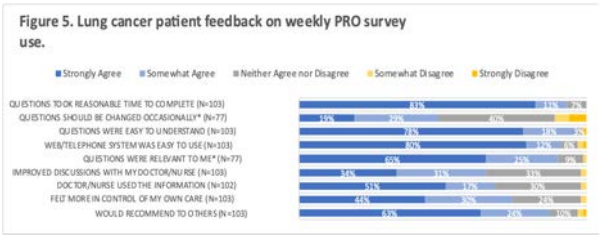
Lung cancer patients would recommend using remote PRO monitoring



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PRO-TECT Lung Conclusions

1. Remote PRO monitoring was feasible in lung cancer patients in the setting of a pragmatic trial.
2. Lung cancer patients on treatment experience a high-symptom burden, which can be detected by PRO surveys.
3. Practice nurses and providers were able to respond to PRO alerts with various management strategies.
4. Real-world experience and best implementation strategies are needed going forward.

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Objectives

1. Describe symptom burden of thoracic surgical and oncologic conditions and treatments
2. Review reasons and methods for patient-reported outcomes monitoring
3. **Discuss implementation of PRO monitoring in thoracic patients' survivorship care**

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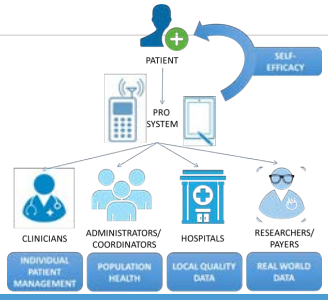
Value of PRO Data in the Electronic Medical Record



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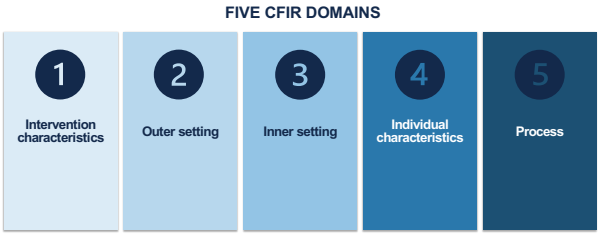
Consolidated Framework for Implementation Research (CFIR)



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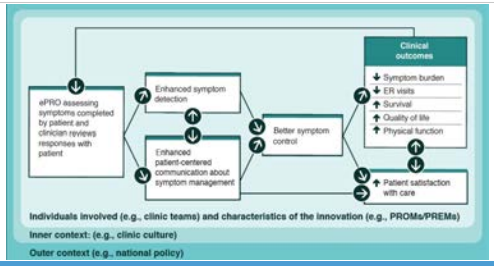
Remote PRO monitoring impacts outcomes



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Organizations increasingly advocate for PRO integration

- Center for Medicare and Medicaid Services (CMS)
- National Quality Forum (NQF)
- National Institutes of Health (NIH)
- National Cancer Institute (NCI)
- US Food and Drug Administration (FDA)
- American College of Surgeons (ACS)
- American College of Chest Physicians (ACCP)
- Center for Medical Technology Policy (CMTP)
- Patient-Centered Outcomes Research Institute (PCORI) created by Affordable Care Act

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UNC Health Care System & UNC Hospitals

- State-owned, not-for-profit medical system
- Affiliated with UNC-Chapel Hill School of Medicine
  - Academic teaching hospital
  - Tradition of public health & service within the community and beyond

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Multidisciplinary Thoracic Oncology Program

- MTOP at UNC Hospitals organized in 1993
- Patients who need testing for - or have been diagnosed with - lung cancer, mesothelioma, and other thoracic malignancies
- Care team includes:
  - surgery
  - pulmonary medicine
  - medical and radiation oncology
  - thoracic radiology
  - pathology
  - oncology nursing

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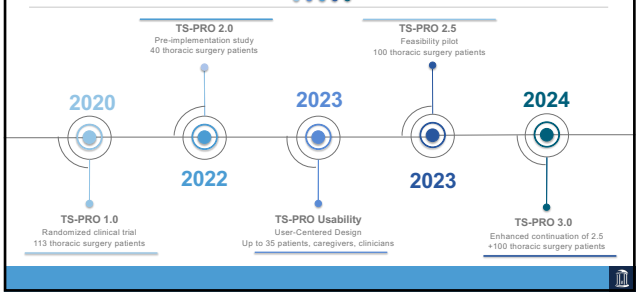
A Timeline of TS-PRO Studies at UNC



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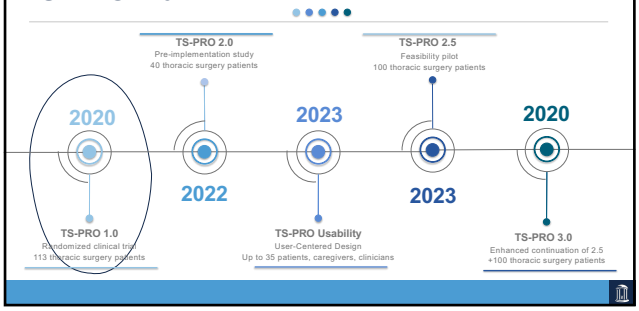
TS-PRO 1.0



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TSPRO 1.0 enrollment

- Recruited **preoperatively** from the UNC MTOP
- April 2020-February 2022
- Eligibility criteria
  - 18 years of age or older
  - **English-speaking**
  - Presenting for elective inpatient thoracic surgery
  - Able and willing to complete **web-based** symptom survey

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TS-PRO 1.0 Symptom Reporting via automated ePROs

- Via UNC PRO-Core
- Web-based
- Email invitations to complete surveys sent per schedule
  - Automated email reminders
  - Study-team reminders by telephone as needed

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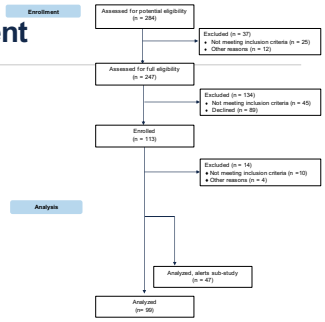
TS-PRO 1.0 Enrollment

- 56% agreed to participate
- 113 enrolled and randomized
  - 57 passive monitoring
  - 56 active monitoring
- 99 participants began ePRO monitoring



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TS-PRO 1.0 PRO and Endpoint Collection Schedule

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TS-PRO 1.0 Demographic Characteristics

	Active Arm (n=56)	Passive Arm (n=57)	Combined (n=113)
Male gender, n (%)	24 (42.9)	18 (32.7)	42 (37.8)
Age, mean ± sd	56.6 ± 13.6	63.1 ± 13.7	60.0 ± 14.0
Race, n (%)			
White	37 (67.2)	42 (77.8)	79 (72.5)
Black or African American	11 (20.0)	8 (14.8)	19 (17.4)
Native American or Alaskan Native	4 (7.3)	1 (1.9)	5 (4.6)
Native Hawaiian or Pacific Islander	0 (0.0)	0 (0.0)	0 (0.0)
Asian	0 (0.0)	2 (3.70)	2 (1.8)
Other	2 (3.6)	1 (1.9)	3 (2.8)
Prefer not to answer	1 (1.8)	0 (0.0)	1 (0.9)

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No demographic differences (refused vs. agreed)

	Approached (n=202)	Agreed (n=113)	Refused (n=89)	p-value
Age (years), mean (SD)	61.1 (14.1)	60.0 (14.0)	62.4 (14.3)	0.113
Male, n (%)	83 (41.5)	42 (37.8)	41 (46.1)	0.252
Ethnicity, n (%)				
Hispanic	3 (1.5)	2 (1.9)	1 (1.1)	1.00
Race, n (%)				0.287
White	146 (73.7)	79 (72.5)	67 (75.3)	0.336
Black or African-American	38 (19.2)	19 (17.4)	19 (21.4)	
Native American/Alaska Native	6 (3)	5 (4.6)	1 (1.1)	
Native Hawaiian/Pacific Islander	1 (0.5)	-	1 (1.1)	
Asian	3 (1.5)	2 (1.8)	1 (1.1)	
Other	3 (1.5)	3 (2.7)	-	
Prefer not to answer	1 (0.5)	1 (0.9)	-	

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TS-PRO 1.0 Clinical Characteristics

	Active Arm (n=56)	Passive Arm (n=57)	Combined (n=113)
BMI	30.15 ± 7.8	28.44 ± 6.5	29.30 ± 7.2
FEV1, mean±sd	87.05 ± 20.5	79.14 ± 23.2	83.06 ± 22.1
DLCO, mean±sd	83.25 ± 21.5	73.93 ± 21.2	78.37 ± 21.7
CAD, n (%)	53 (94.6)	47 (85.4)	100 (90.1)
Diabetes, n (%)	10 (17.9)	5 (9.1)	15 (13.5)
HTN, n (%)	30 (53.6)	33 (60.0)	63 (56.8)
PVD/PE/DVT, n (%)	6 (10.7)	4 (7.3)	10 (9.0)
Smoking, current, n (%)	5 (8.9)	9 (16.4)	14 (12.6)
Smoking, ever, n (%)	31 (58.9)	38 (69)	71 (64.0)
Lung cancer, n (%)	13 (23.6)	25 (45.5)	38 (34.5)
Malignancy, n (%)	28 (50.0)	37 (68.5)	65 (59.1)

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TS-PRO 1.0 Surgery Types

	Active Arm (n=56)	Passive Arm (n=57)	Combined (n=113)
Wedge, n (%)	19 (38.0)	16 (32.6)	35 (35.4)
Segmentectomy, n (%)	1 (2.0)	1 (2.0)	2 (2.0)
Lobectomy, n (%)	10 (20.0)	16 (32.7)	26 (26.3)
Pneumonectomy, n (%)	1 (2.0)	2 (4.1)	3 (3.0)
Chest wall repair, n (%)	3 (6.0)	3 (6.1)	6 (6.1)
Diaphragm repair, n (%)	4 (8.0)	2 (4.1)	6 (6.1)
Thymectomy, n (%)	2 (4.0)	3 (6.1)	5 (5.1)
Biopsy, n (%)	7 (14.0)	4 (8.2)	11 (11.1)
Other, n (%)	5 (5.05%)	3 (6.00%)	2 (4.08%)

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TS-PRO 1.0 ePRO Participation Levels

Post-discharge timing	High (>80%*)	Moderate (50-80%*)	Low (1-49%*)	None (0%*)	Total
Daily survey delivery (14 surveys)					
Day 1-7	34%	27%	17%	22%	100%
Days 8-14	37%	28%	13%	22%	100%
Weekly survey delivery (11 surveys)					
Weeks 3-4	64%	10%	0%	26%	100%
Weeks 5-8	51%	25%	6%	18%	100%
Weeks 9-12	49%	20%	7%	24%	100%

*% of post-discharge ePRO surveys completed

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Predictors of ePRO Participation Level

	None	Low (0-50% survey completed)	Medium (50-80% completed)	High (>80% completed)	p-value
Overall	12 (12.1)	27 (27.3)	18 (18.2)	42 (42.4)	0.155
Active monitoring	4 (33.3)	12 (44.4)	13 (72.2)	21 (50.0)	
Passive monitoring	8 (66.7)	15 (55.6)	5 (27.8)	21 (50.0)	
Gender					0.179
Male	6 (50.0)	13 (50.0)	7 (38.9)	11 (26.2)	
Female	6 (50.0)	13 (50.0)	11 (61.1)	31 (73.8)	
Race					0.339
White	7 (58.3)	15 (55.6)	13 (72.2)	32 (76.2)	
Black	3 (25.0)	8 (29.6)	4 (22.2)	4 (9.5)	
Other	2 (16.7)	4 (14.8)	1 (5.6)	6 (14.3)	
Education					0.064
No college degree	9 (90.0)	15 (71.4)	5 (35.7)	19 (55.9)	
College degree or more	1 (10.0)	6 (28.6)	9 (64.3)	14 (41.2)	
Other	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.9)	
Marital Status					0.009
Not married or partnered	8 (72.7)	4 (19.0)	7 (50.0)	9 (25.7)	
Married or partnered	3 (27.3)	17 (81.0)	7 (50.0)	26 (74.3)	
Computer Frequency					0.148
Seldom or never	2 (18.2)	2 (10.0)	0 (0.0)	1 (2.9)	
Daily or often	9 (81.8)	18 (90.0)	14 (100.0)	34 (97.1)	
Smoke					0.015
Never	1 (8.3)	6 (22.2)	8 (44.4)	21 (50.0)	
Smoking ever	11 (91.7)	21 (77.8)	10 (55.6)	21 (50.0)	

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TS-PRO 1.0 Patient Interview Methods

- 30–60-minute audio-taped telephone interview
- Semi-structured interview guide:
  - Section 1. Barriers and Facilitators Encountered During Study
  - Section 2. Enrollment Experience
  - Section 3. Experience with Clinician Contacts due to Alerts (*Active Monitoring Arm only*)
  - Section 4. Closing

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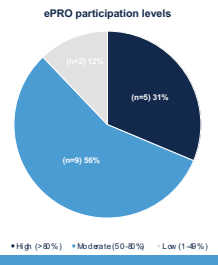
Characteristics of semi-structured interview participants (n=16)

	n	%
Sex		
Female	12	75
Male	4	25
Race		
White	9	56
Black/African-American	6	38
American Indian	1	6
Location		
Urban	12	75
Rural	4	25
Surgery approach		
Minimally invasive	12	75
Open	2	12



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Qualitative analysis by COM-B domains

Capability

Is daily too often?

Theme 1. Symptoms and physical functioning during surgical recovery were barriers to ePRO assessment completion.

"There was days where I was feeling awful and I didn't complete the survey, but it was because of how I was physically feeling, not because of I didn't wanna do the survey, if that makes sense."

"I think I was just mainly exhausted, and it was that [the surveys] were helpful and (

Doing assessments when feeling better?

"... a couple of weeks that I didn't complete [the surveys] … was at the beginning because I was still going through a little bit of, I guess, side effects from the surgery, so I really wasn't doing a lot of things on the computer or on the internet at that time. That was the only time."

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Qualitative analysis by COM-B domains

Opportunity

Offer telephonic even if have internet?

Theme 2. Adequate access to the required technology was a barrier to completing web-based ePROs for a few participants.

"Well, my daughter, I was usin' her email, and it wouldn't let her login… see, my daughter do that, and she live [elsewhere], so I'd rather be called on the phone to answer any survey."

"…I live in the country. If anything, the service is a little slow, but as far as loggin' in and answerin' the questions and stuff it was no problem."

" It's just I tried to log in on my phone, and it wouldn't—you know, it just wouldn't go to that website…"

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Qualitative analysis by COM-B domains

Opportunity

Theme 3. Participants reported ease of completing the ePRO assessments.

"[The surveys] weren't that long, so they weren't time consuming at all."

"The questions and the answers were self-explanatory. It was pretty simple, pre(the questions. "

Busy clinicians?

Theme 4. Patients preferred engagement on ePRO participation with the surgical care team.

"Yeah, [the surgeon] told me when we were in office, they asked me and then sent the person in... I did it more for the surgeon than if you would've hit me blind, I probably would've questioned it more... I guess it gave it legitimacy, with the surgeon [telling me]."

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Qualitative analysis by COM-B domains

Motivation

Shorten or tailor ePRO?

Theme 5. Participants reported irrelevant or repeated ePRO monitoring questions.

"I think also because the surgery didn't really turn out the way that it was expected, that I think a lot of the questions didn't really apply to me because, like I said, [surgery] didn't really do what it was supposed to do."

"I think it was aimed [at someone with more extreme symptoms]—I came back negative for cancer… and I'm in overall good health. I don't want to say [the surveys were] monotonous because you—I can see where the questions need to be asked and in the time frame that they're asked. It was just for me, it was just asking a lot of questions that I wasn't running into…"

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Qualitative analysis by COM-B domains

Motivation

Tie to perioperative teaching or discharge process?

Theme 6. Participants reported a lack of clarity on ePRO assessment integration with routine clinical care.

"I don't know. I don't know if [my care team] see the survey, if they don't see the survey. I don't know."

"Well, I think, to begin with, I thought it was all part of the care there at UNC. I guess after talking to them, I realized that it was a study that was bein' done separate."

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Qualitative analysis by COM-B domains

Motivation

Theme 7. Participants reported increased awareness of their symptoms and recovery with ePRO use.

"I think it's beneficial because it makes you think about how you're feelin'. Again, I was goin' through so much that I think it was crucial, really, to make sure there wasn't major problems with me."

"[The questions] gives the patient time to really think about what symptoms that they may be having. They may not think about it at the moment, but when they're filling out the survey, they have a chance to think about how they're feeling... it was good [the surveys] continue to come so that if [symptoms] do come, I can write 'em down, and then hopefully someone from the team would reach out and ask me, "When did they start? How are you feeling? Do you feel like you need to come in?" Follow-up questions like that."

"[The surveys help] you keep up with yourself, plus you feel like you have support from another … source."

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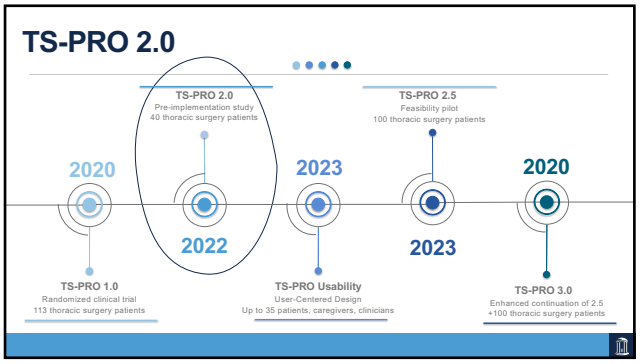
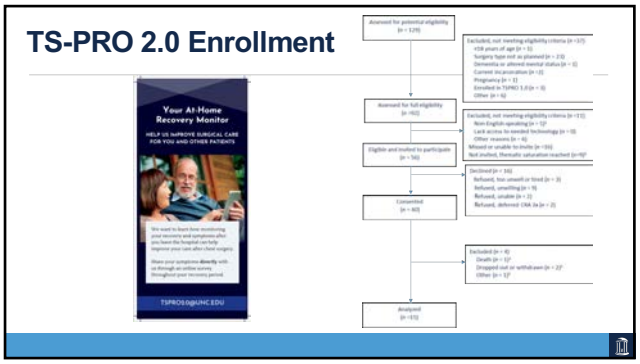

TS-PRO 2.0
TS-PRO 2.0
Pre-implementation study
40 thoracic surgery patients
TS-PRO 2.5
Feasibility pilot
100 thoracic surgery patients
2020
2022
2023
2023
2020
TS-PRO 1.0
Randomized clinical trial
113 thoracic surgery patients
TS-PRO Usability
User-Centered Design
Up to 35 patients, caregivers, clinicians
TS-PRO 3.0
Enhanced continuation of 2.5
+100 thoracic surgery patients

100


Revised Recruitment Materials
Your At-Home Recovery Monitor
UNC Thoracic Surgery Recovery Monitoring Study
UNC Thoracic Surgery Recovery Monitoring Study
FAQ

101


TS-PRO 2.0 Enrollment
Your At-Home Recovery Monitor

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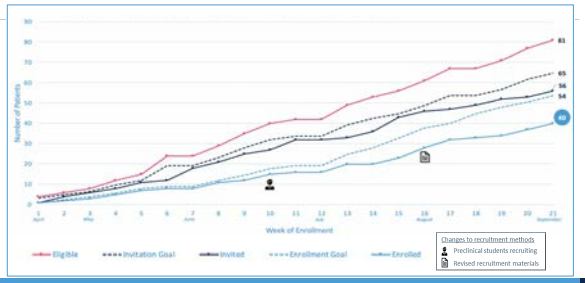
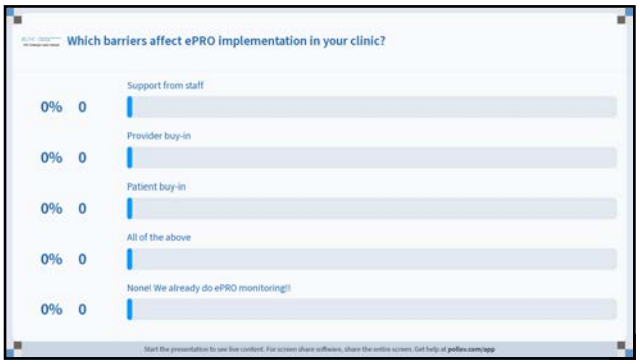
TS-PRO 2.0 Recruitment Run Chart



103



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Audience question

- Which barriers affect ePRO implementation in your clinic?
  - A. Support from staff
  - B. Provider buy-in
  - C. Patient buy-in
  - D. All of the above
  - E. None! We already do ePRO monitoring!!

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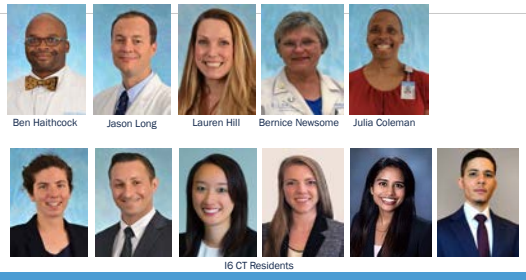
Acknowledgements: clinical care team



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- NIH National Heart, Lung, and Blood Institute (K23HL157765)
- American College of Surgeons Foundation
- Sivan Innovation

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1. Slide contributions: Ethan Basch, Angela Smith, Amanda Gentry
2. UNC Pro Core

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For more information, please visit our website:

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UNC SCHOOL OF MEDICINE

Questions: gita_mody@med.unc.edu

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PRO Core Demo Slides

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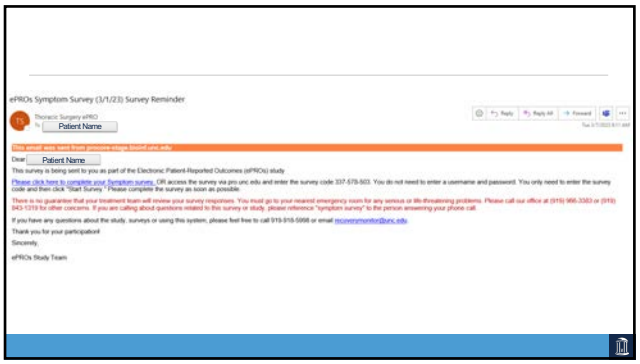

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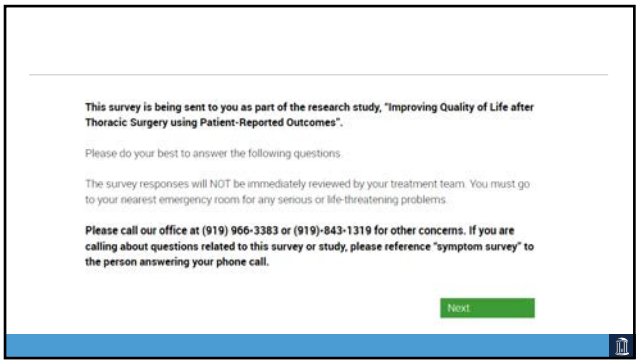

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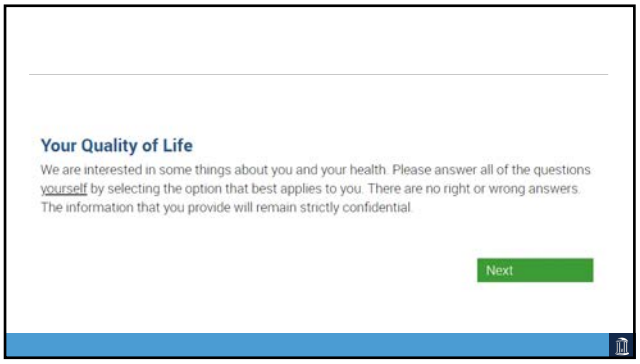
Your Quality of Life
We are interested in some things about you and your health. Please answer all of the questions yourself by selecting the option that best applies to you. There are no right or wrong answers. The information that you provide will remain strictly confidential.
Next

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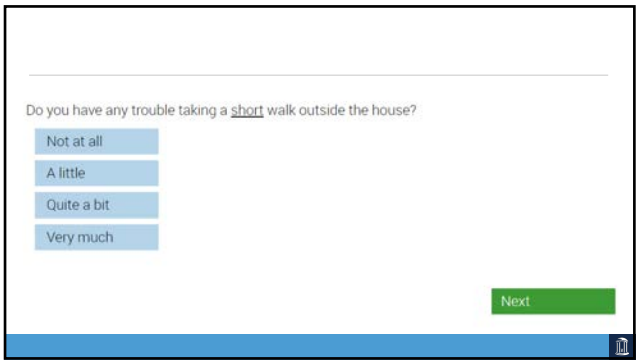
Do you have any trouble taking a short walk outside the house?
Not at all
A little
Quite a bit
Very much
Next

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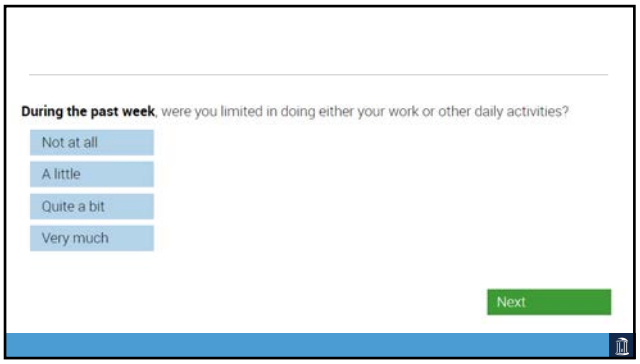
During the past week, were you limited in doing either your work or other daily activities?
Not at all
A little
Quite a bit
Very much
Next

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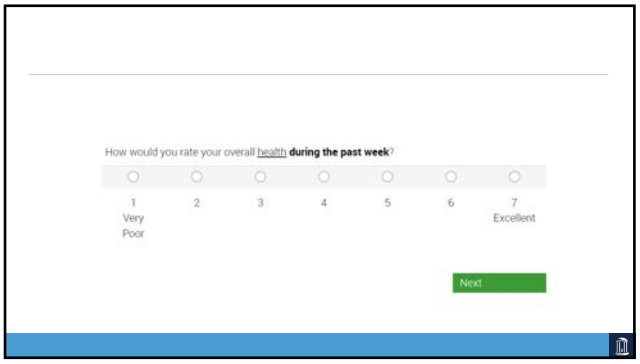
How would you rate your overall health during the past week?
1
Very Poor
2
3
4
5
6
7
Excellent
Next

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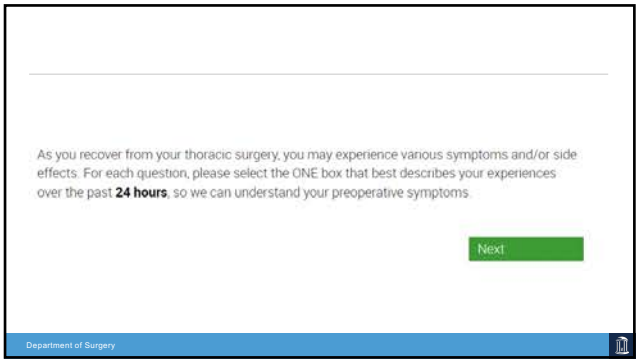
As you recover from your thoracic surgery, you may experience various symptoms and/or side effects. For each question, please select the ONE box that best describes your experiences over the past 24 hours, so we can understand your preoperative symptoms.
Next
Department of Surgery

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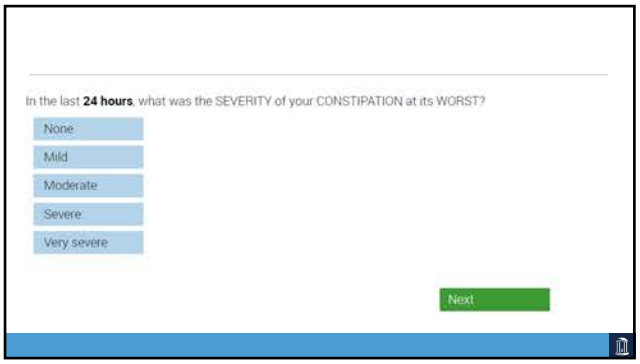
In the last 24 hours, what was the SEVERITY of your CONSTIPATION at its WORST?
None
Mild
Moderate
Severe
Very severe
Next

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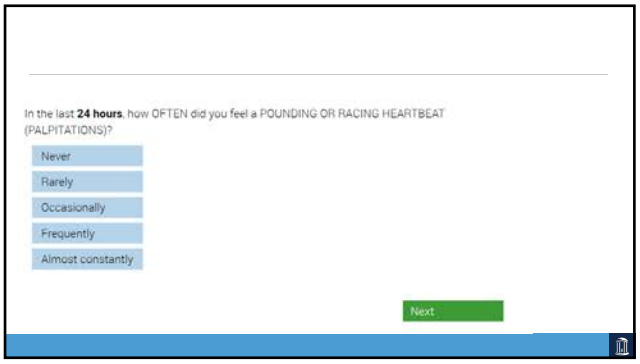
In the last **24 hours**, how OFTEN did you feel a POUNDING OR RACING HEARTBEAT (PALPITATIONS)?
Never
Rarely
Occasionally
Frequently
Almost constantly
Next

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Do you have any other symptoms that you wish to report?
No
Yes
If yes, please describe:
Next

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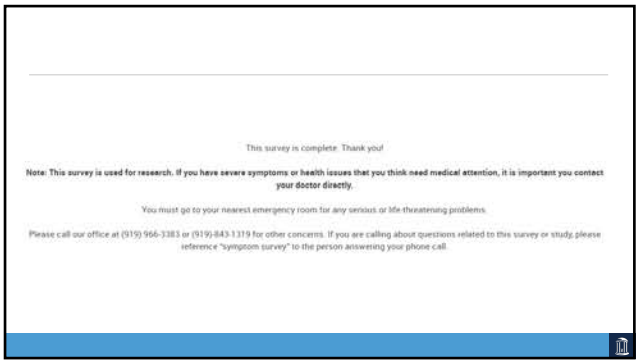
This survey is complete. Thank you!
Note: This survey is used for research. If you have severe symptoms or health issues that you think need medical attention, it is important you contact your doctor directly.
You must go to your nearest emergency room for any serious or life-threatening problems.
Please call our office at (919) 966-3383 or (919)-843-1319 for other concerns. If you are calling about questions related to this survey or study, please reference "symptom survey" to the person answering your phone call.

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Questions/Comments?
Nobody has responded yet.
Hang tight! Responses are coming in.

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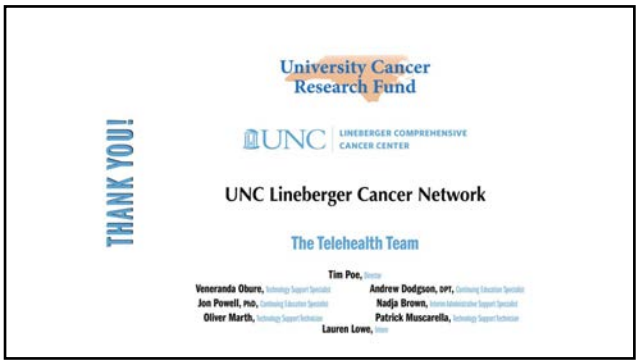
THANK YOU!
University Cancer Research Fund
UNC LINEBERGER COMPREHENSIVE CANCER CENTER
UNC Lineberger Cancer Network
The Telehealth Team
Tim Poe,
Veneranda Obure,
Jon Powell, RN,
Oliver Marth,
Andrew Dodgson, OPT,
Nadja Brown,
Patrick Muscarella,
Lauren Lowe,

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UPCOMING LIVE WEBINARS
ADVANCED PRACTICE PROVIDER
July 19
4:00 PM
Overview of Clinical Trials for the APP
Clarissa Urban, PA-C
RESEARCH TO PRACTICE
July 26
12:00 PM
Therapeutic Approaches for Soft Tissue Sarcomas: 2023 Update
Mark Woodcock, MD
PATIENT CENTERED CARE
August 9
12:00 PM
Cognitive Impairment in Cancer: Updates in Understanding Causes and Effective Treatments
Zev Nakamura, MD
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