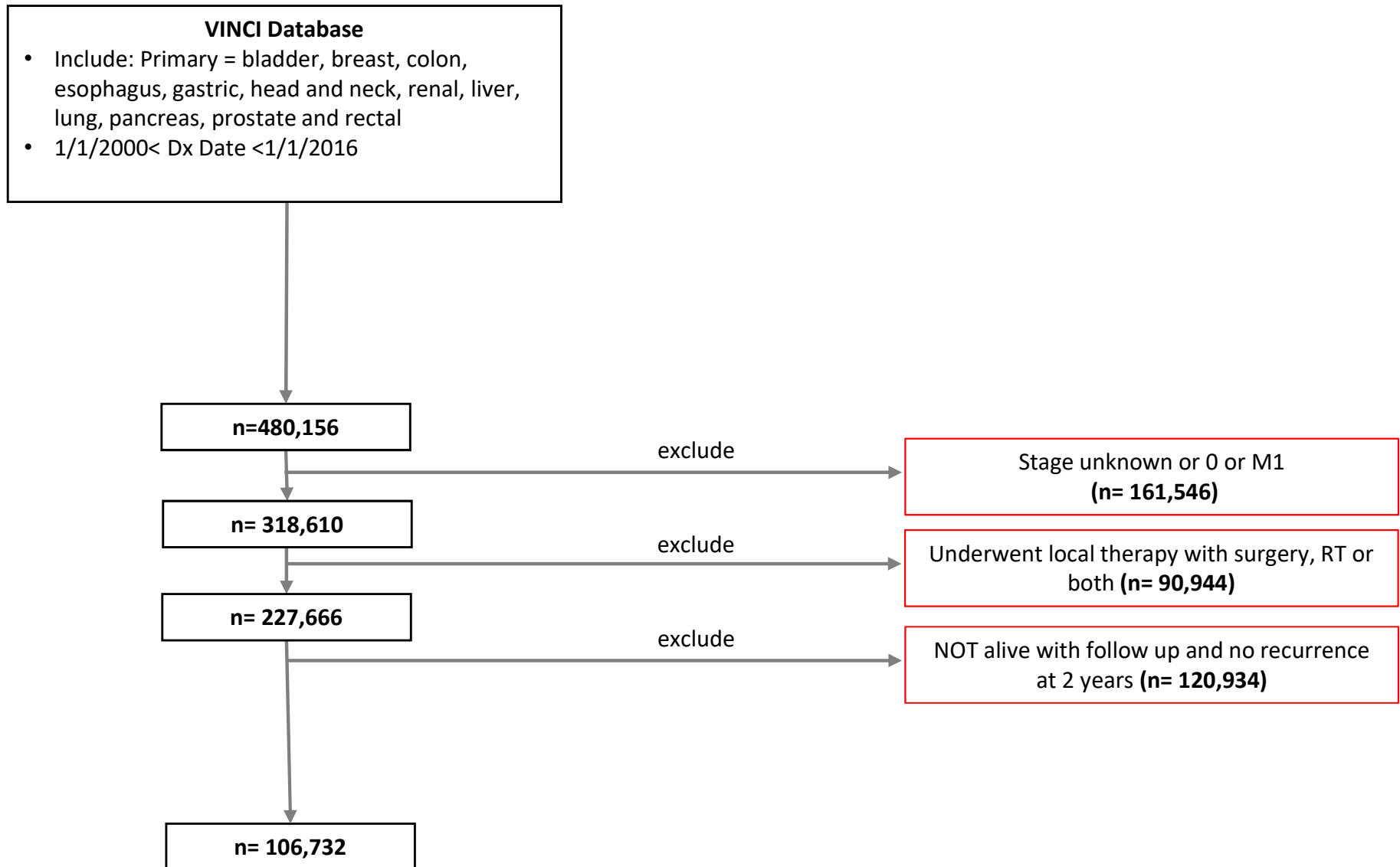
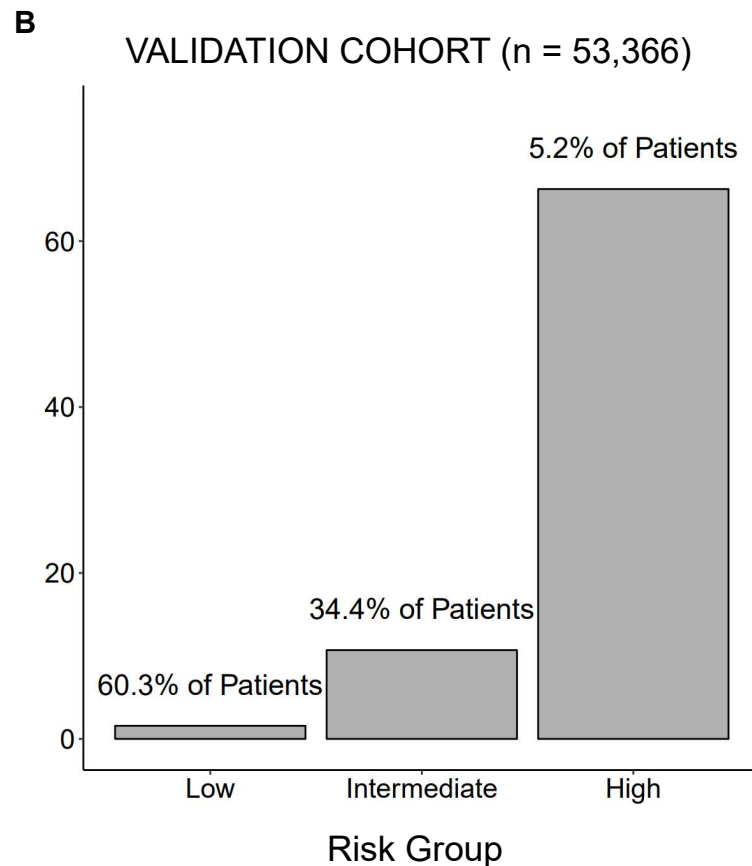
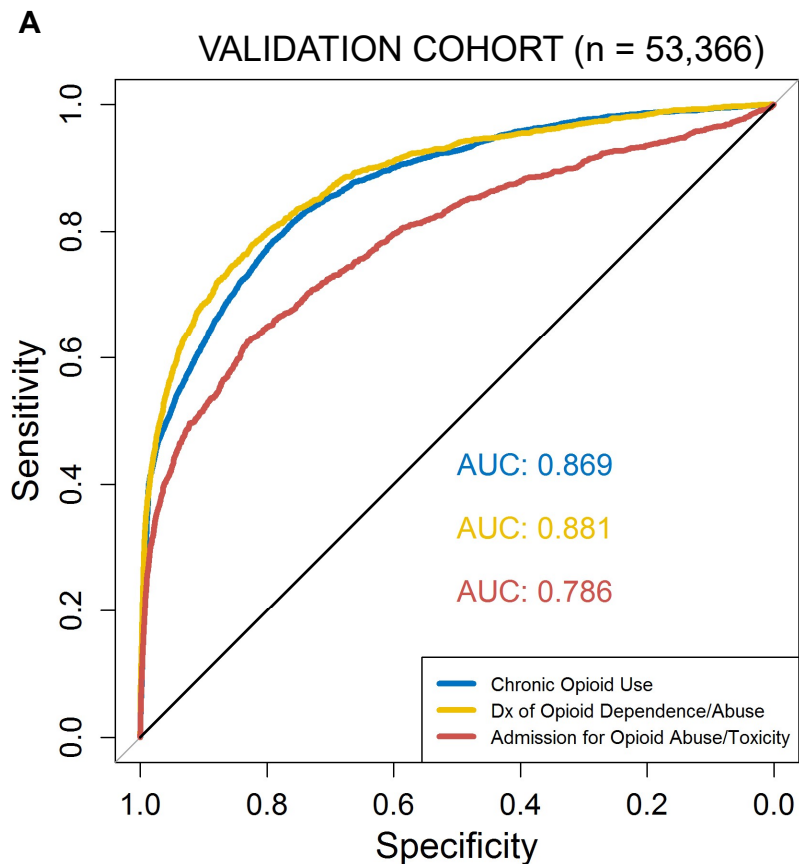


Opioid Patient Selection

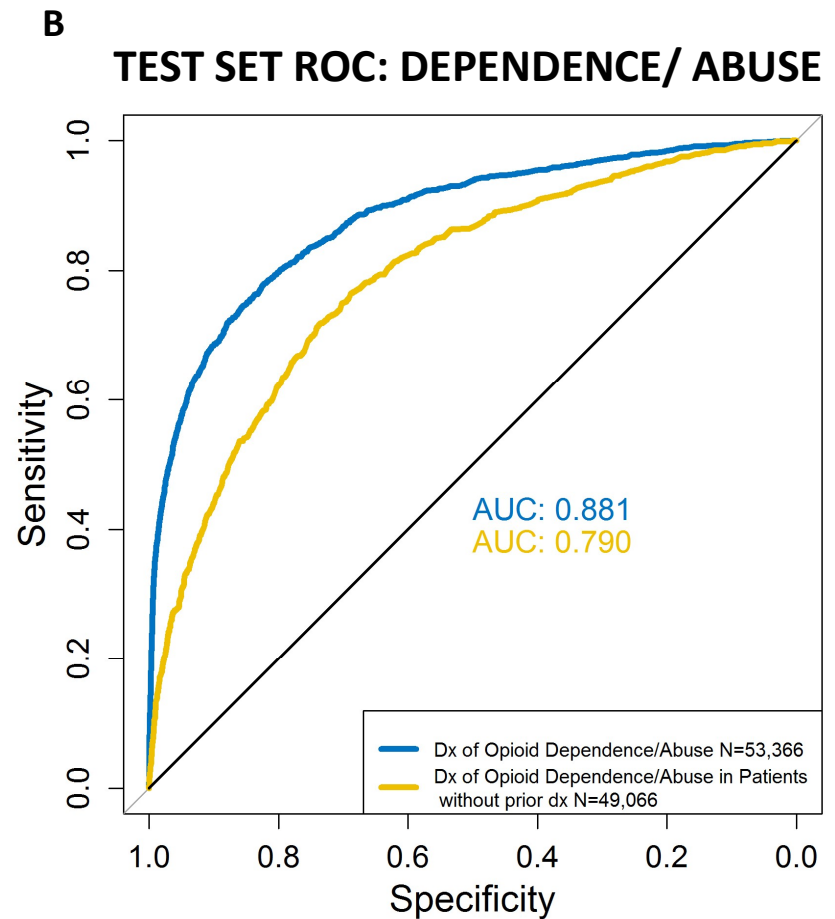
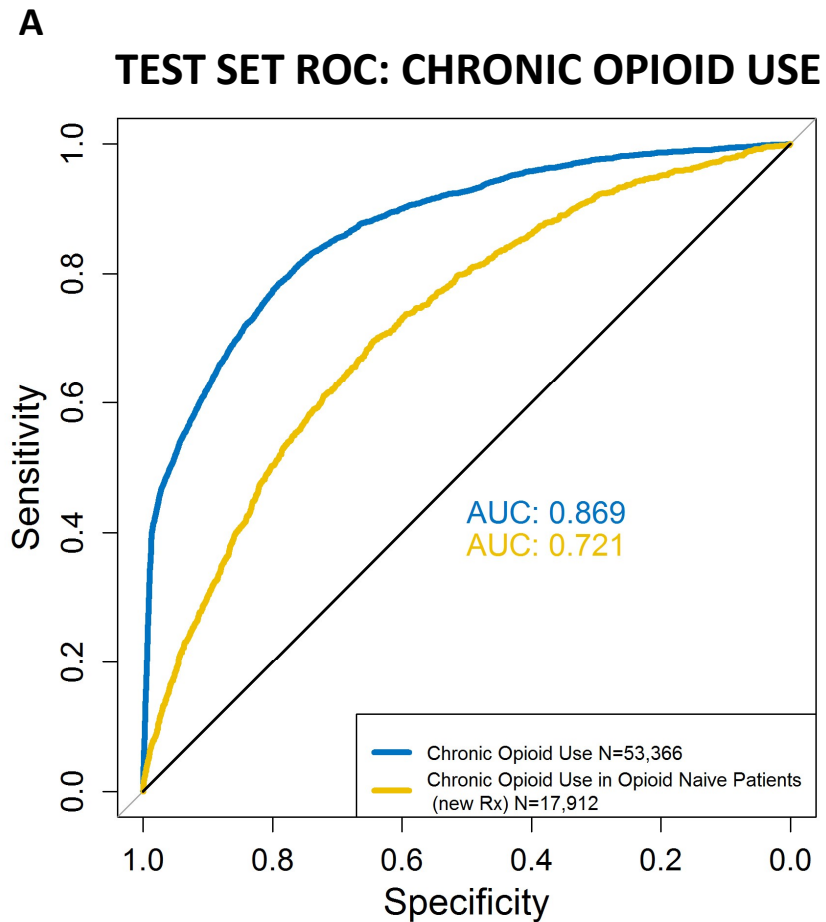


Supplementary Figure 1: Patient selection for the cohort based on inclusion and exclusion criteria.

Abbreviations: Dx, Diagnosis; M1, Metastatic Disease; RT, Radiation Therapy.



Supplementary Figure 2: Validation of non-parsimonious model. a) ROC curve showing discrimination of the full (non-parsimonious) LASSO model in predicting persistent opioid use, a future diagnosis of opioid abuse or dependence and future admissions for opioid abuse, dependence or toxicity. b) Bar plot showing incidence of persistent opioid use for the predicted risk groups using the full LASSO model. Abbreviations: AUC, Area under the curve; Dx, Diagnosis.



Supplementary Figure 3: Validation of models among opioid naïve patients and those without a prior diagnosis of addiction. ROC curve showing discrimination of LASSO model in predicting a) persistent opioid use for all patients and among opioid naïve patients with a new prescription during treatment and b) a diagnosis of opioid dependence or abuse among all patients and those without a prior diagnosis of substance abuse. Abbreviations: ROC, Receiver Operating Characteristic.; AUC, Area under the curve; Dx, diagnosis.

Supplementary Table 1. Stratified Logistic Regression By Primary Type*

	Odds ratio (95% CI)					
	PROSTATE	COLON	RECTUM	BLADDER	BREAST	KIDNEY
AJCC 7th ed. Stage (Ref: I)						
II	1.03 (0.86-1.23)	1.19 (0.94-1.49)	1.24 (0.74-2.08)	0.99 (0.7-1.41)	1.54 (1.09-2.17)	1.04 (0.77-1.40)
III	1.12 (0.89-1.42)	1.50 (1.13-2.00)	0.93 (0.49-1.75)	1.55 (0.96-2.51)	1.67 (0.93-3.00)	0.93 (0.68-1.26)
IV	1.58 (1.1-2.27)	NA	NA	1 (0.44-2.27)	NA	0.28 (0.06-1.35)
Local Treatment (Ref: Surgery)						
RT	1.42 (1.28-1.57)	NA	NA	NA	NA	NA
Surgery+RT	1.28 (0.93-1.75)	1.72 (0.84-3.50)	1.41 (0.76-2.60)	3.12 (1.68-5.81)	0.81 (0.58-1.13)	3.34 (0.67-16.63)
Chemotherapy	1.63 (0.41-6.41)	1.14 (0.84-1.54)	0.90 (0.46-1.78)	0.72 (0.42-1.25)	1.27 (0.88-1.82)	4.58 (1.57-13.41)
	GASTRIC	LUNG	PANCREAS	HN	ESOPHAGUS	LIVER
AJCC 7th ed. Stage (Ref: I)						
II	1.62 (0.71-3.71)	1.49 (1.22-1.82)	1.34 (0.51-3.56)	1.4 (1.14-1.72)	1.47 (0.77-2.83)	1.19 (0.73-1.94)
III	0.84 (0.26-2.7)	1.6 (1.25-2.04)	6.14 (0.30-124.45)	1.23 (0.98-1.54)	1.48 (0.71-3.08)	1.19 (0.34-4.19)
IV	NA	NA	NA	1.50 (1.22-1.84)	NA	NA
Local Treatment (Ref: Surgery)						
RT	NA	1.71 (1.41-2.08)	NA	1.16 (0.95-1.4)	1.81 (0.32-10.07)	NA
Surgery+RT	2.75 (1.05-7.19)	1.47 (1.04-2.07)	2.72 (0.82-9.04)	1.11 (0.90-1.37)	1.86 (0.51-6.70)	NA
Chemotherapy	1.10 (0.40-3.04)	1.06 (0.85-1.32)	0.92 (0.29-2.92)	1.10 (0.92-1.31)	0.67 (0.13-3.45)	1.06 (0.14-8.19)

Abbreviations: Ref, Reference Group; NA, Not Applicable; AJCC, American Joint Committee on Cancer; ed., edition; HN, Head and Neck; RT, Radiation Therapy.

* Logistic regression models for persistent opioid use with treatment and stage covariates separated by cancer type. Covariates are adjusted for patient and socioeconomic factors. 95% confidence intervals calculated from logistic regression model.

Supplementary Table 2: LASSO Logistic Regression Predictive Modeling Covariates by Outcome for the full (non-parsimonious) models*

Variable	Category/Unit	Chronic Opioid Use	Chronic Opioid Use (Opioid Naïve-New Prescription)	Diagnosis of Opioid Dependence	New Diagnosis of Opioid Dependence	Admission for Opioid Toxicity
Intercept		-1.617	-1.141	-1.217	-1.522	-2.871
Age	Per 10 years	-0.199	-0.24	-0.486	-0.462	-0.194
Race (Ref: white)	Black	-0.154	-0.065	--	--	--
Employed	--	-0.152	-0.061	-0.058	--	-0.025
High Risk Psychiatric Condition	--	--	--	0.064	--	0.173
Depression	--	0.355	0.29	0.27	0.345	0.204
Alcohol Abuse	--	0.125	0.109	0.285	0.265	0.114
Non-Opioid Drug Abuse		0.041	0.251	0.975	N/A	0.59
Past Opioid Drug Abuse		0.137	0.056	2.542	N/A	2.026
Alcohol Use (Ref: None)	Past Use	0.041	--	--	--	--
Tobacco Use (Ref:None)	Current Use	0.149	0.236	0.142	0.109	--
Prior opioid use (Ref: opioid-naïve new prescription)	Opioid-naïve- No Rx	-1.068	N/A	-0.149	-0.117	-0.274
	Prior chronic use	3.472	N/A	1.227	1.536	0.868
	Prior intermittent use	0.919	N/A	0.099	--	0.136
BMI category (Ref: healthy weight)	Overweight	-0.049	-0.063	--	--	-0.104
	Underweight	0.165	0.206	--	--	0.237
AJCC 7 (Ref: Stage I)	Stage IV	0.089	0.05	--	--	--
Local therapy (Ref: RT)	Surgery	--	-0.366	--	--	--
	Surgery + RT	0.08	--	--	--	--
Chemotherapy		0.267	0.274	--	--	0.074
Interaction Terms:						
Primary cancer (Ref: Prostate)	Esophagus	0.244	0.182	--	--	--

	HNC	0.162	--	--	--	--
	Liver	0.211	--	--	--	0.122
	Lung	0.11	0.042	--	--	--
	Pancreas	0.129	--	--	--	--
Local Therapy; Primary	Surgery + RT; HNC	0.015	--	--	--	--
	Surgery; Liver	0.008	--	--	--	--
	Surgery + RT; Pancreas	0.878	0.693	--	--	--
	Surgery; Prostate	-0.272	-0.301	--	--	--
Chemotherapy; Primary	Chemo; Lung	0.005	0.053	--	--	--
AJCC 7 Stage; Primary	II; HNC	0.026	--	--	--	--
	IV; HNC	0.078	--	--	--	--
	II; Lung	0.231	0.402	--	--	--
	III; Lung	0.57	0.484	--	--	--
	II; Prostate	-0.083	-0.041	--	--	--

Abbreviations: LASSO, least absolute shrinkage and selection operator; RT, radiation therapy; AJCC 7, American Joint Committee on Cancer staging system 7th edition.
*Table of log odds covariates from final predictive models, omitting covariates not predictive in any model.