UCSF Medical Center

Improving Patient Outcomes in Thoracic Surgery

Robotic-Assisted Thoracic Surgery & Enhanced Recovery After Surgery

David M. Jablons, MD – Chief of Thoracic Surgery

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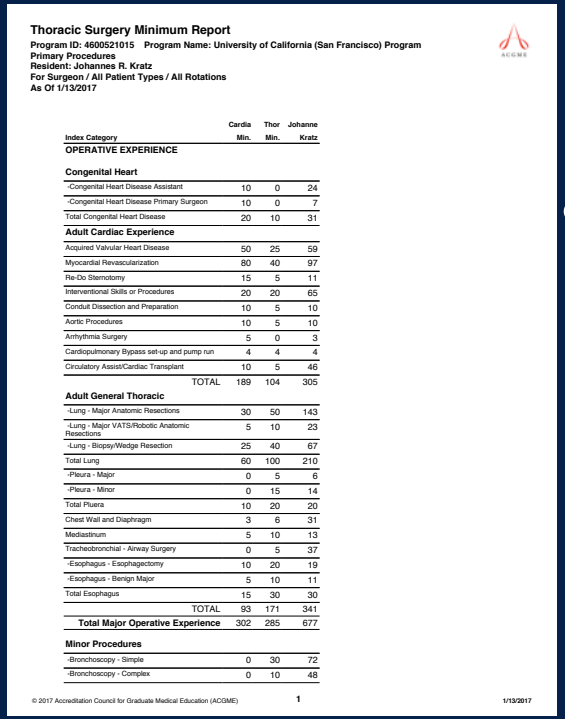
Greg J. Haro, MD – General Surgery Resident

UCSF Thoracic Surgery – FY16 to FY17

- Length of Stay

SERVICE LINE	No. of Discharges	Direct Cost Per Case	Length of Stay			
			Observed	Expected	Index	% Change FY16 to FY17
Adult Cancer: Thoracic	342	$22,736	4.92	5.82	0.85	-14.5%

UCSF Thoracic Surgery in 2016 – My Personal Case Log



Thoracic Surgery Minimum Report

Program ID: 4600521015 Program Name: University of California (San Francisco) Program
Primary Procedures
Resident: Johannes R. Kratz
For Surgeon / All Patient Types / All Rotations
As Of 1/13/2017

Index Category	Cardia Min.	Thor Min.	Johanne Kratz
OPERATIVE EXPERIENCE			
Congenital Heart			
-Congenital Heart Disease Assistant	10	0	24
-Congenital Heart Disease Primary Surgeon	10	0	7
Total Congenital Heart Disease	20	10	31
Adult Cardiac Experience			
Acquired Valvular Heart Disease	50	25	59
Myocardial Revascularization	80	40	97
Re-Do Sternotomy	15	5	11
Interventional Skills or Procedures	20	20	65
Conduit Dissection and Preparation	10	5	10
Aortic Procedures	10	5	10
Arrhythmia Surgery	5	0	3
Cardiopulmonary Bypass set-up and pump run	4	4	4
Circulatory Assist/Cardiac Transplant	10	5	46
TOTAL	189	104	305
Adult General Thoracic			
-Lung - Major Anatomic Resections	30	50	143
-Lung - Major VATS/Robotic Anatomic Resections	5	10	23
-Lung - Biopsy/Wedge Resection	25	40	67
Total Lung	60	100	210
-Pleura - Major	0	5	6
-Pleura - Minor	0	15	14
Total Pluera	10	20	20
Chest Wall and Diaphragm	3	6	31
Mediastinum	5	10	13
Tracheobronchial - Airway Surgery	0	5	37
-Esophagus - Esophagectomy	10	20	19
-Esophagus - Benign Major	5	10	11
Total Esophagus	15	30	30
TOTAL	93	171	341
Total Major Operative Experience	302	285	677
Minor Procedures			
-Bronchoscopy - Simple	0	30	72
-Bronchoscopy - Complex	0	10	48

Adult General Thoracic			
-Lung - Major Anatomic Resections	30	50	143
-Lung - Major VATS/Robotic Anatomic Resections	5	10	23

86% of major anatomic lung resections were open
14% were VATS

-Esophagus - Esophagectomy	10	20	19

100% of esophagectomies were open

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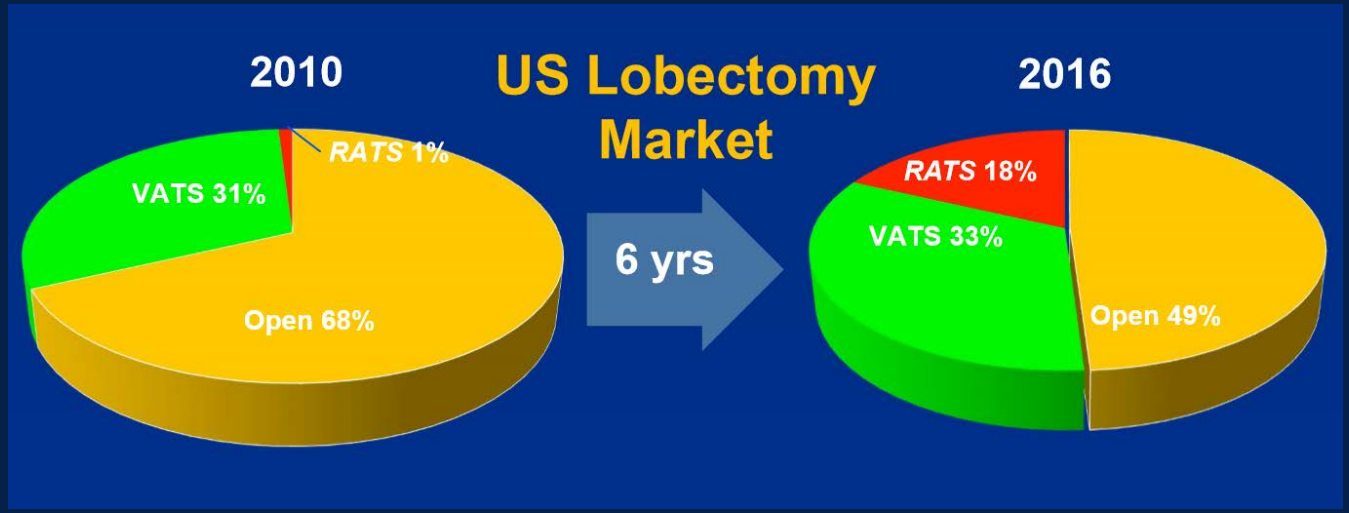
Lung Resection: Robotic vs VATS vs Open



Farivar et al, Minimally Invasive Cardiothoracic Surgery (2014); Premier Database (2016)

Open, Video-Assisted Thoracic Surgery, and Robotic Lobectomy: Review of a National Database

Michael Kent, MD,* Thomas Wang, PhD,* Richard Whyte, MD, Thomas Curran, MD, Raja Flores, MD, and Sidhu Gangadharan, MD

Division of Thoracic Surgery and Interventional Pulmonology, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston Massachusetts; Department of Economics, Harvard University, Cambridge, Massachusetts; and Division of Thoracic Surgery, Mount Sinai Medical Center, New York, New York

THE ANNALS OF THORACIC SURGERY
Official Journal of The Society of Thoracic Surgeons and the Southern Thoracic Surgical Association

Table 4. Propensity-Matched Analysis of Patients Undergoing Open, Video-Assisted Thoracic Surgery (VATS) or Robotic Pulmonary Resection

Outcome	Open (n = 1,233)	VATS (n = 1,233)	Robotic (n = 411)	*p* Value[a]	*p* Value[b]
Mortality	25 (2.0%)	14 (1.1%)	1 (0.2%)	0.122	0.016
LOS (mean)	8.2	6.3	5.9	0.454	<0.0001
Routine discharge	734 (59.5%)	795 (64.5%)	262 (63.7%)	0.828	0.214
Prolonged LOS	118 (9.6%)	85 (6.9%)	18 (4.4%)	0.118	0.003
Any complication	667 (54.1%)	558 (45.3%)	180 (43.8%)	0.674	0.003
Bleeding complication	24 (1.9%)	16 (1.3%)	7 (1.7%)	0.633	0.795

[a] Between robot and VATS resections. [b] Between robot and open resections.

Kent et al, Ann Thorac Surg (2014)

Robotic Thoracic Surgery at UCSF

- Da Vinci Xi Robot arrived at Parnassus Campus in October 2016
- October 11, 2016 – 1st Robotic Thoracic Operation at UCSF (Wedge Resection)
- November 2017
  - 110 Robotic Thoracic Procedures
    - 33 Sublobar Resections (~1/3 Segmentectomies)
    - 22 Lobectomies
    - 26 Esophagectomies
    - 29 Thymus/Pleural Biopsy/Lung Biopsy/Misc
- Projected to perform 200 in our 2nd Year

Robotic vs VATS vs Open: UCSF Experience

- 152 Consecutive Patients with Primary Lung Cancer or Lung Metastasis
- Robotic, VATS, or Open Lobectomy or Sublobar Resection since introduction of the Robot in October 2016
- Primary Endpoint: Length of Stay
- Secondary Endpoints: In-Hospital Composite Morbidity, Oncologic Resection, Day of Discharge Pain Score

Robotic vs VATS vs Open: UCSF Experience

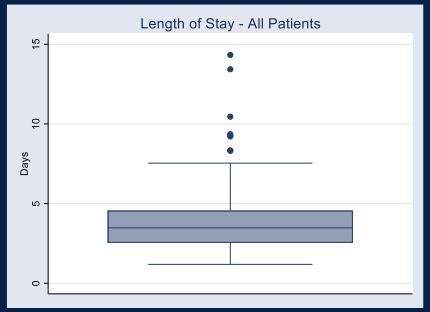
Patient Characteristics

- Open n=47, VATS n=50, Robotic n=55

- Overall Lobectomy 40%
  - Open 66%, VATS 13%, Robotic 40%

- No difference in Sex, Race, ASA Class, Smoking History
  - VATS patients were younger, had better lung function, and had larger proportion of patients with lung metastasis

Robotic vs VATS vs Open: UCSF Experience



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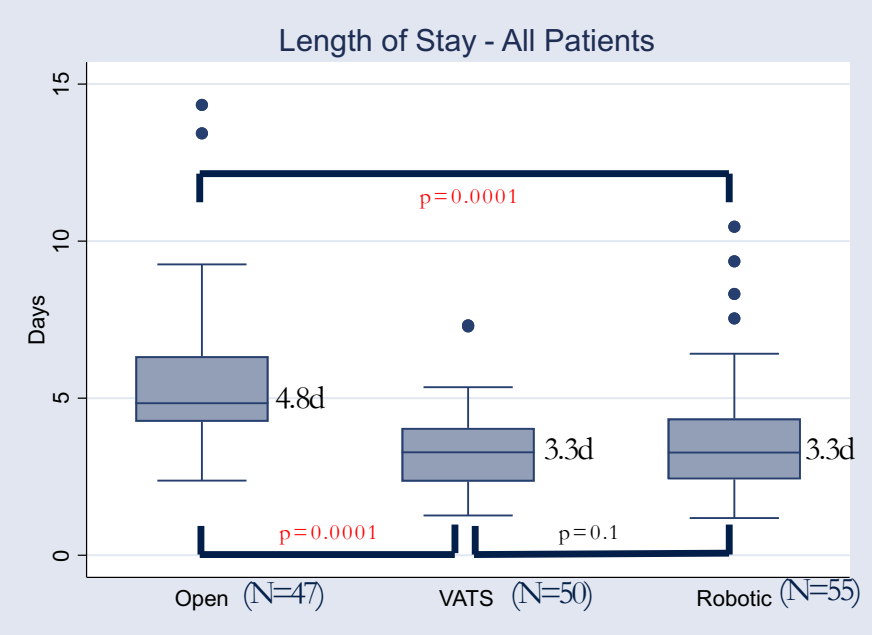
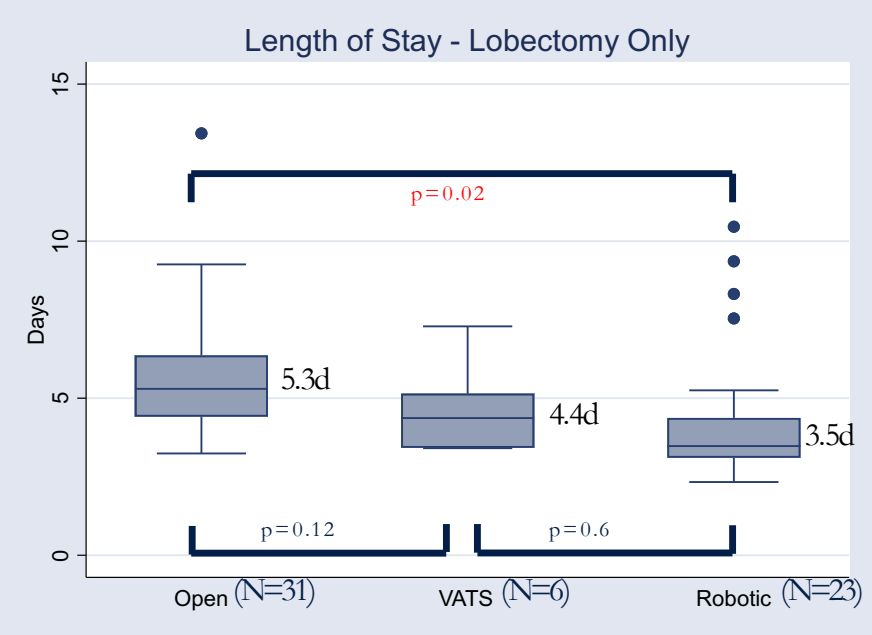
Robotic vs VATS vs Open: UCSF Experience





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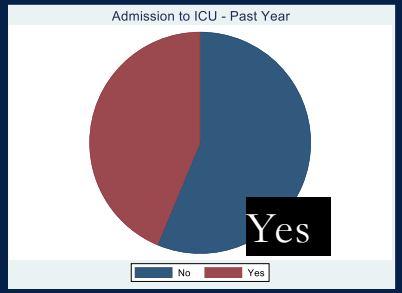
Robotic vs VATS vs Open: UCSF Experience



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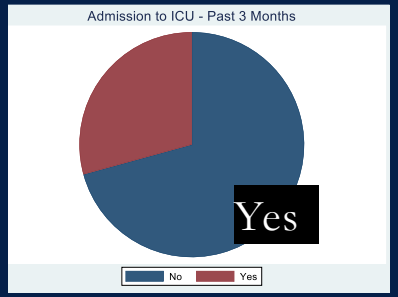

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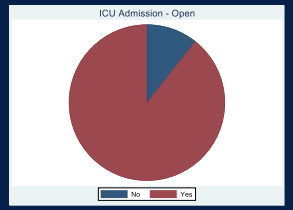

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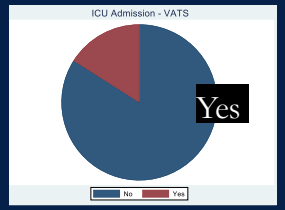
Yes



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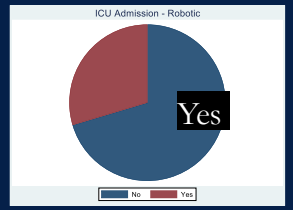

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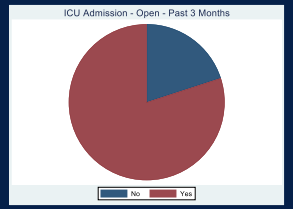

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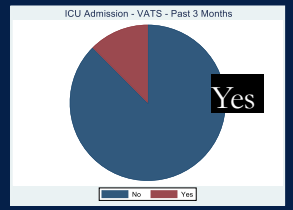
Yes



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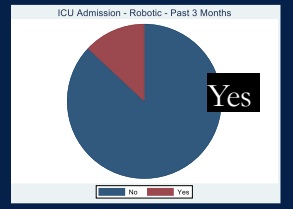

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Robotic vs VATS vs Open: UCSF Experience

- In-Hospital Composite Morbidity:
  - Overall 25%

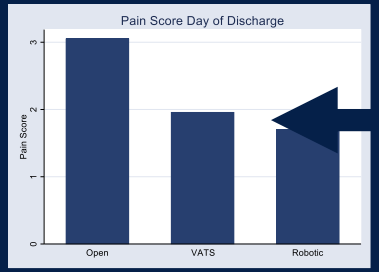
Morbidity	Open (n=47)	Robotic (n=55)	VATS (n=50)
No	29 (62%)	37 (67%)	47 (94%)
Yes	18 (38%)	18 (33%)	3 (6%)

Atrial Fibrillation (n=10), Pneumonia (n=10), Prolonged Air Leak (n=8), Delirium (n=7)

Robotic vs VATS vs Open: UCSF Experience

- Oncologic Resection
  - R0 Resection
    - Overall 98% Patients
    - 2 Patients in the Open Group with R1 Resection

- Pain



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Robotic vs VATS vs Open: UCSF Experience

- Conclusions:
  - Robotic-Assisted Thoracic Surgery,
    - Reduces Length of Stay in comparison to Open Surgery
    - Can be performed Safely with morbidity similar to Open Surgery
    - Can achieve Successful Oncologic Resection
    - Reduces Pain on day of discharge in comparison to Open Surgery

UCSF Thoracic Surgery Residency

Formal Robotic Training Curriculum

UCSF Thoracic Fellowship
Clinical Pathway For Robotic Surgery Training

The following outlines the pathway for all UCSF Thoracic Fellows who wish to develop the knowledge and skills to perform Robotic Thoracic Surgery. Each phase builds upon skills acquired in the previous phase, culminating in performing complex robotic Thoracic procedures as the Console Surgeon. Upon successful completion of this Clinical Pathway, a Certificate of da Vinci System Training As a Console Surgeon will be issued.

Phase I - Introduction To da Vinci® Surgery

- **Sign up for On-line da Vinci community: 10 minutes**
  - www.davincisurgerycommunity.com
  - Click "Join The Community"
- **da Vinci Xi System on-line training: 2 hours**
  - System overview
    - Select P6 software or later
    - Select Training > Xi Video Training
    - Watch the following Xi Video Training Video Categories (including all videos at the bottom, and any additional videos available using the small triangle near the bottom of the screen -> click to expand).
      - System Overview
      - Surgeon Console
      - Patient Cart
      - Vision Cart
      - Instruments and Accessories

Enhanced Recovery After Surgery (ERAS)

Enhanced Recovery After Surgery

- Concept: Improve patient outcomes by integrating evidence-based perioperative care techniques in a collaborative, multi-disciplinary fashion.
- Colorectal surgery and other abdominal surgical specialties have shown that ERAS programs reduce:
  - Length of Stay - Mean -2.3 Days (95%CI -3.1 to -1.47)
  - Morbidity - RR 0.6 (95%CI 0.46 to 0.76)
  - Direct Hospital Cost Savings - $1,900/patient
- Thoracic Surgery?

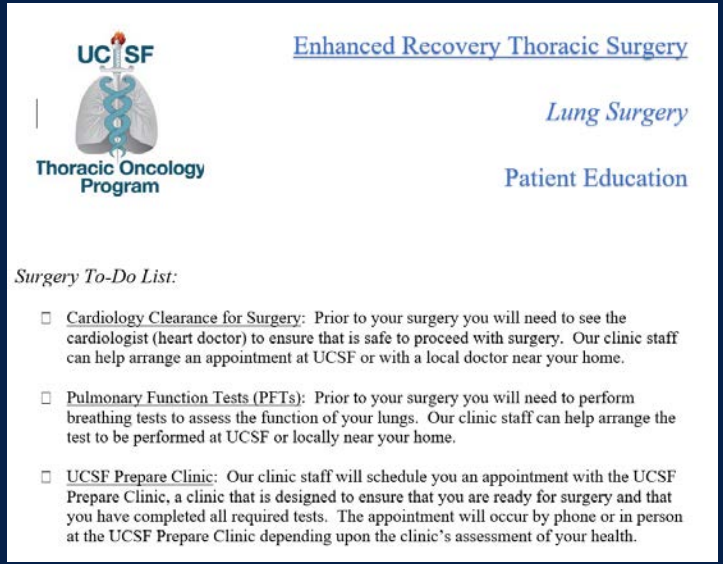
Ljungqvist et al. JAMA (2017); Greco et al. World J Surg (2014); Wick et al. J Am Coll Surg (2015)

UCSF Enhanced Recovery Thoracic Surgery Program

UCSF Enhanced Recovery Thoracic Surgery Program

Preoperative

- Patient Education
- Surgery Wellness Referral
- Smoking Cessation
- Dietician Consultation for all Esophageal Caner Patients



UCSF Thoracic Oncology Program

Enhanced Recovery Thoracic Surgery

Lung Surgery

Patient Education

Surgery To-Do List:

- ☐ Cardiology Clearance for Surgery: Prior to your surgery you will need to see the cardiologist (heart doctor) to ensure that is safe to proceed with surgery. Our clinic staff can help arrange an appointment at UCSF or with a local doctor near your home.
- ☐ Pulmonary Function Tests (PFTs): Prior to your surgery you will need to perform breathing tests to assess the function of your lungs. Our clinic staff can help arrange the test to be performed at UCSF or locally near your home.
- ☐ UCSF Prepare Clinic: Our clinic staff will schedule you an appointment with the UCSF Prepare Clinic, a clinic that is designed to ensure that you are ready for surgery and that you have completed all required tests. The appointment will occur by phone or in person at the UCSF Prepare Clinic depending upon the clinic's assessment of your health.

UCSF Enhanced Recovery Thoracic Surgery Program

Preoperative

- Patient Education
- Surgery Wellness Clinic Referral
- Smoking Cessation
- Dietician Consultation for all Esophageal Cancer Patients

UCSF Center for Surgery in Older Adults
Department of Surgery

Surgery Wellness Program

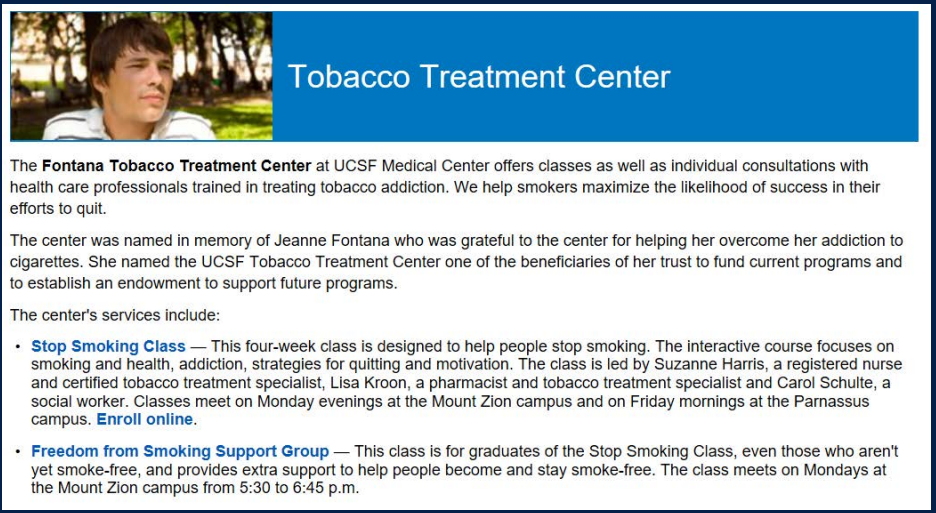
Our dedicated care team provides individualized care for older patients undergoing surgery. At the UCSF Surgery Wellness Clinic, our multidisciplinary team of dieticians, physical and occupational therapists design individual programs to help patients get fit for surgery.

Our geriatrician and palliative care specialists assist patients and their families with advanced directives and helping older patients articulate their treatment goals. In the hospital, our care pathways are designed to enhance recovery and prevent debilitating events such as delirium, falls, and pressure ulcers that can result pain and disability after surgery. We pay special attention to facilitating a safe transition to home after surgery so that older adults can continue their recovery and maintain independence.

UCSF Enhanced Recovery Thoracic Surgery Program

Preoperative

- Patient Education
- Surgery Wellness Clinic Referral
- Smoking Cessation
- Dietician Consultation for all Esophageal Cancer Patients



UCSF Enhanced Recovery Thoracic Surgery Program

Preoperative

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- Smoking Cessation
- Dietician Consultation for all Esophageal Cancer Patients

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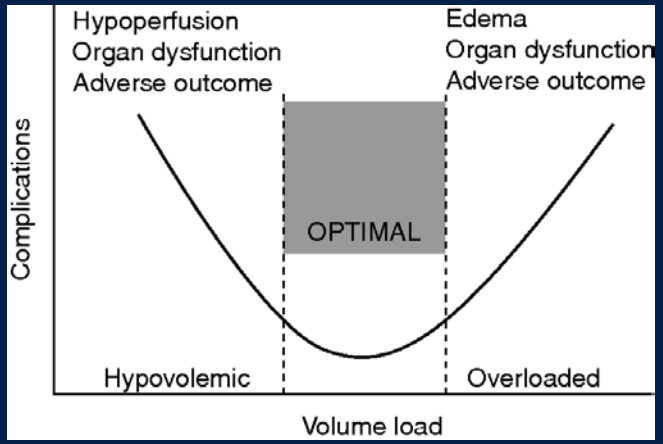
UCSF Enhanced Recovery Thoracic Surgery Program

Intraoperative

- Anesthesia:
  - Surgical Site Infection Prophylaxis
  - Goal-Directed Fluid Therapy
  - Lung Protective Ventilation Strategies
  - Postoperative Nausea/Vomiting Prevention
- Surgery
  - Robot Whenever Feasible
  - Intercostal Nerve Block



UCSF Enhanced Recovery Thoracic Surgery Program

Intraoperative

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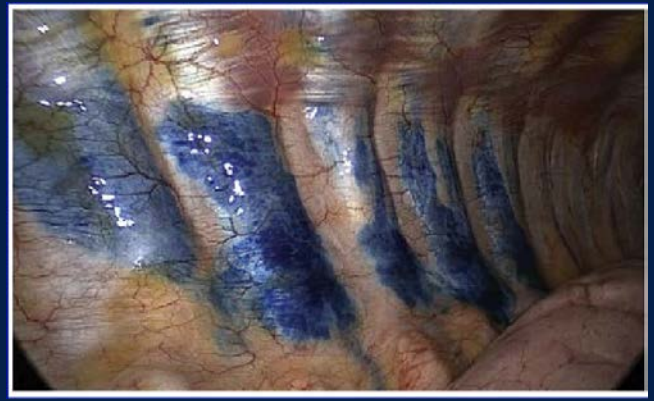

UCSF Enhanced Recovery Thoracic Surgery Program

Postoperative

- Admission to Transitional Care Unit

- Delirium Order Set
- Case Management Meeting on Day of Surgery
- Respiratory Therapy and Physical Therapy Consultations
  - Ambulation Day of Surgery and Goal QID

UCSF Enhanced Recovery Thoracic Surgery Program

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UCSF Enhanced Recovery Thoracic Surgery Program

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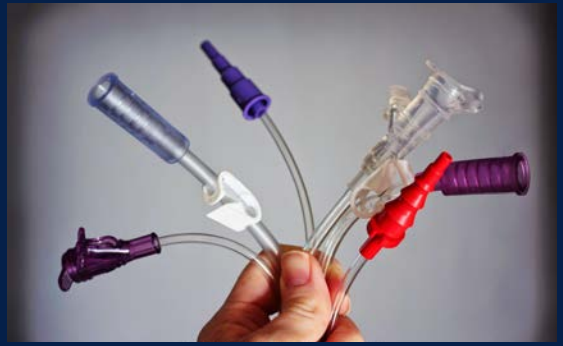

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UCSF Enhanced Recovery Thoracic Surgery Program

Postoperative

- Admission to Transitional Care Unit

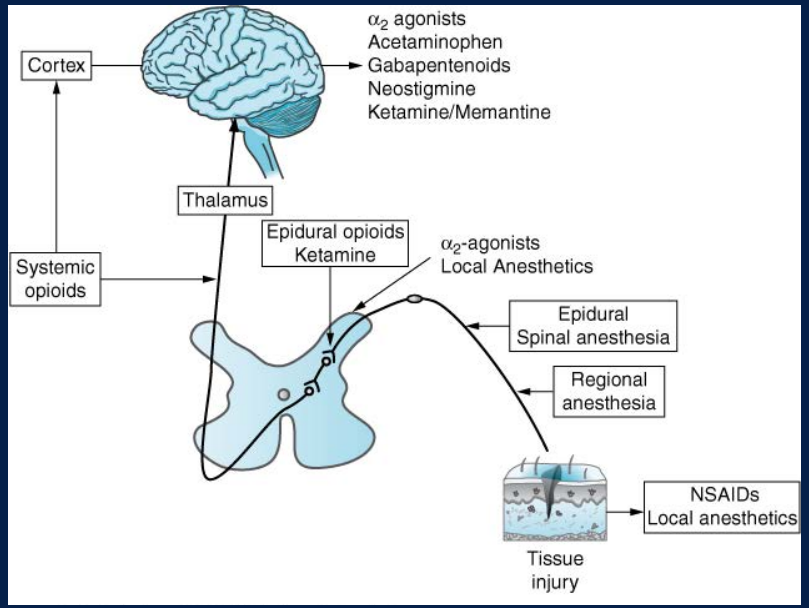
UCSF Department of Physical Therapy and Rehabilitation Science

- Delirium Order Set
- Case Management Meeting on Day of Surgery
- Respiratory Therapy and Physical Therapy Consultations
  - Ambulation Day of Surgery and Goal QID

UCSF Enhanced Recovery Thoracic Surgery Program

Postoperative

- Multimodality Pain Management
  - Tylenol, Gabapentin, NSAIDS
  - Minimization of Opioids
- Line Management
- Meals/Snacks only when Out of Bed



UCSF Enhanced Recovery Thoracic Surgery Program

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  - Tylenol, Gabapentin, NSAIDS
  - Minimization of Opioids
- Line Management
- Meals/Snacks only when Out of Bed

UCSF Enhanced Recovery Thoracic Surgery Program

Postoperative

- Expected Discharges:

  - POD1: Robotic Sublobar Resection
  - POD2: Robotic Lobectomy
  - POD3: Open Sublobar Resection/Lobectomy
  - POD5: Robotic Esophagectomy

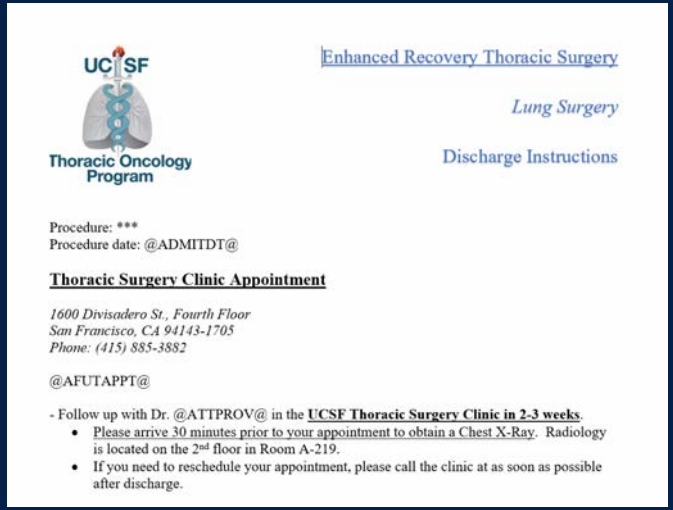
UCSF Enhanced Recovery Thoracic Surgery Program

Postoperative

- Discharge Details:
  - Meds to Beds
  - Standardized Discharge Instructions
  - Coordination between Hospital and Clinic

UCSF, Walgreens Open New Pharmacy to Explore New Models of Patient-Centered Care

'Walgreens at UCSF' Aims to Improve Medication Use, Reduce Hospital Readmissions



UCSF Thoracic Oncology Program

Enhanced Recovery Thoracic Surgery

Lung Surgery

Discharge Instructions

Procedure: ***
Procedure date: @ADMITDT@

Thoracic Surgery Clinic Appointment

1600 Divisadero St., Fourth Floor
San Francisco, CA 94143-1705
Phone: (415) 885-3882

@AFUTAPPT@

- Follow up with Dr. @ATTPROV@ in the **UCSF Thoracic Surgery Clinic in 2-3 weeks**.
  - Please arrive 30 minutes prior to your appointment to obtain a Chest X-Ray. Radiology is located on the 2nd floor in Room A-219.
  - If you need to reschedule your appointment, please call the clinic at as soon as possible after discharge.

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