

Ad Hoc Task 5: End of Life (EOL) Measure Testing Memorandum

Chapter 2, Deliverable 2-5e

Centers for Medicare & Medicaid Services: Measure Instrument Development and Support

Development, Reevaluation, and Implementation of Outcome/Efficiency Measures for Hospitals and Eligible Clinicians, Option Period 4

Contract Number HHSM-75FCMC18D0042, Task Order HHSM-75FCMC19F0001

Submitted March 13, 2024 to:

Raquel Myers, PhD, Contracting Officer Representative
Centers for Medicare & Medicaid Services

Prepared by:

Yale New Haven Health Services Corporation/Center for Outcomes Research and Evaluation
Lisa Gale Suter, MD, Project Director

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MEMORANDUM

TO: Raquel Myers, Centers for Medicare and Medicaid Services (CMS), Contracting Officer's Representative

FROM: Yale New Haven Health Services Corporation/Center for Outcomes Research and Evaluation (YNHHSC/CORE)

DATE: March 13, 2024

SUBJECT: Ad Hoc Task #5: End of Life (EOL) Measure Testing Memo

Introduction

Currently, the American Society of Clinical Oncology (ASCO) has four end-of-life (EOL), National Quality Foundation (NQF) endorsed, claims-based measures at the hospital/facility level:

1. Proportion of patients who died from cancer receiving chemotherapy in the last 14 days of life (PCH-32),
2. Proportion of patients who died from cancer admitted to the ICU in the last 30 days of life (PCH-33),
3. Proportion of patients who died from cancer not admitted to hospice (PCH-34), and
4. Proportion of patients who died from cancer admitted to hospice for less than 3 days (PCH-35).

Each measure is reported with an overall score and then further stratified by cancer type (acute hematology, non-acute hematology, or solid tumor).

The Centers for Medicare and Medicaid Services (CMS) intends to submit these four measures to the Measures Under Consideration (MUC) Entry/Review Information Tool (MERIT) submission for the Inpatient Quality Reporting (IQR) Program. To do so, CMS has asked the Yale New Haven Health Services /Center for Outcomes Research and Evaluation (YNHHS/CORE) to conduct reliability and validity testing on the four measures. These results will be shared with CMS who will forward them to ASCO to submit in the MERIT system.

Eleven hospitals are in the PCHQR program, all of which are represented in the data CORE received.

Table 1: Prospective Payment System (PPS)-Exempt Cancer Hospital Quality Reporting (PCHQR) Program Hospitals

CMS Certification Number (CCN)	Name	City, State	Applicable Regulation/Statute
05-0146	City of Hope National Medical Center	Los Angeles, CA	Social Security Amendments of 1983 (P.L. 98-21)
05-0660	USC Kenneth Norris Jr. Cancer Hospital	Los Angeles, CA	Social Security Amendments of 1983 (P.L. 98-21)
10-0079	University of Miami Hospital and Clinics	Miami, FL	Balanced Budget Act of 1997 (P.L. 105-33)
10-0271	H. Lee Moffitt Cancer and Research Institute Hospital, Inc.	Tampa, FL	Balanced Budget Act of 1997 (P.L. 105-33)
22-0162	Dana-Farber Cancer Institute	Boston, MA	Social Security Amendments of 1983 (P.L. 98-21)
33-0154	Memorial Hospital for Cancer and Allied Disease	New York, NY	Social Security Amendments of 1983 (P.L. 98-21)
33-0354	Roswell Park Memorial Institute	Buffalo, NY	Social Security Amendments of 1983 (P.L. 98-21)
36-0242	Arthur G. James Cancer Hospital and Research Institute	Columbus, OH	Omnibus Reconciliation Act of 1989 (P.L. 101-239)
39-0196	American Oncologic Hospital (Fox Chase)	Philadelphia, PA	Social Security Amendments of 1983 (P.L. 98-21)
45-0076	The University of Texas M. D. Anderson Cancer Center	Houston, TX	Social Security Amendments of 1983 (P.L. 98-21)
50-0138	Fred Hutchinson Cancer Research Center (Seattle Cancer Care Alliance)	Seattle, WA	Social Security Amendments of 1983 (P.L. 98-21)

Source: <https://www.cms.gov/medicare/payment/prospective-payment-systems/acute-inpatient-pps/pps-exempt-cancer-hospitals-pchs>

Methodology

Below we describe our approach to measure score reliability and empiric validity testing.

The reliability of a performance measure is the degree to which variability in the measure score is evidence of real quality differences among measured entities. For measures of hospital performance, the measured entity is the hospital. The reliability of the measure score can be assessed using a signal-to-noise approach.ⁱ The reliability of any one facility's measure score will vary depending on the number of patients included in the measure denominator. Facilities with higher case volume (with more patients included in the measure) will tend to have more reliable scores, while facilities with lower volume will tend to have less reliable scores. Therefore, we used the formula presented by Adams et al.ⁱ to conduct facility-level reliability testing and presented the distribution of reliability values across hospitals.

Measuring empiric validity is challenging, especially in the absence of a clear gold standard of performance quality to which to compare hospitals' performance. Very high correlations with comparison measure scores are rare, as the populations being assessed by measures under comparison, while aligned, are rarely closely overlapping and may represent slightly different time periods and

patient populations. Further, the aspects of quality being measured are also aligned but represent distinct quality facets and domains.

To assess empiric validity of the measure score, we identified and assessed the correlation of each of the four EOL measures with other measures that target the same (or similar) domain of quality for the same or similar patient populations. The goal was to identify whether the identification of better performance in this measure was related to the identification of better performance in other relevant structural, process, or outcome measures. We sought comparator measures for validity testing that 1) reflect high quality of care for the same topic as the end-of-life measures being assessed, 2) carry face validity for supporting the end-of-life measures validity, and 3) are feasible for testing with available data. Given the limited time and the absence of measures identified that assess the same domains of quality for testing, we focused on oncology-specific PCHQR measures for comparison:

- 30-Day Unplanned Readmissions for Cancer Patients (CMIT ID# 00004-01-C-PCHQR; PCH-36)
- Admissions for Patients Receiving Outpatient Chemotherapy (CMIT ID# 00021-01-C-PCHQR; PCH-3031)
- Emergency Department (ED) Visits for Patients Receiving Outpatient Chemotherapy (CMIT ID# 00021-01-C-PCHQR; PCH-3031)
- Surgical Treatment Complications for Localized Prostate Cancer Measure (CMIT ID# 00714-01-C-PCHQR; PCH-37)

The data for the four EOL Measures being tested were from 2021-2022, used in fiscal year (FY) 2024. The data from comparator measures PCH-3031 (Admissions Visits for Patients Receiving Outpatient Chemotherapy and Emergency Department [ED] Visits for Patients Receiving Outpatient Chemotherapy) were from 7/1/22 – 6/30/23, used in FY 2024. The data from comparator measure PCH-36 (30-Day Unplanned Readmissions for Cancer Patients) were from 10/1/22 – 9/30/23, used in FY 2024. The data from comparator measure PCH-37 (Surgical Treatment Complications for Localized Prostate Cancer Measure) were from 7/1/21 – 6/30/22, used in FY 2024.

We examined the relationship of performance between each EOL measure score and each of these external measures of hospital quality. We interpreted the EOL measures as higher scores demonstrating a *less* patient-centered hospital performance, with regards to end-of-life cancer care (worse performance). For the comparator measures with the exception of PCH-37, higher measure scores also represent worse performance (more frequent returns to hospital and higher complication rates). Thus, we might hypothesize the EOL measure scores would have a small, positive association with the comparator measures listed above. For PCH-37, the association would be expected to be negative.

We calculated a quantified summary value (correlation coefficient) for each measure comparison. The validity analysis results are captured in Table 6 below. We also provide scatterplots to visualize the relationships, detailed in the Appendix.

Results and Interpretation

In the following Tables 2-5, we summarize (mean, median, minimum, and maximum) the results of hospital-level measure score reliability testing for each of the four EOL measures. Complete hospital-level results are supplied in the accompanying Excel workbook (EOL_ReliabilityTesting_03132024.xlsx). Current guidance for the Consensus-Based Endorsement (CBE) entity is for reliability values to be greater than or equal to 0.6 (on 0-1 scale). Therefore, we provide the percentage of hospitals meeting this threshold of hospital score reliability. PCH-32 had no data for acute-hematology patients and PCH-

35 had no data for non-acute hematology patients, resulting in no reliability results for these measures and strata.

Table 2: Measure Score Reliability Testing Results for Measure PCH-32: Proportion of patients who died from cancer receiving chemotherapy in the last 14 days of life

Measure Stratification	Mean	Median	Minimum	Maximum	Percent of hospitals ≥ 0.6
Overall	0.6321	0.6091	0.2552	0.8581	54.55
Solid Tumor	0.6655	0.6503	0.3224	0.8834	72.73
Acute Hematology	N/A	N/A	N/A	N/A	N/A
Non-acute hematology	0.4918	0.4949	0.0413	0.7433	36.36

Table 3: Measure Score Reliability Testing Results for Measure PCH-33: Proportion of patients who died from cancer admitted to the ICU in the last 30 days of life

Measure Stratification	Mean	Median	Minimum	Maximum	Percent of hospitals ≥ 0.6
Overall	0.9730	0.9766	0.9018	0.9939	100.00
Solid Tumor	0.9668	0.9703	0.8932	0.9926	100.00
Acute hematology	0.7734	0.7657	0.2373	0.9413	90.91
Non-acute hematology	0.8320	0.8841	0.2511	0.9575	90.91

Table 4: Measure Score Reliability Testing Results for Measure PCH-34: Proportion of patients who died from cancer not admitted to hospice

Measure Stratification	Mean	Median	Minimum	Maximum	Percent of hospitals ≥ 0.6
Overall	0.9116	0.9189	0.7136	0.9778	100.00
Solid tumor	0.9030	0.9093	0.7196	0.9761	100.00
Acute hematology	0.7006	0.6698	0.1619	0.9087	81.82
Non-acute hematology	0.4498	0.4460	0.0312	0.7041	27.27

Table 5: Measure Score Reliability Testing Results for Measure PCH-35: Proportion of patients who died from cancer admitted to hospice for less than 3 days

Measure Stratification	Mean	Median	Minimum	Maximum	Percent of hospitals ≥ 0.6
Overall	0.8208	0.8423	0.5117	0.9446	90.91
Solid Tumor	0.8149	0.8323	0.5360	0.9447	90.91
Acute hematology	0.3300	0.3077	0.0734	0.5738	0.00
Non-acute hematology	N/A	N/A	N/A	N/A	N/A

Below (Table 6), we provide results of empiric validity comparisons between oncology-related PCHQR measures and the EOL measures. In red are the measure comparisons with statistical significance. Among the 64 comparisons, only two were statistically significant with moderate correlation values. This is most likely due to the very small number of PCH hospitals. The two correlations that reached statistical significance were between “PCH-34: Proportion of patients who died from cancer not admitted to hospice” and “PCH-36: 30-day Cancer Readmission”. This may reflect the competing risk of mortality among cancer patients, producing a lower-than-expected readmission rate. Graphic representations of these comparisons are shown as scatterplots in Appendix A.

Table 6: Empiric Validity Comparisons of EOL measures with Other Oncology-Specific PCHQR Measures

Measure	Stratification	Correlation (p value) with PCH-36 Cancer Readmission	Correlation (p value) with PCH-37 Prostatectomy	Correlation (p value) with PCH-3031 Chemo Patient Admissions	Correlation (p value) with PCH-3031 Chemo Patient ED Visits
PCH-32 - Proportion of patients who died from cancer receiving chemotherapy in the last 14 days of life	OVERALL	-0.08 (0.81)	-0.42 (0.35)	-0.23 (0.49)	0.13 (0.71)
	Solid Tumor	-0.16 (0.64)	-0.45 (0.32)	-0.19 (0.58)	0.08 (0.82)
	Acute Hematology	0.46 (0.15)	0.10 (0.83)	-0.22 (0.52)	0.40 (0.22)
	Non-Acute Hematology	-0.09 (0.79)	-0.45 (0.31)	-0.10 (0.77)	0.06 (0.85)
PHC-33 - Proportion of patients who died from cancer admitted to the ICU in the last 30 days of life	OVERALL	-0.13 (0.70)	0.04 (0.94)	-0.14 (0.69)	-0.16 (0.64)
	Solid Tumor	-0.16 (0.63)	0.03 (0.94)	-0.17 (0.62)	-0.22 (0.51)
	Acute Hematology	-0.12 (0.73)	0.27 (0.56)	0.11 (0.75)	-0.07 (0.84)
	Non-Acute Hematology	0.12 (0.73)	0.38 (0.39)	-0.17 (0.62)	-0.16 (0.63)
PHC-34 - Proportion of patients who died from cancer not admitted to hospice	OVERALL	-0.64 (0.03)	0.17 (0.72)	0.15 (0.67)	-0.48 (0.13)
	Solid Tumor	-0.62 (0.04)	0.23 (0.61)	0.06 (0.87)	-0.51 (0.11)
	Acute Hematology	-0.25 (0.46)	0.45 (0.31)	0.13 (0.71)	-0.32 (0.34)
	Non-Acute Hematology	-0.24 (0.48)	0.21 (0.65)	0.21 (0.53)	-0.44 (0.18)
PCH-35 - Proportion of patients who died from cancer admitted to hospice for less than 3 days	OVERALL	-0.18 (0.60)	-0.47 (0.29)	0.06 (0.87)	-0.25 (0.46)
	Solid Tumor	-0.22 (0.52)	-0.56 (0.19)	-0.04 (0.91)	-0.33 (0.32)
	Acute Hematology	-0.27 (0.45)	0.44 (0.39)	0.28 (0.44)	-0.19 (0.61)
	Non-Acute Hematology	-0.04 (0.91)	-0.51 (0.25)	0.37 (0.26)	0.34 (0.31)

Conclusion

In general, the EOL measures demonstrate high reliability and most measures (both overall scores and scores stratified by cancer type) produce reliability scores meeting or exceeding the current CBE reliability threshold. Unlike the other EOL measures, which had universally high reliability results, roughly half of hospitals achieve the CBE reliability threshold for Measure PCH-32 - Proportion of patients who died from cancer receiving chemotherapy in the last 14 days of life; this is likely due to the low reliability of the non-hematology cancer subgroup and may reflect a combination of low variance and low case volumes.

In contrast, the empiric validity testing does not provide strong support for the EOL measures. This is likely due to the small sample of PCH hospitals and the lack of gold standard comparators. While we anticipate the oncology-specific PCHQR measures should be more closely correlated with the EOL measures than non-oncology-specific measures (such as hospital acquired infection measures), they still measure different quality domains.

Because the EOL measures address a unique measure gap, measure score validity may be better addressed by face validity vote with or without peer-reviewed literature demonstrating the value of the measure concepts to patients and caregivers. For example, large retrospective cohort data support that even just one day of hospice care may increase life expectancy by up to three months.^{ii, iii, iv, v} Other data show that hospice care is associated with higher patient autonomy in decision-making,^{vi} better symptom relief, patient-goal attainment, and quality of EOL care.^{vii}

Appendix A

The scatterplots provided below provide visual comparisons of each oncology-specific PCH measure to each EOL measure. Each plot shows the measure score of the oncology-specific PCH comparator measure on the vertical axis and the specific EOL measure score on the horizontal axis. Axis scales are data-derived and not comparable across graphs.

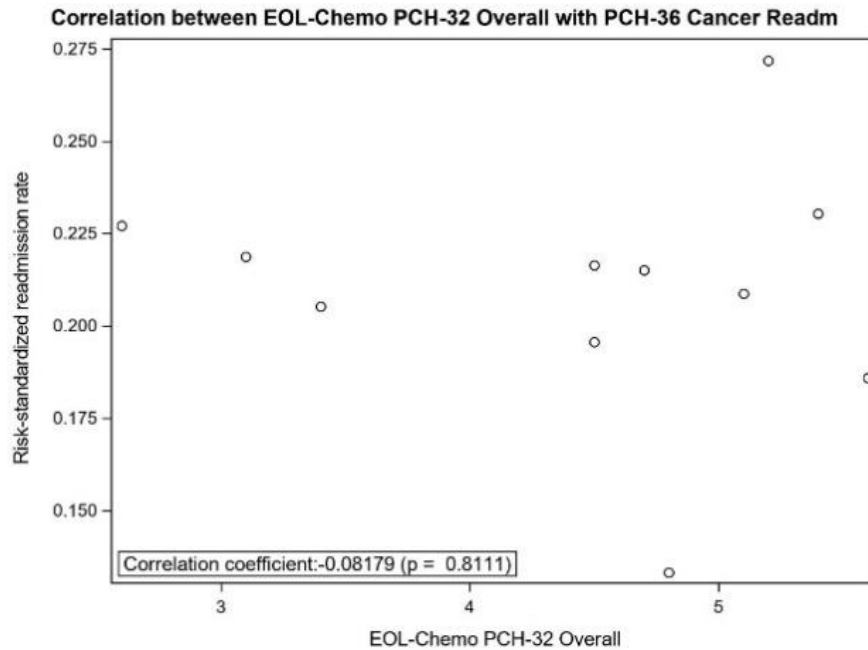


Figure 1: PCH-32 Overall with PCH-36

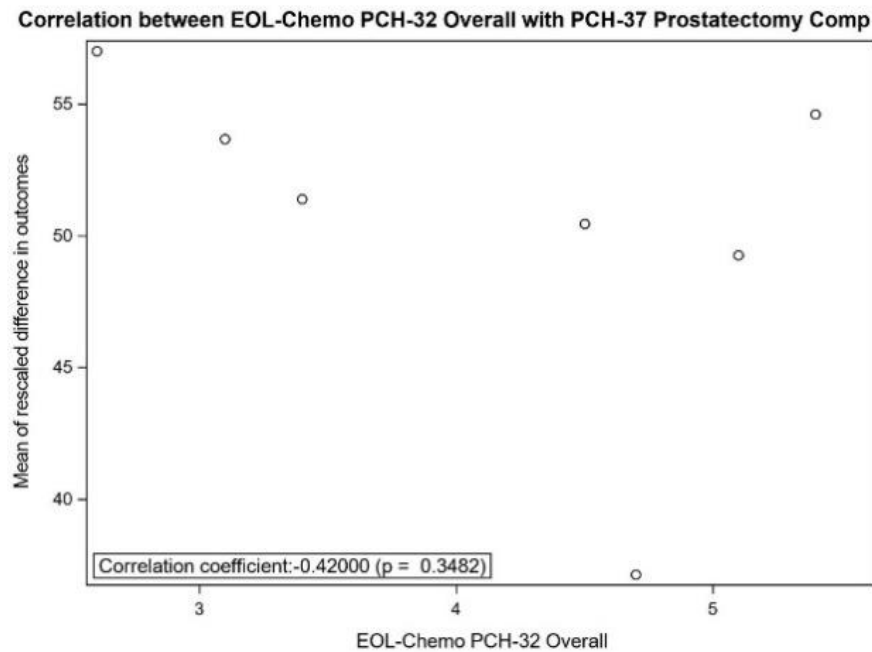


Figure 2: PCH-32 Overall with PCH-37

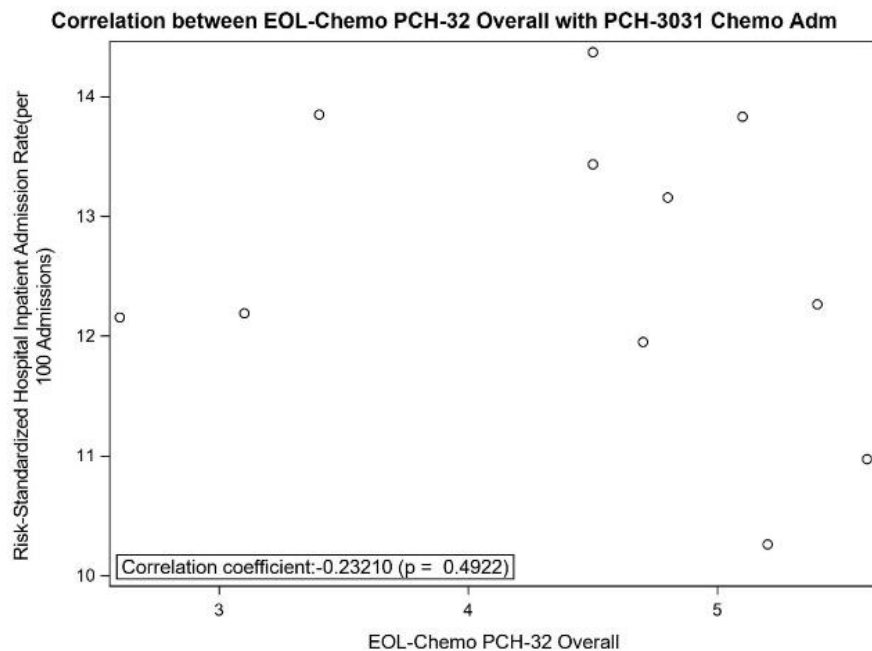


Figure 3: PCH-32 Overall with PCH-3031 Chemo Admits

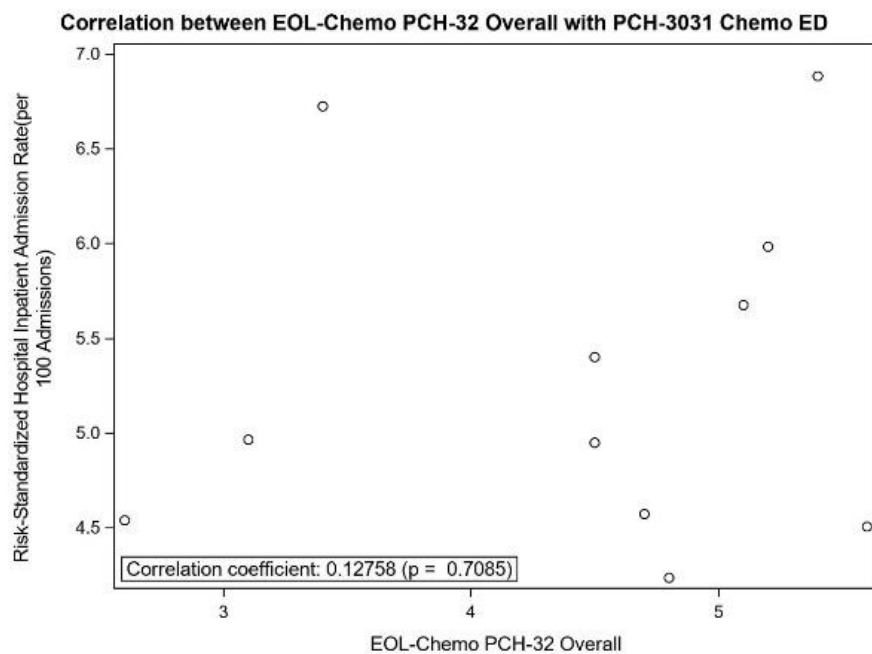


Figure 4: PCH-32 Overall with PCH-3031 Chemo ED Visits

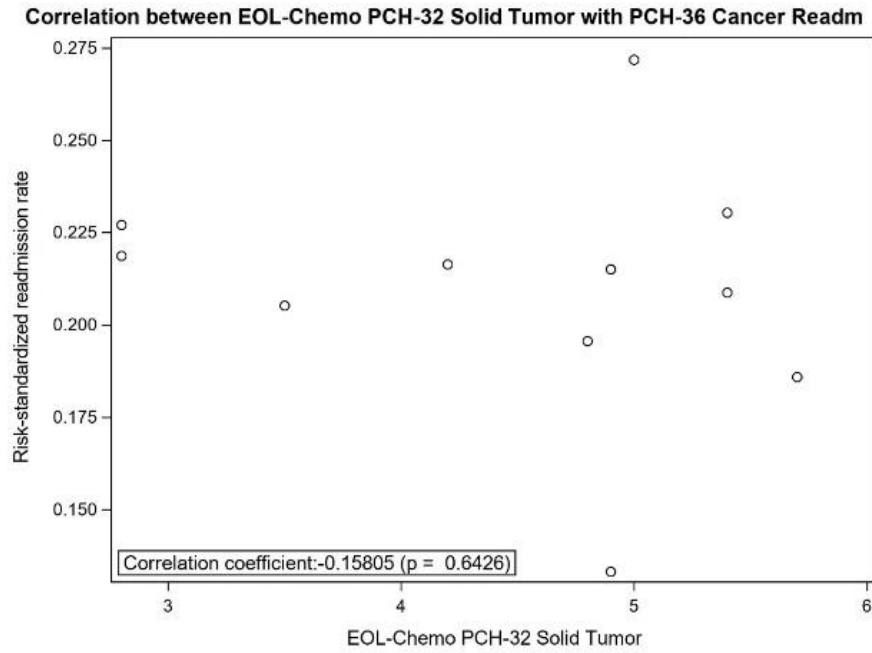


Figure 5: PCH-32 Solid Tumor with PCH-36 Readmits

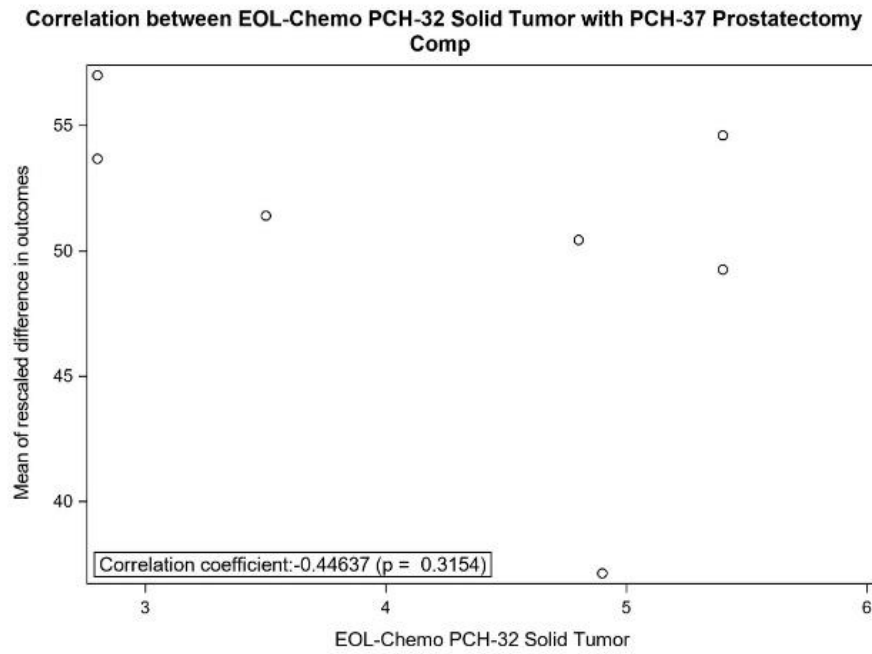


Figure 6: PCH-32 Solid Tumor with PCH-37

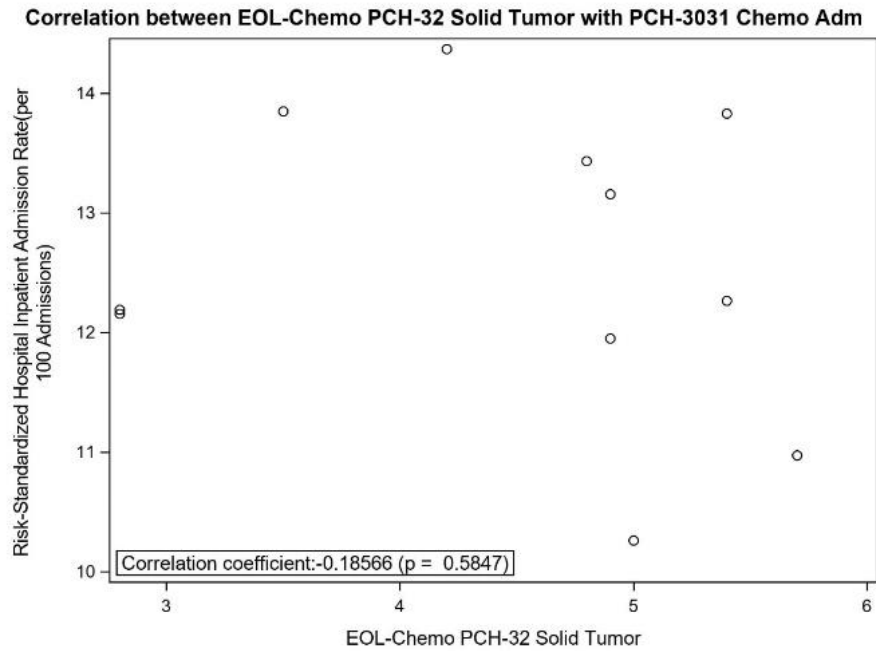


Figure 7: PCH-32 Solid Tumor with PCH-3031 Chemo Admits

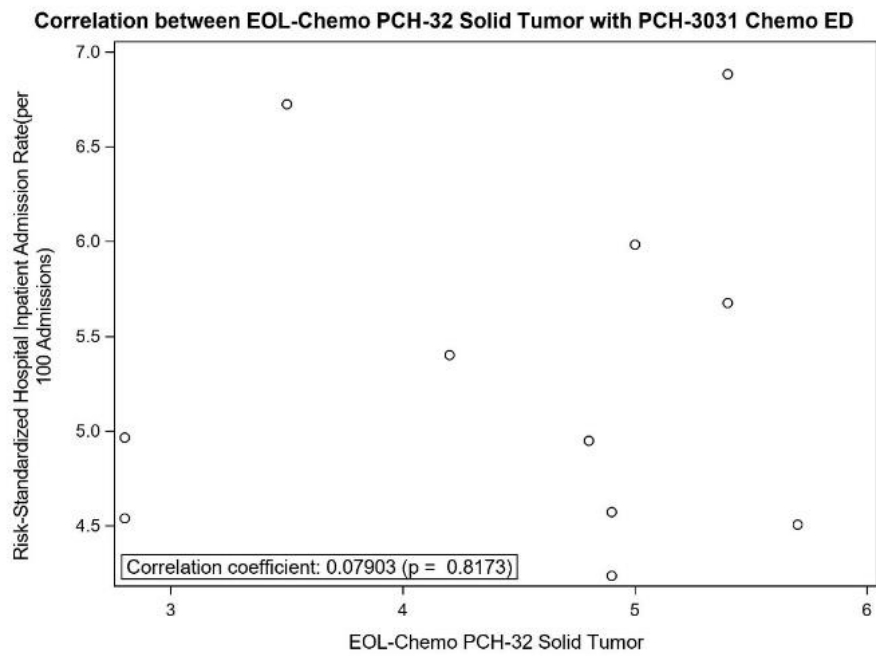


Figure 8: PCH-32 Solid Tumor with PCH-3031 Chemo ED Visits

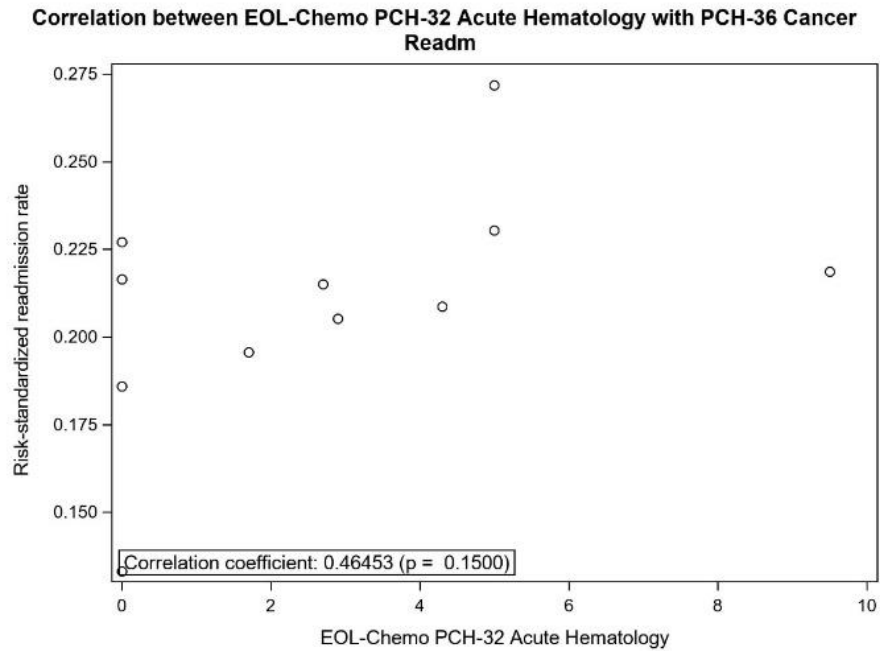


Figure 9: PCH-32 Acute Hematology with PCH-36 Readmits

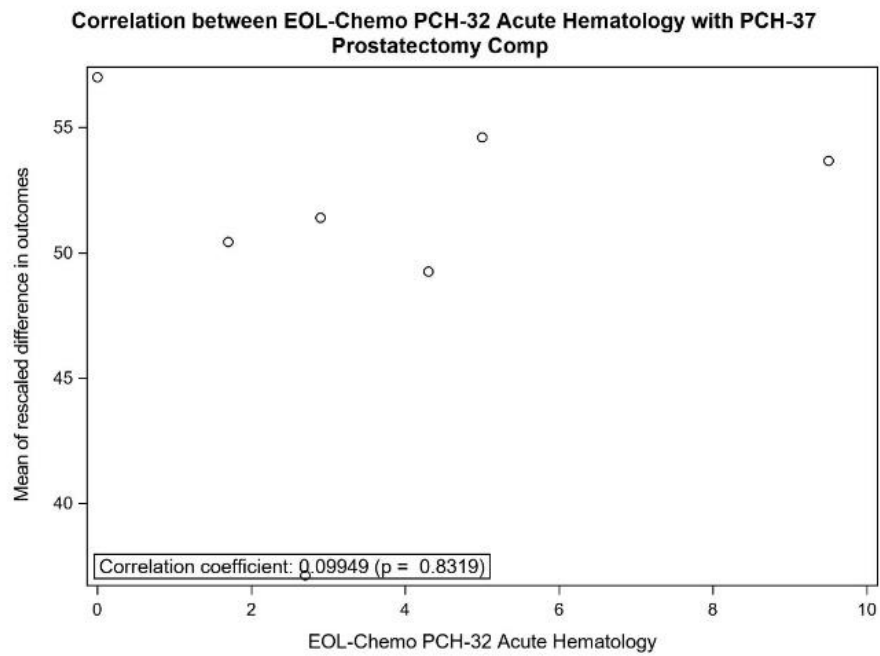


Figure 10: PCH-32 Acute Hematology with PCH-37

Correlation between EOL-Chemo PCH-32 Acute Hematology with PCH-3031 Chemo Adm

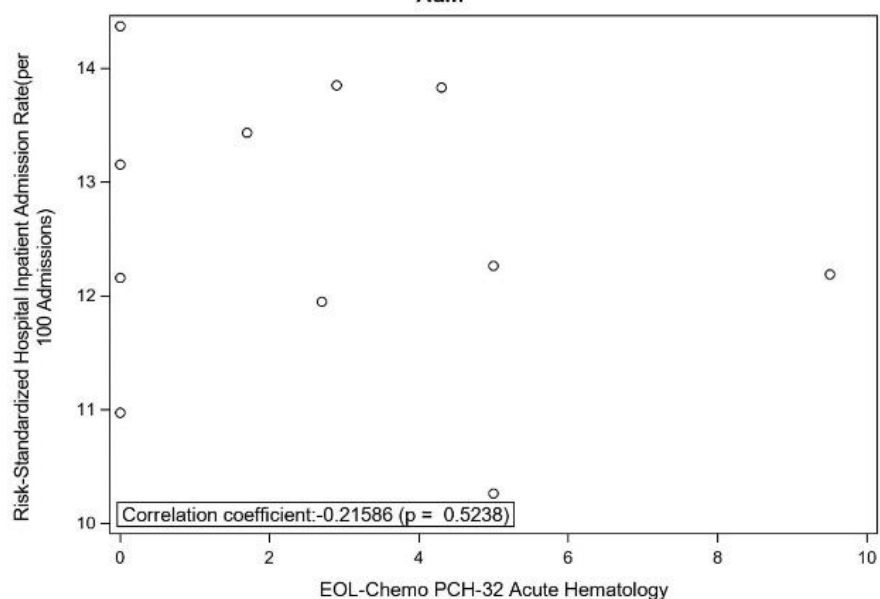


Figure 11: PCH-32 Acute Hematology with PCH-3031 Chemo Admits

Correlation between EOL-Chemo PCH-32 Acute Hematology with PCH-3031 Chemo ED

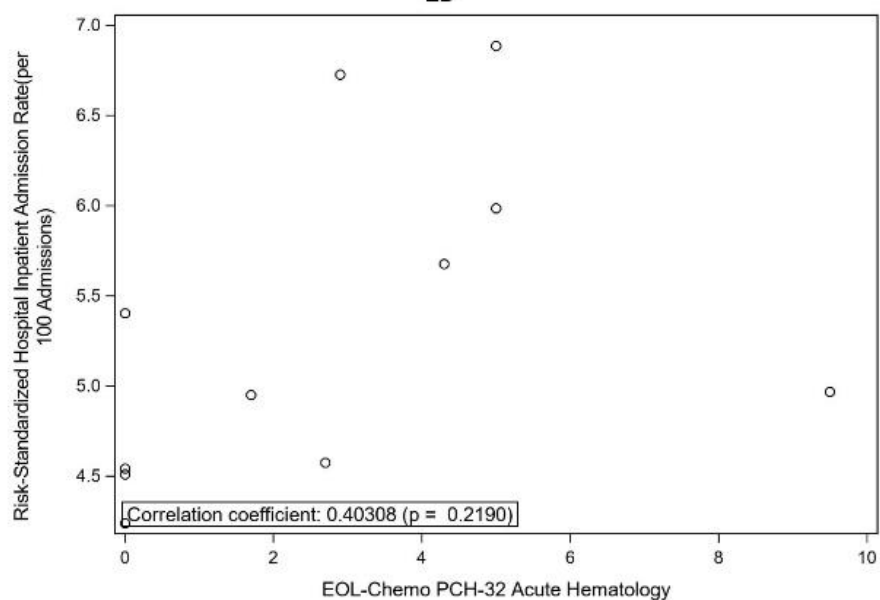


Figure 12: PCH-32 Acute Hematology with PCH-3031 Chemo ED Visits

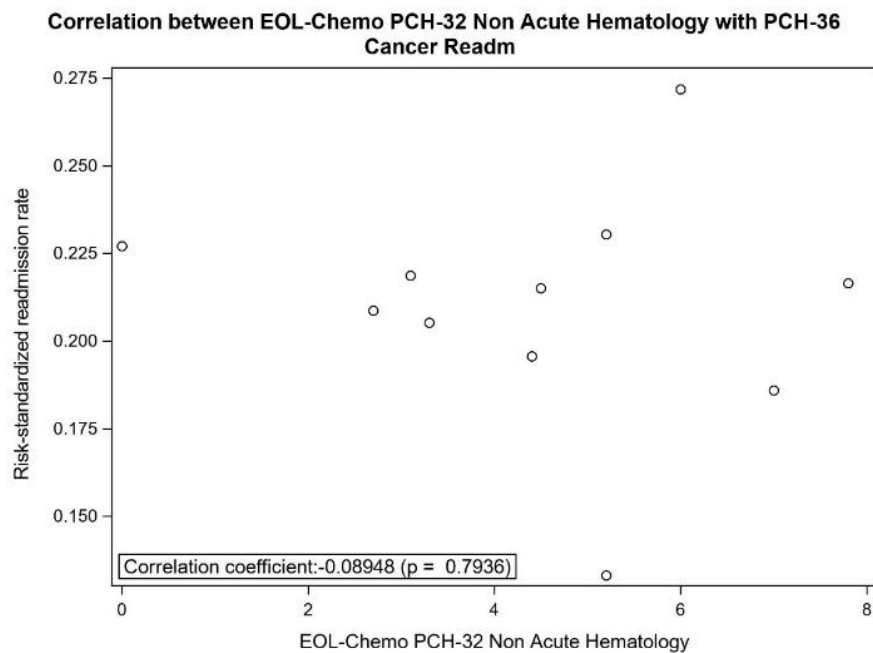


Figure 13: PCH-32 Non-Acute Hematology with PCH-36 Readmits

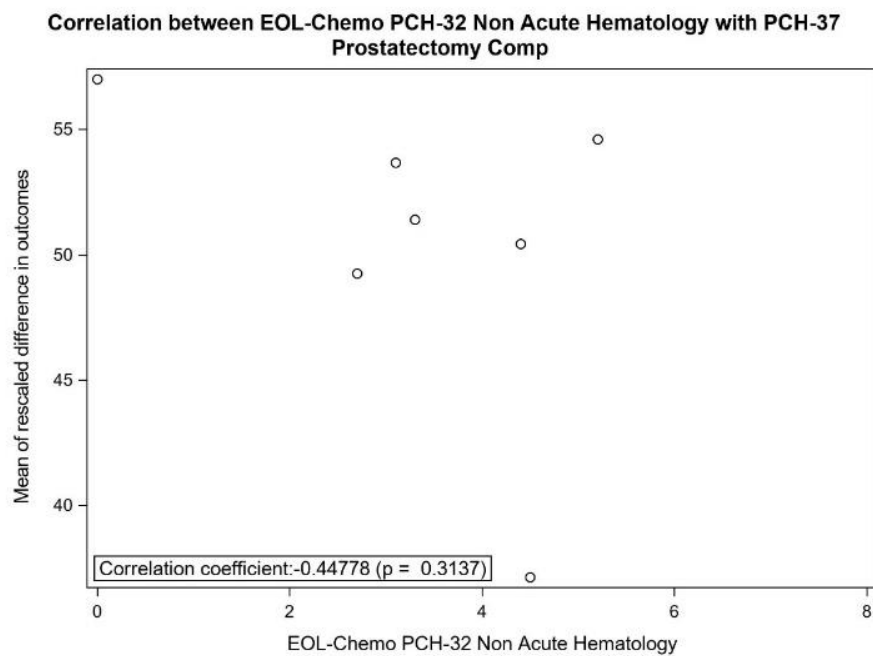


Figure 14: PCH-32 Non-Acute Hematology with PCH-37

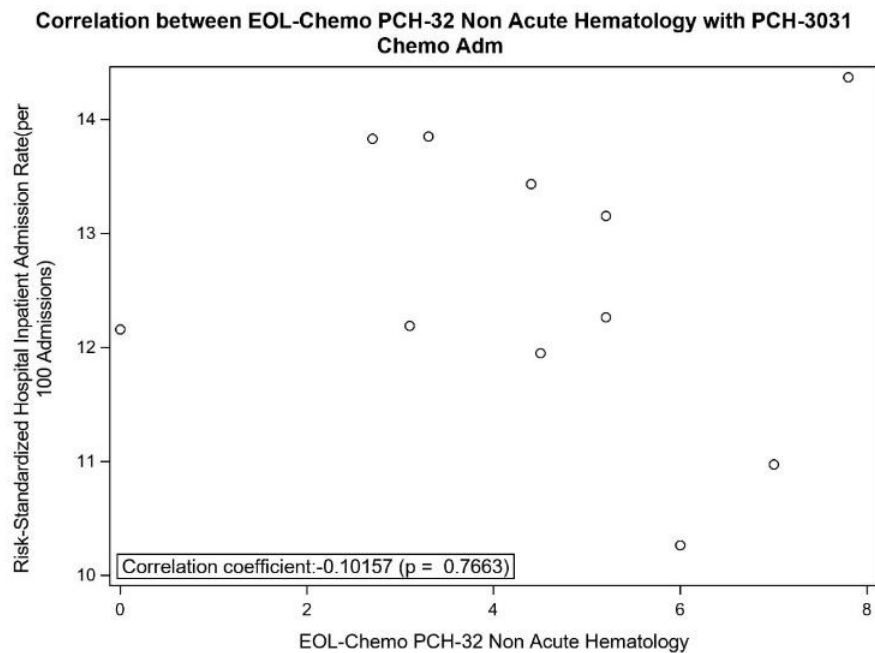


Figure 15: PCH-32 Non-Acute Hematology with PCH-3031 Admits

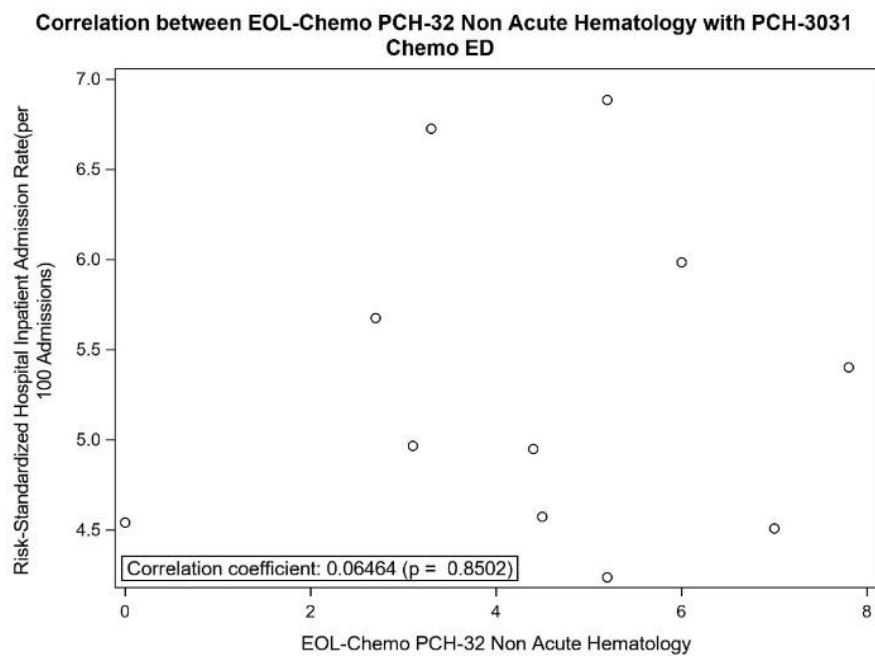


Figure 16: PCH-32 Non-Acute Hematology with PCH-3031 ED Visits

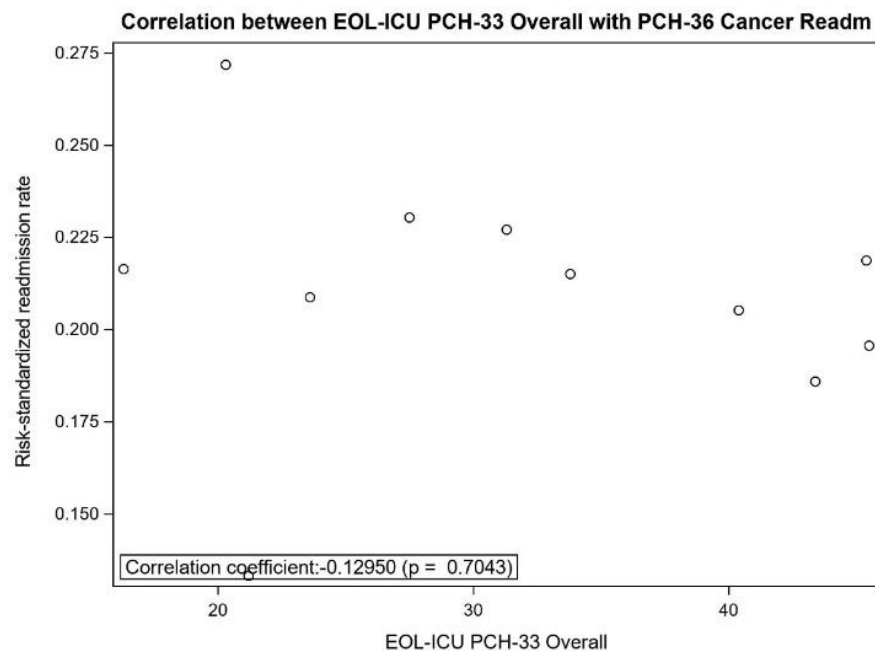


Figure 17: PCH-33 Overall with PCH-36 Readmits

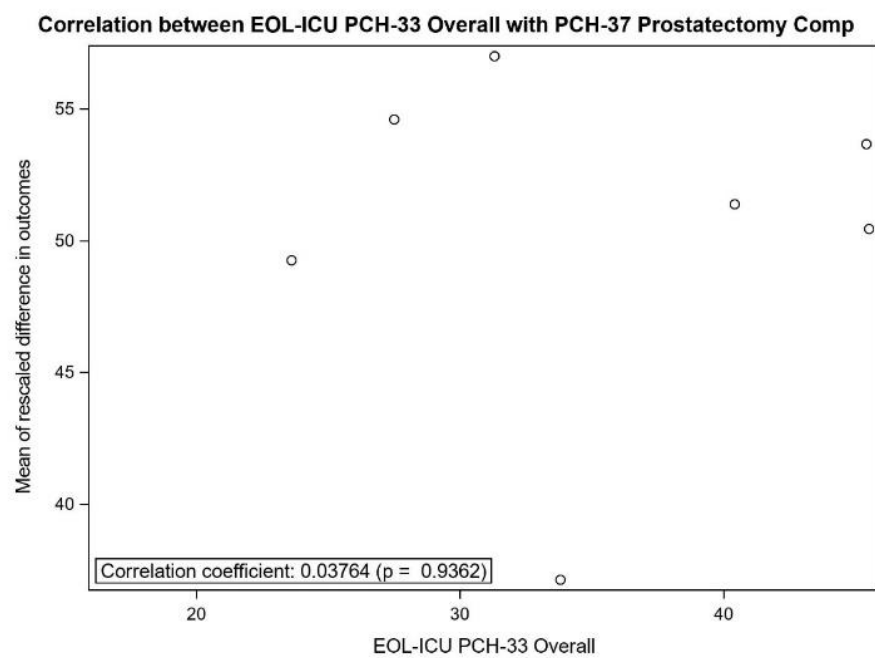


Figure 18: PCH-33 Overall with PCH-37

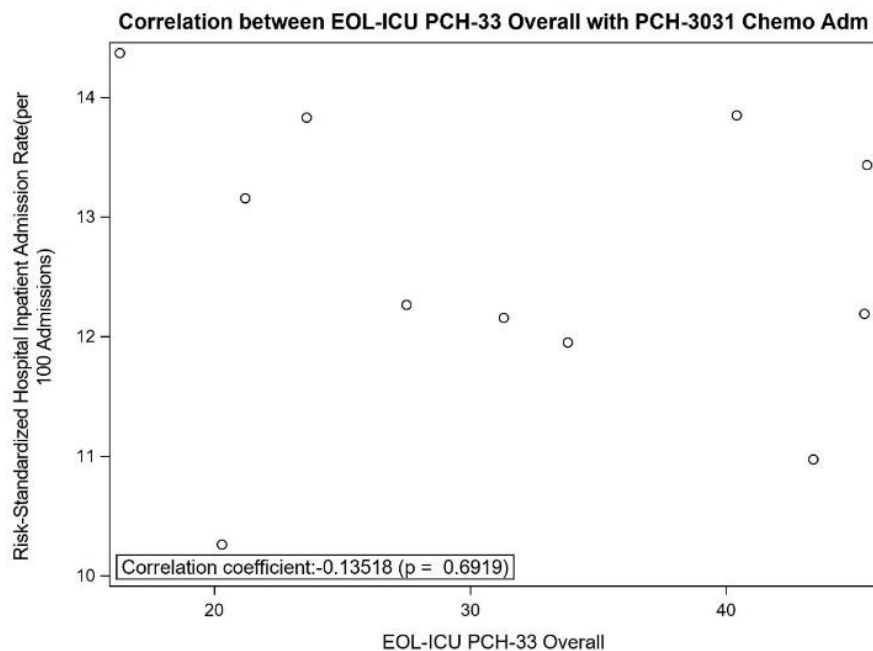


Figure 19: PCH-33 Overall with PCH-3031 Admits

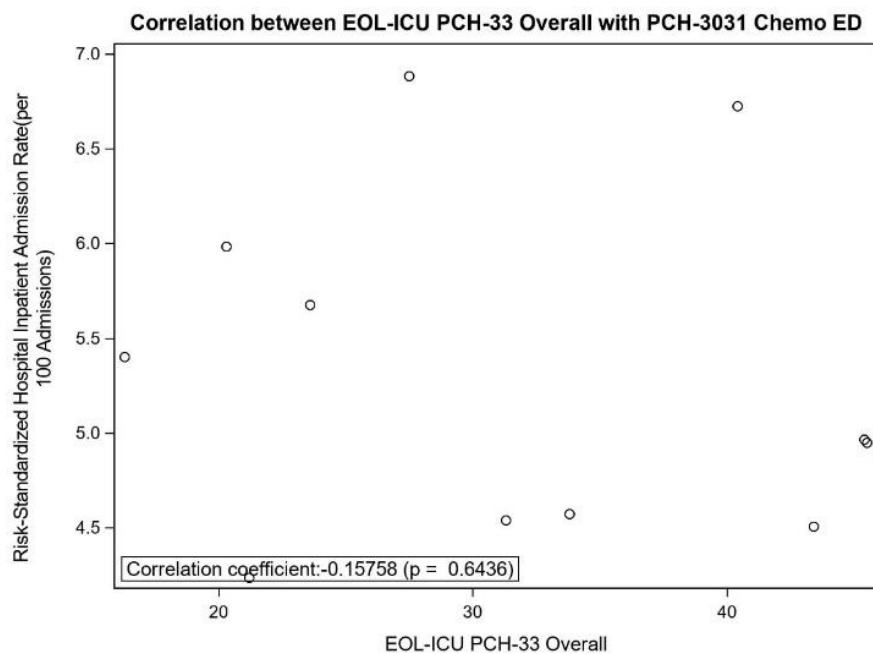


Figure 20: PCH-33 Overall with PCH-3031 ED Visits

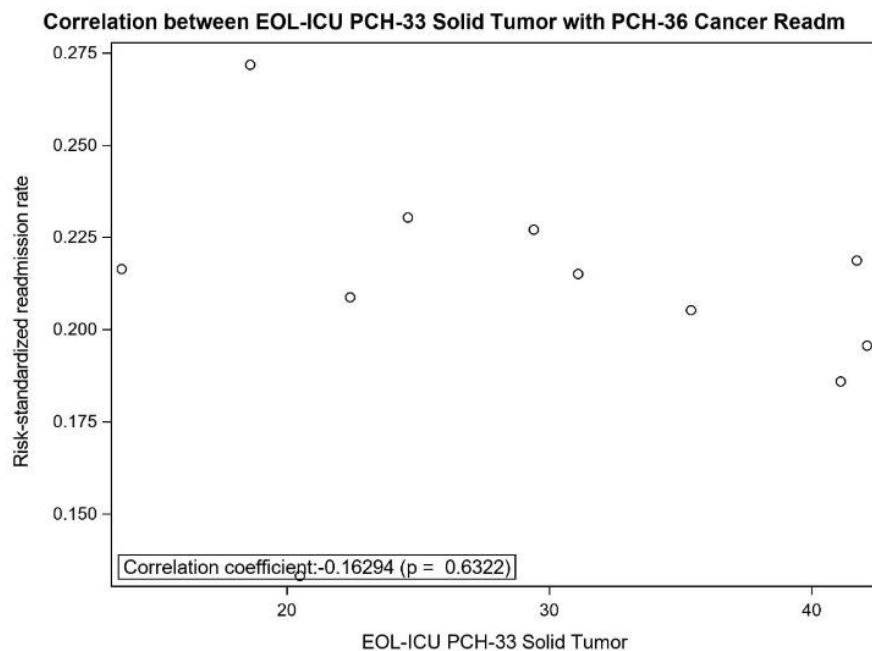


Figure 21: PCH-33 Solid Tumor with PCH-36 Readmits

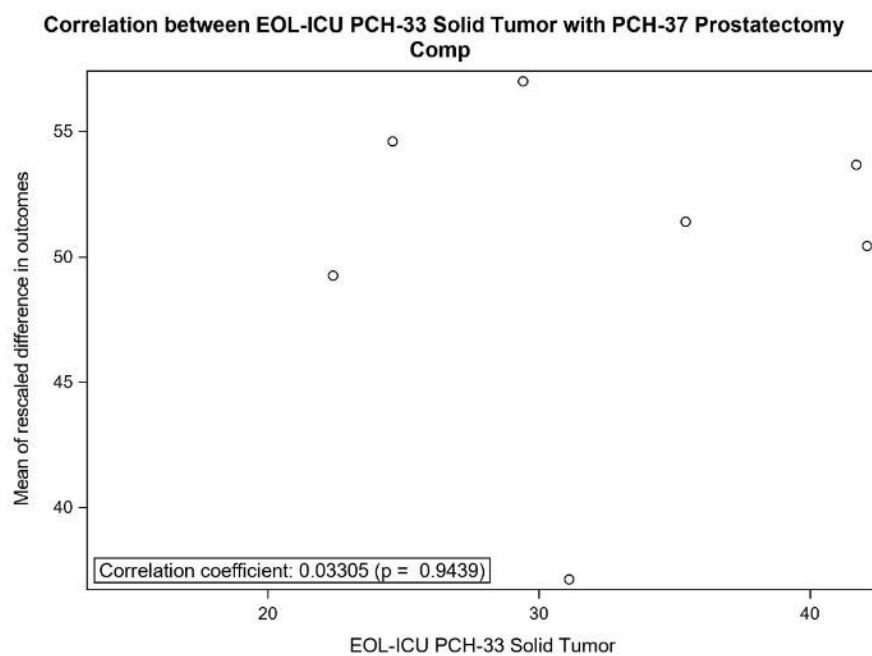


Figure 22: PCH-33 Solid Tumor with PCH-37

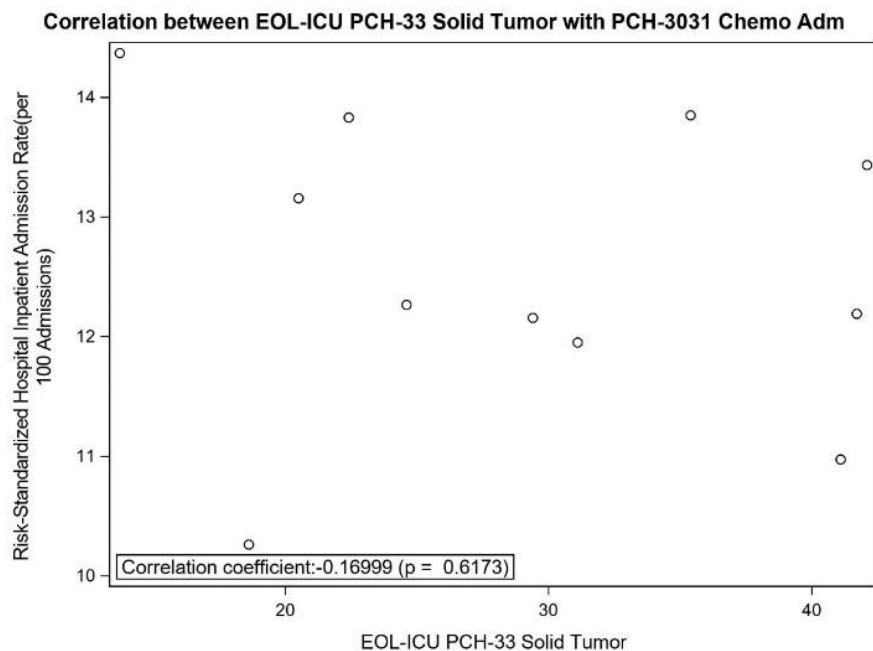


Figure 23: PCH-33 Solid Tumor with PCH-3031 Admits

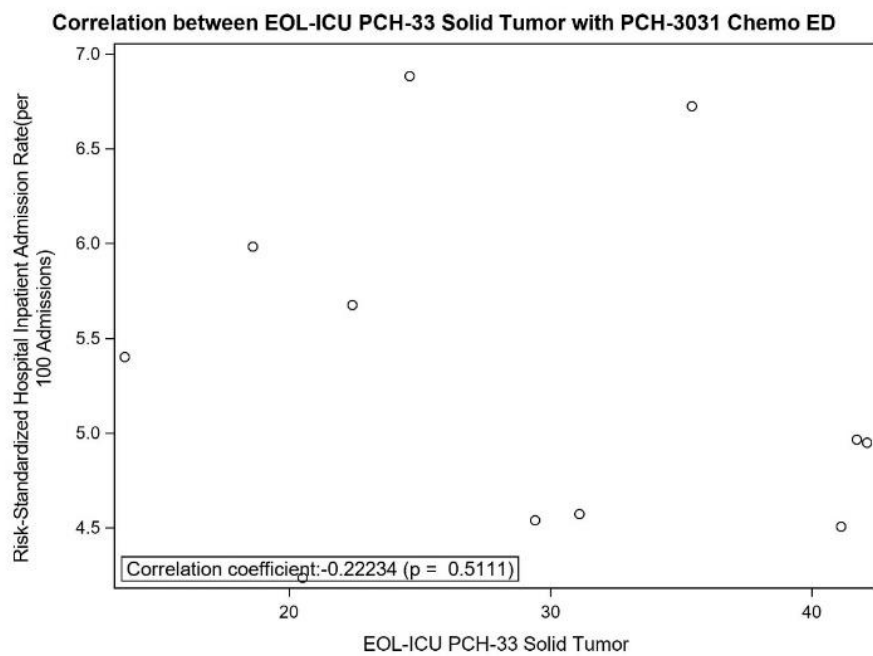


Figure 24: PCH-33 Solid Tumor with PCH-3031 ED Visits

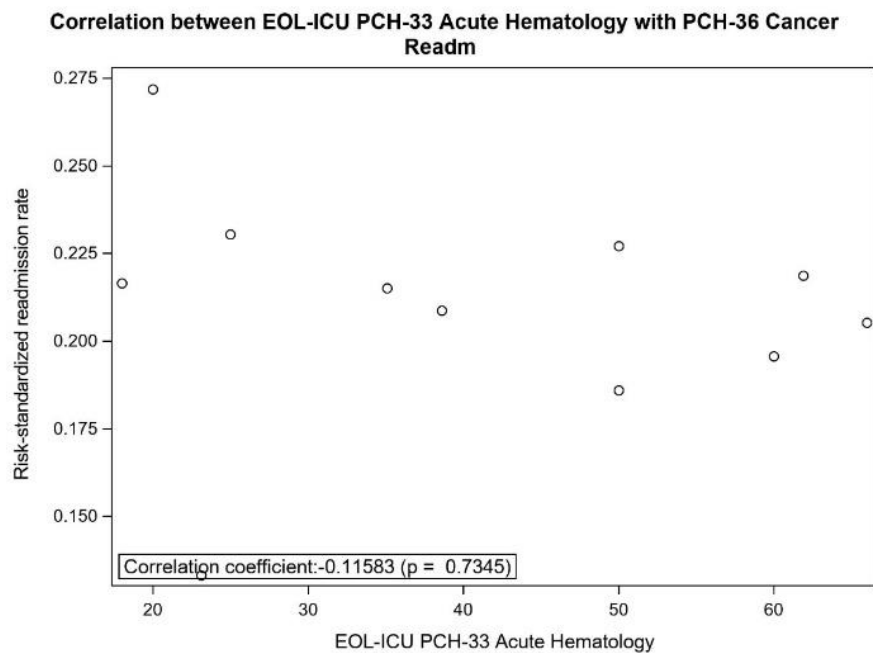


Figure 25: PCH-33 Acute Hematology with PCH-36 Readmits

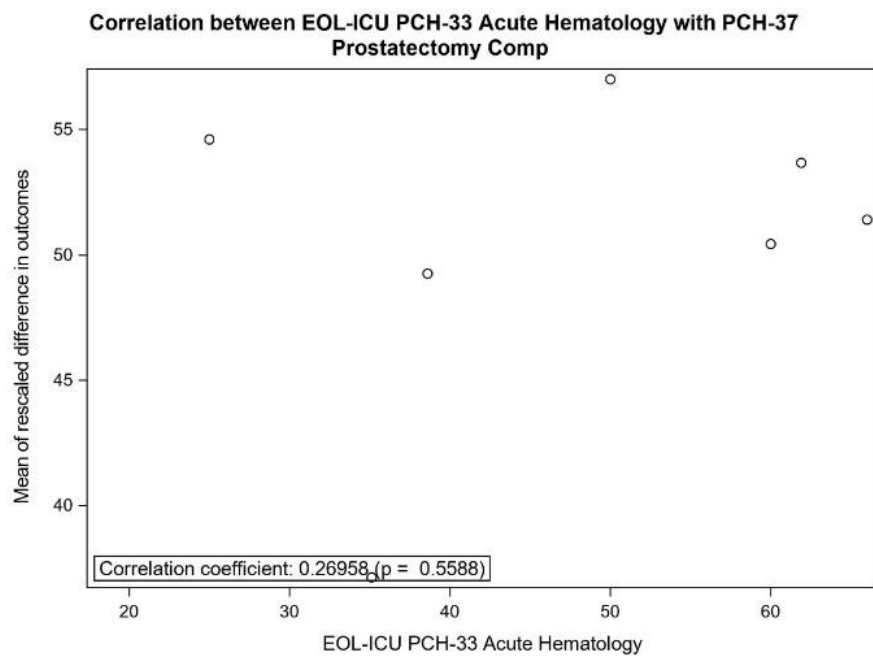


Figure 26: PCH-33 Acute Hematology with PCH-37

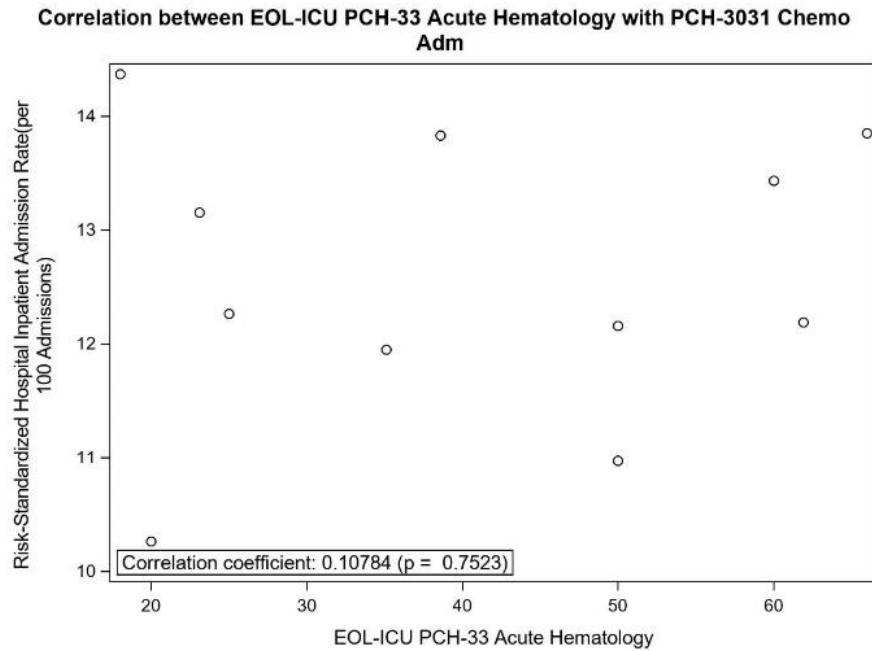


Figure 27: PCH-33 Acute Hematology with PCH-3031 Admits

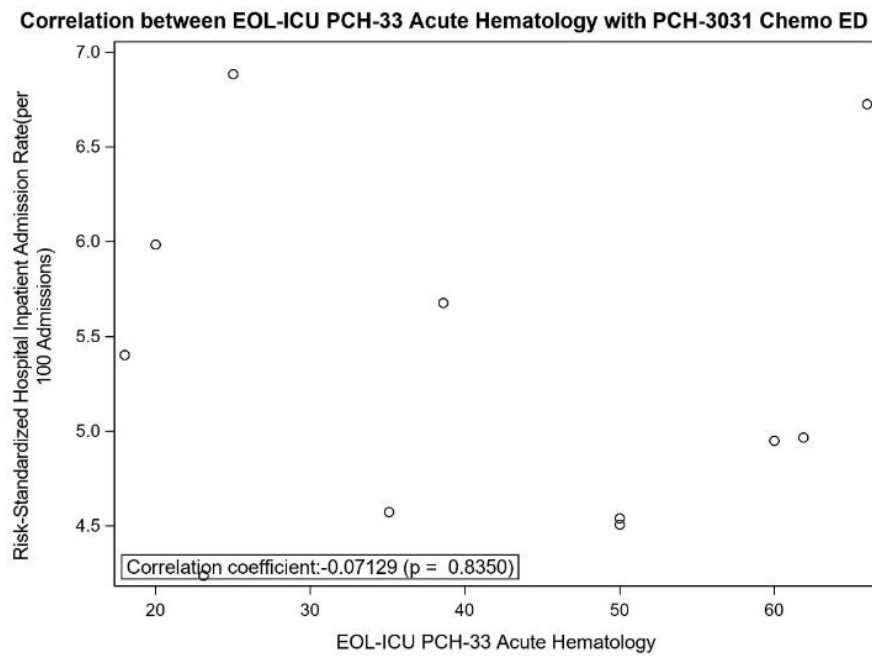


Figure 28: PCH-33 Acute Hematology with PCH-3031 ED Visits

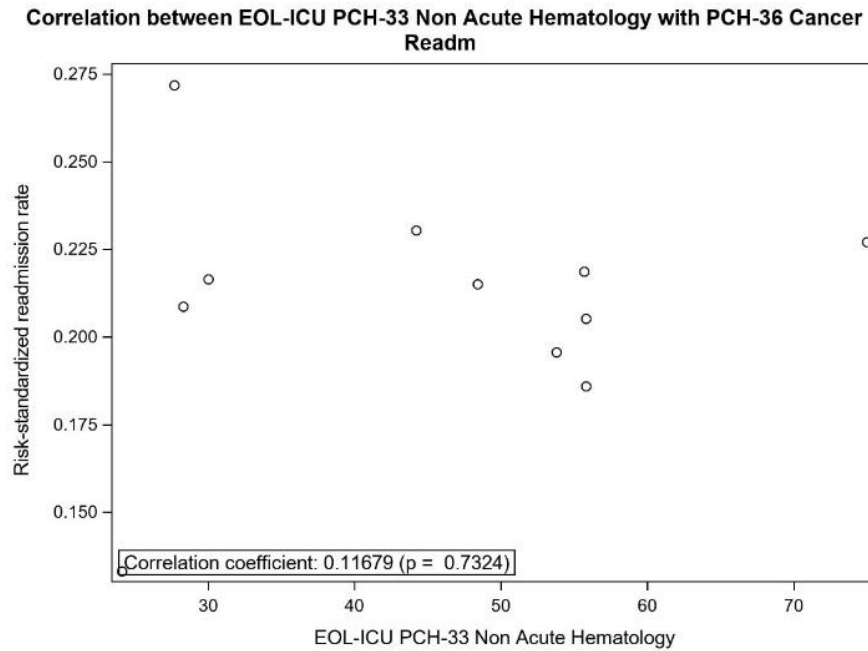


Figure 29: PCH-33 Non-Acute Hematology with PCH-36 Readmits

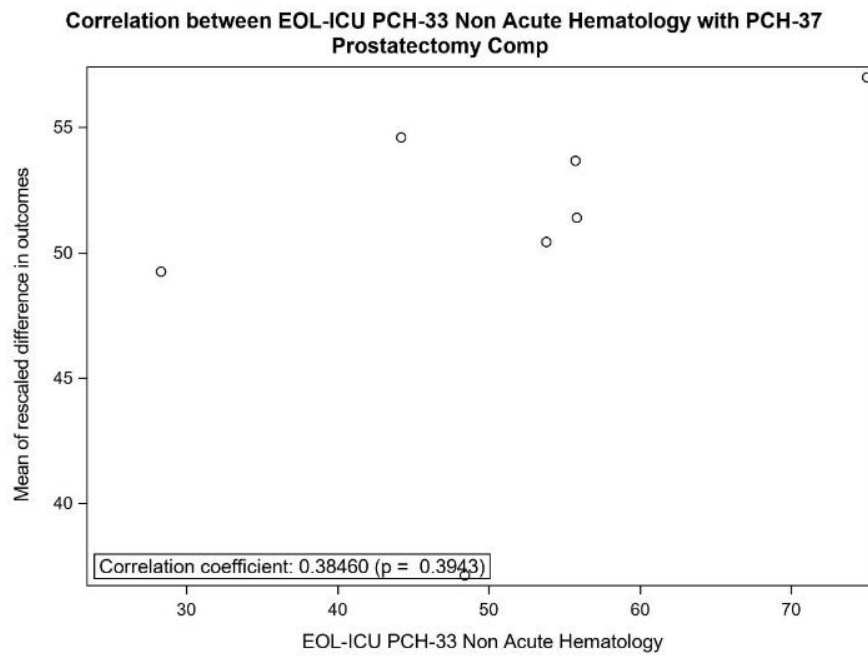


Figure 30: PCH-33 Non-Acute Hematology with PCH-37

Correlation between EOL-ICU PCH-33 Non Acute Hematology with PCH-3031 Chemo Adm

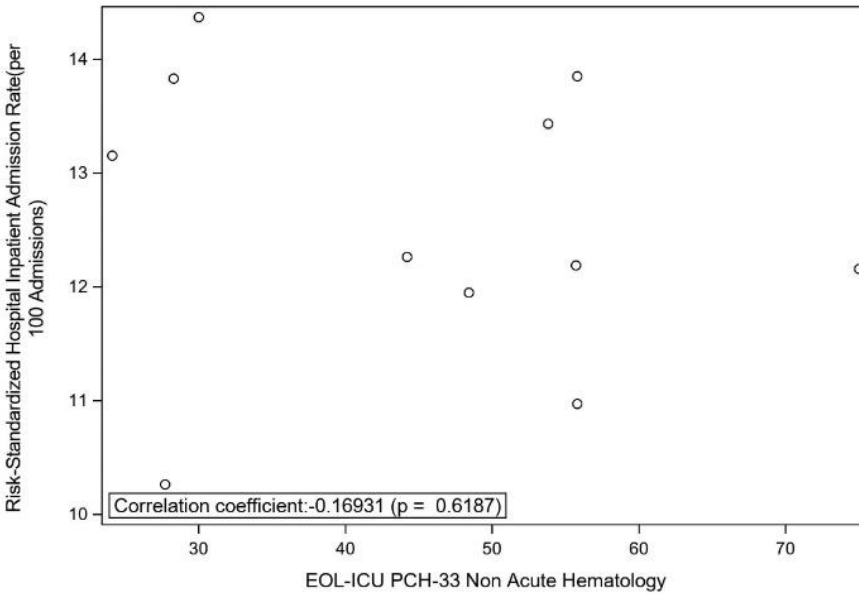


Figure 31: PCH-33 Non-Acute Hematology with PCH-3031 Admits

Correlation between EOL-ICU PCH-33 Non Acute Hematology with PCH-3031 Chemo ED

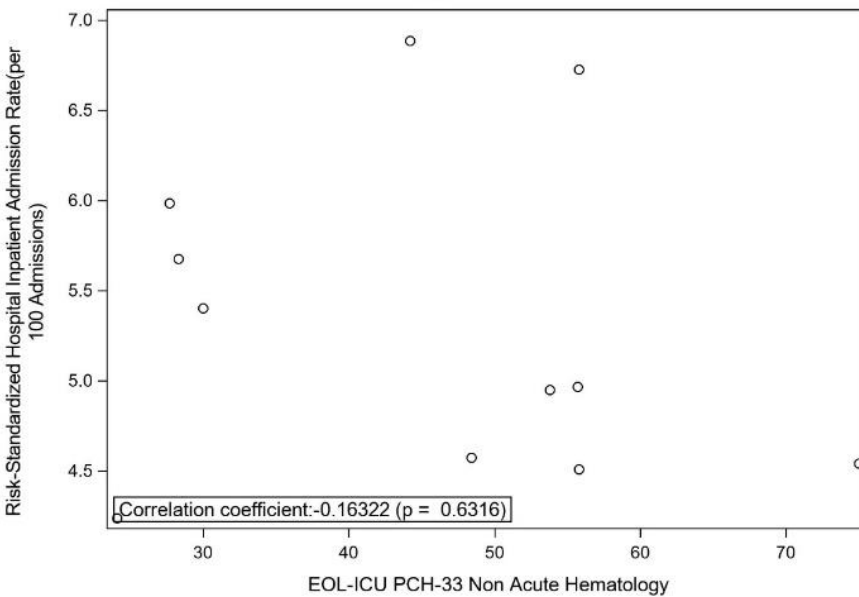


Figure 32: PCH-33 Non-Acute Hematology with PCH-3031 ED Visits

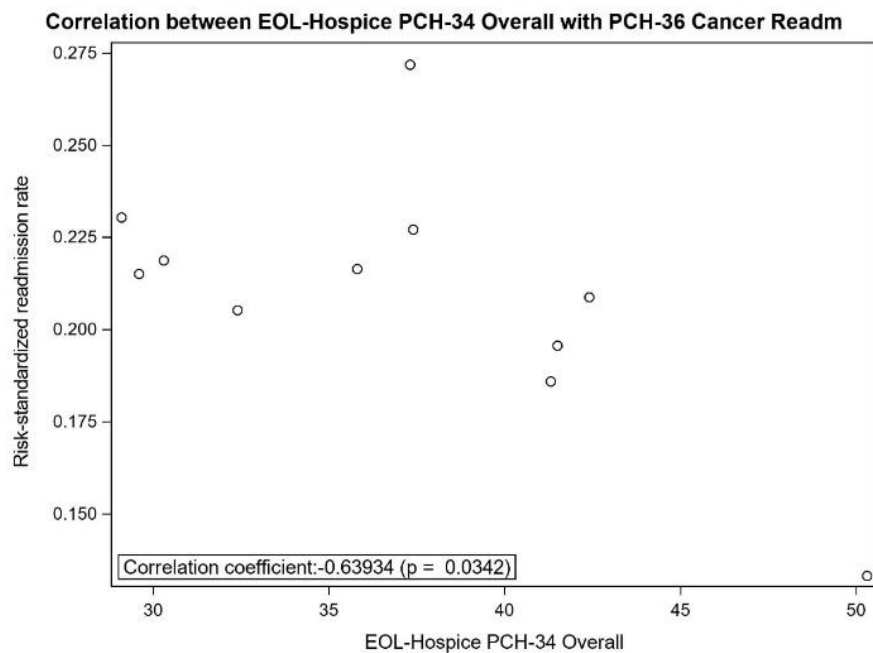


Figure 33: PCH-34 Overall with PCH-36 Readmits

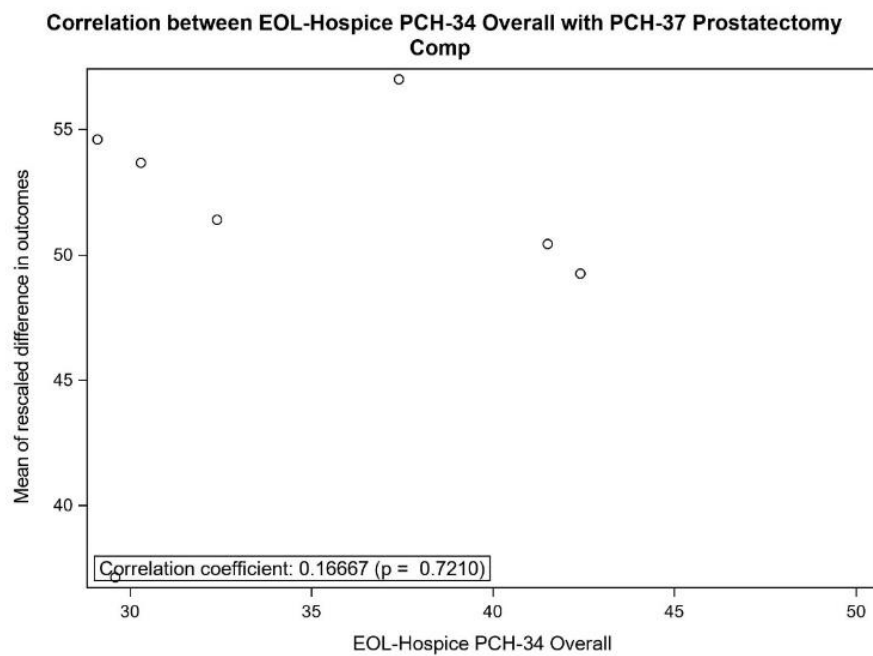


Figure 34: PCH-34 Overall with PCH-37

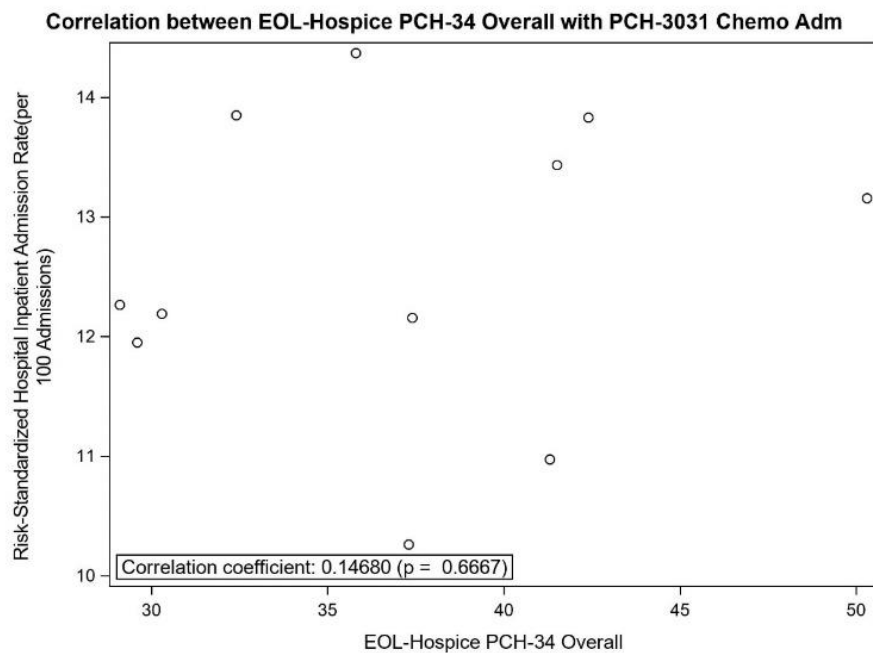


Figure 35: PCH-34 Overall with PCH-3031 Admits

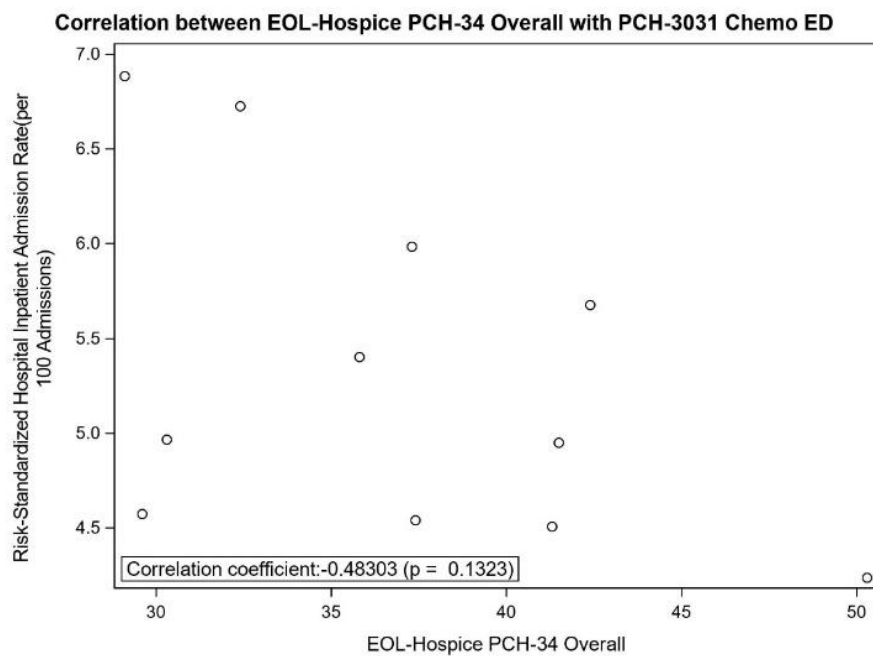


Figure 36: PCH-34 Overall with PCH-3031 ED Visits

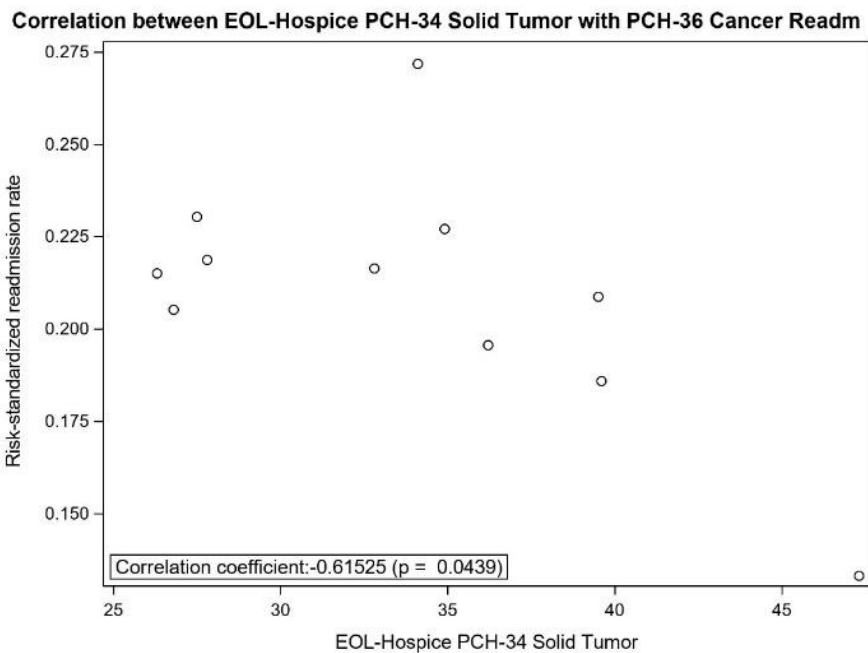


Figure 37: PCH-34 Solid Tumor with PCH-36 Readmits

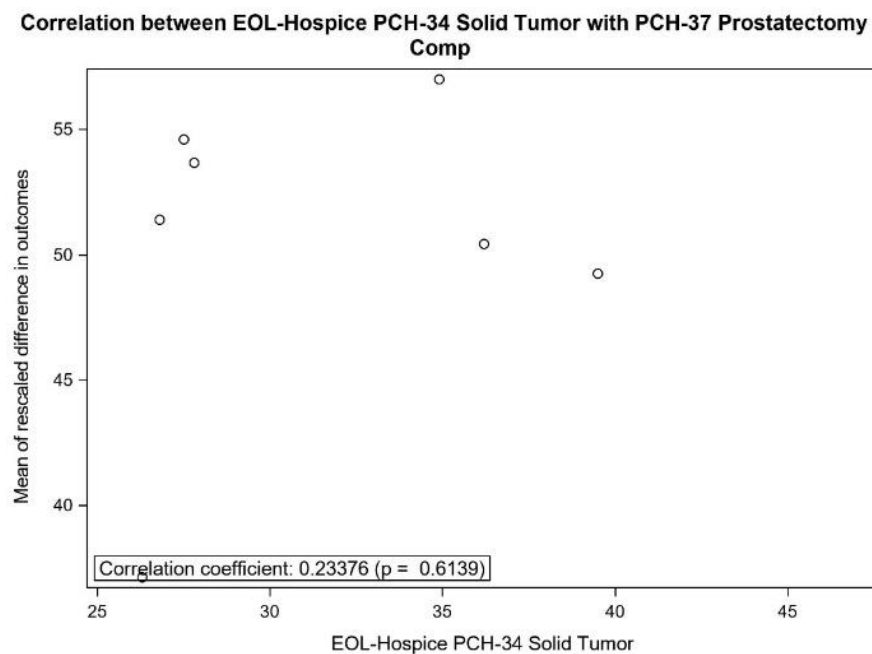


Figure 38: PCH-34 Solid Tumor with PCH-37

Correlation between EOL-Hospice PCH-34 Solid Tumor with PCH-3031 Chemo Adm

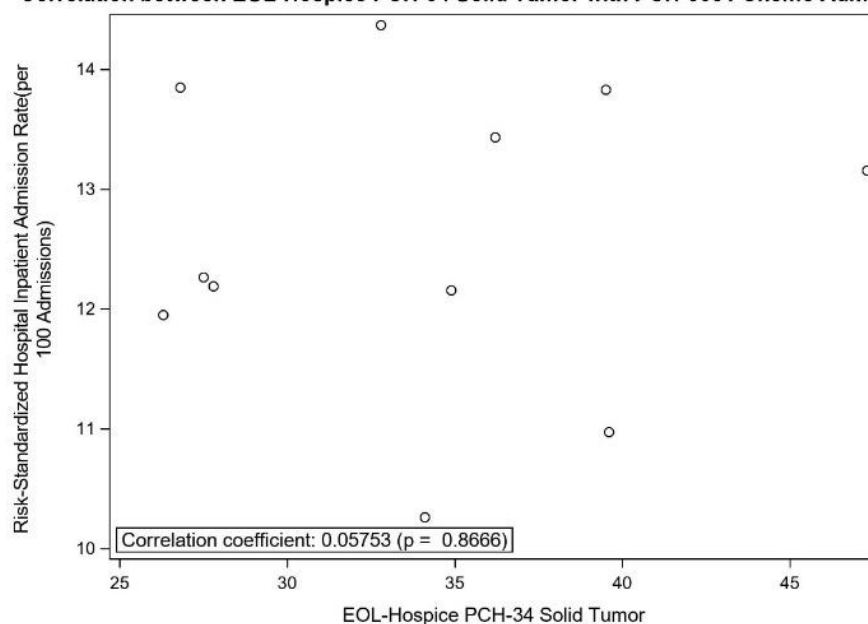


Figure 39: PCH-34 Solid Tumor with PCH-3031 Admits

Correlation between EOL-Hospice PCH-34 Solid Tumor with PCH-3031 Chemo ED

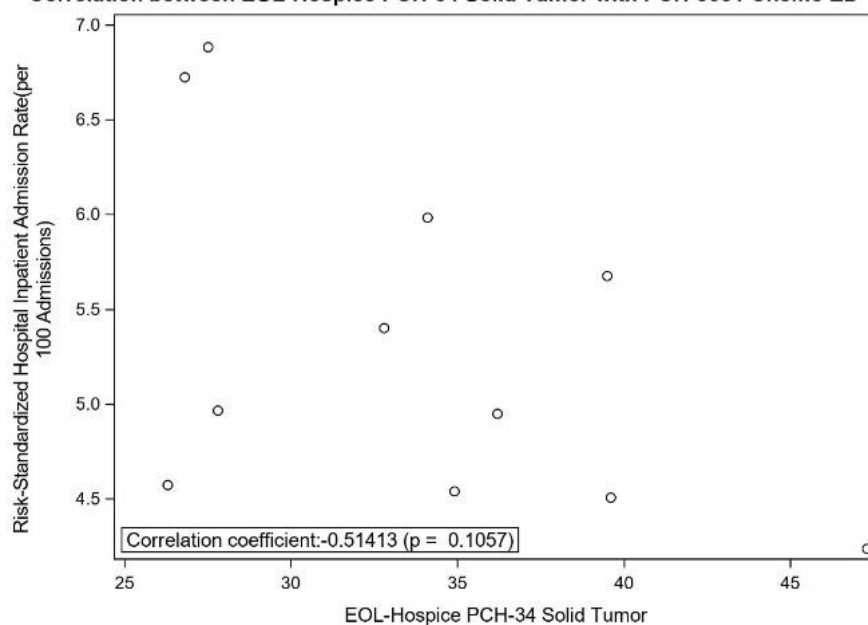


Figure 40: PCH-34 Solid Tumor with PCH-3031 ED Visits

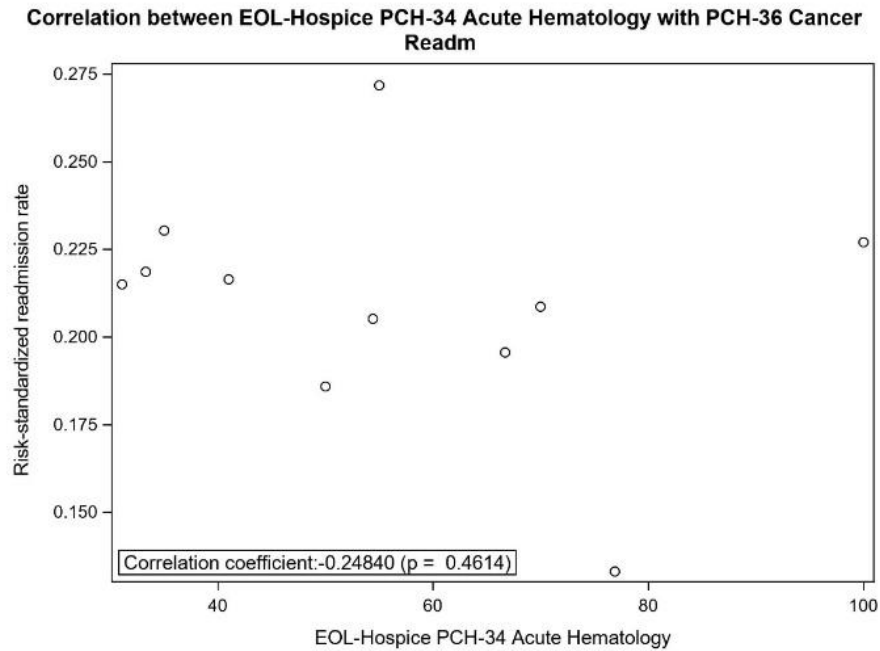


Figure 41: PCH-34 Acute Hematology with PCH-36 Readmits

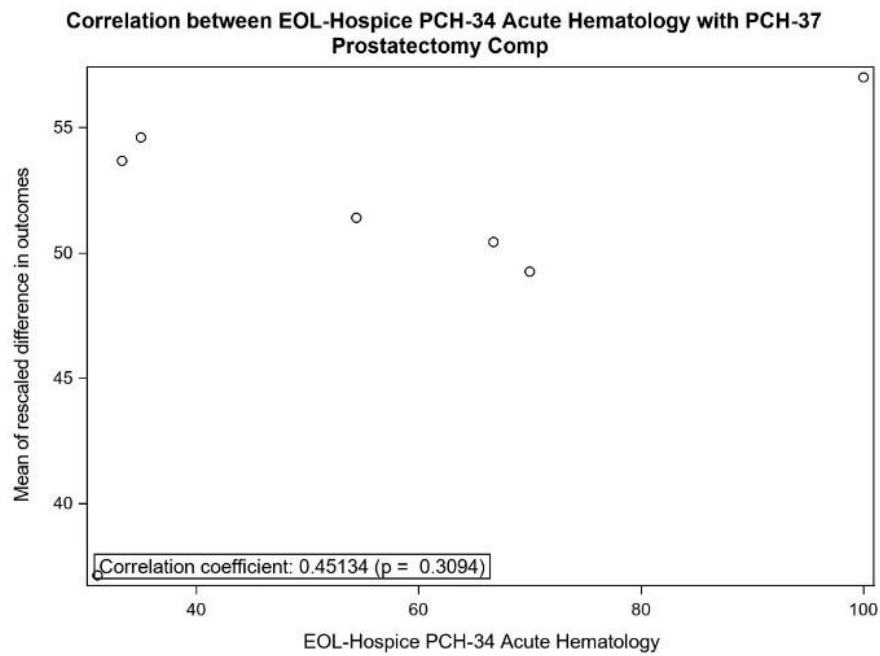


Figure 42: PCH-34 Acute Hematology with PCH-37

Correlation between EOL-Hospice PCH-34 Acute Hematology with PCH-3031 Chemo Adm

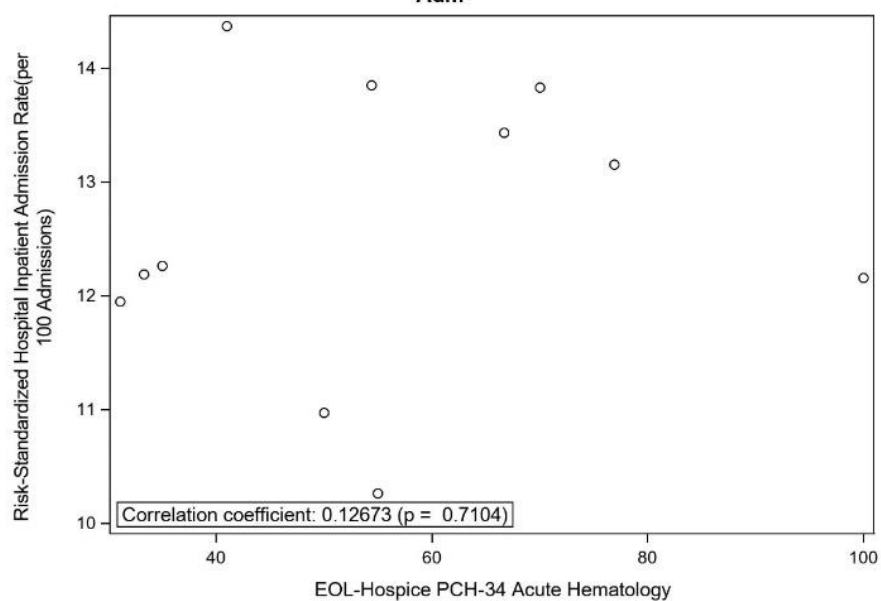


Figure 43: PCH-34 Acute Hematology with PCH-3031 Admits

Correlation between EOL-Hospice PCH-34 Acute Hematology with PCH-3031 Chemo ED

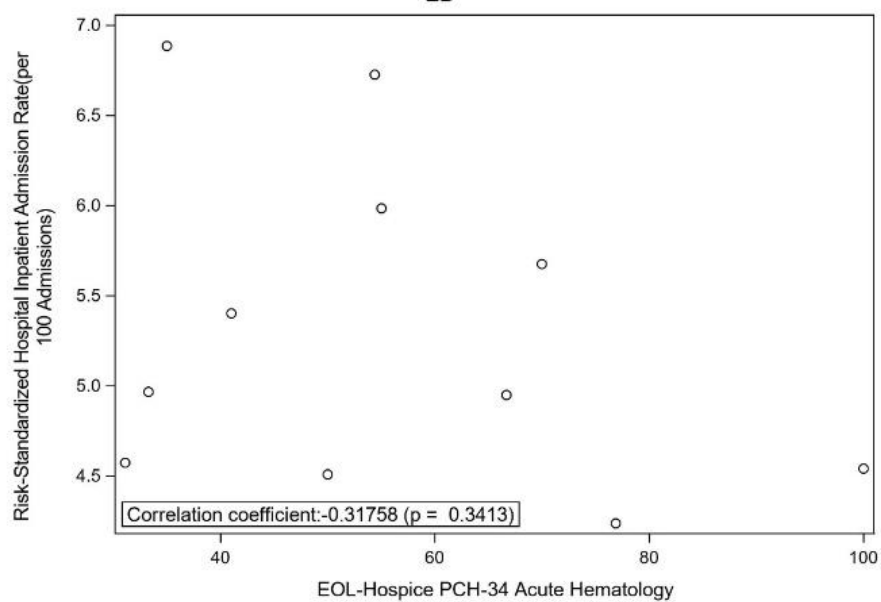


Figure 44: PCH-34 Acute Hematology with PCH-3031 ED Visits

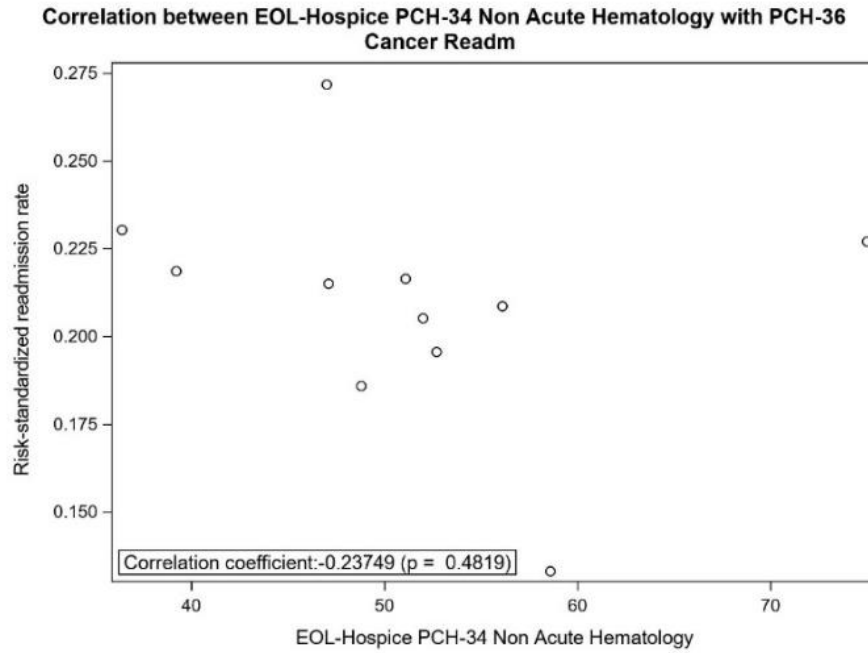


Figure 45: PCH-34 Non-Acute Hematology with PCH-36 Readmits

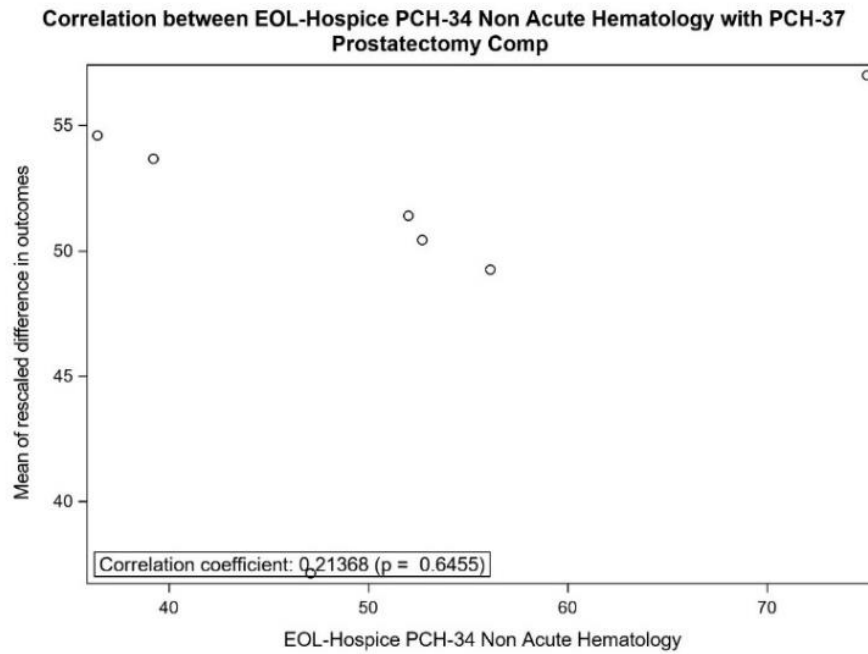


Figure 46: PCH-34 Non-Acute Hematology with PCH-37

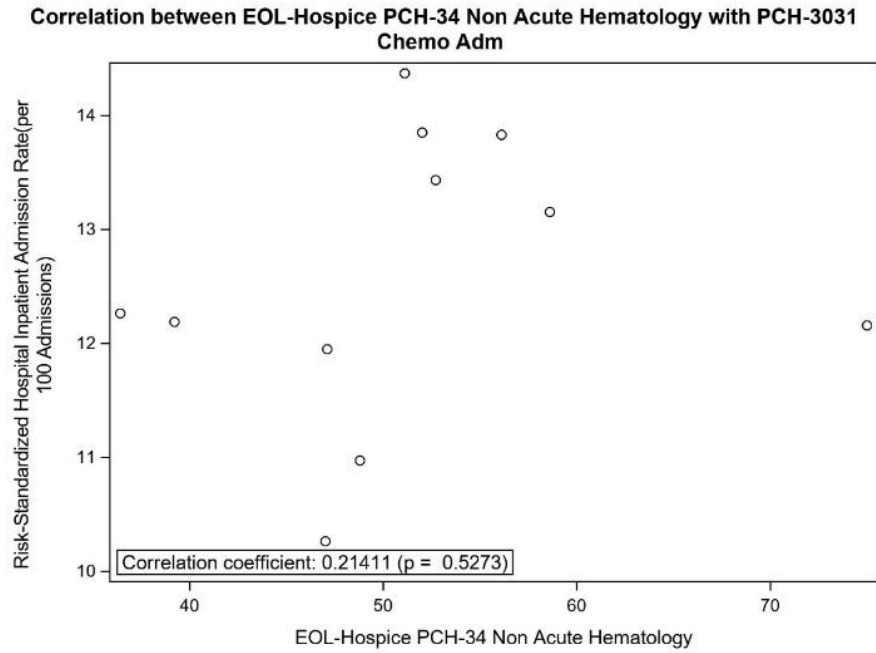


Figure 47: PCH-34 Non-Acute Hematology with PCH-3031 Admits

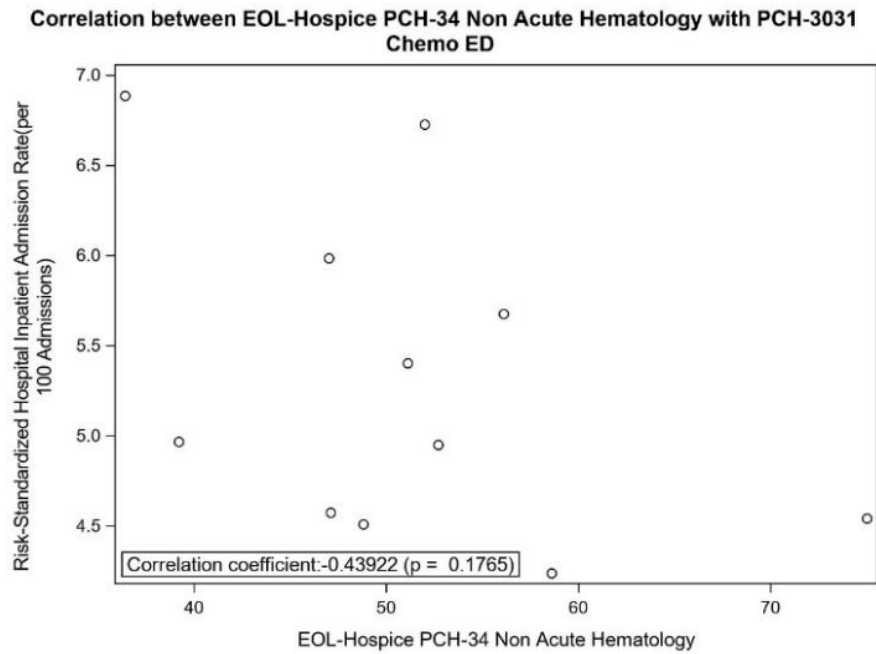


Figure 48: PCH-34 Non-Acute Hematology with PCH-3031 ED Visits

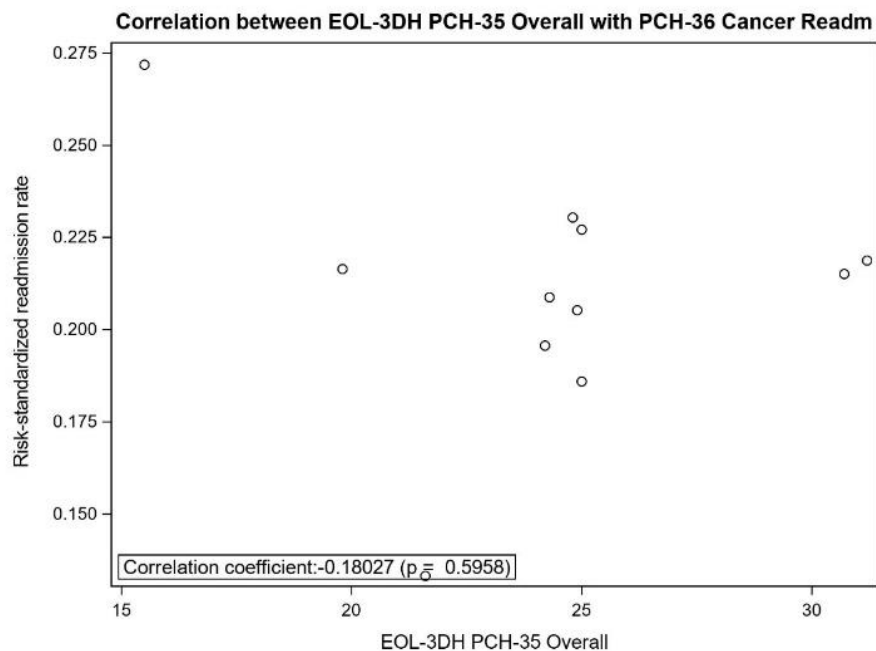


Figure 49: PCH-35 Overall with PCH-36 Readmits

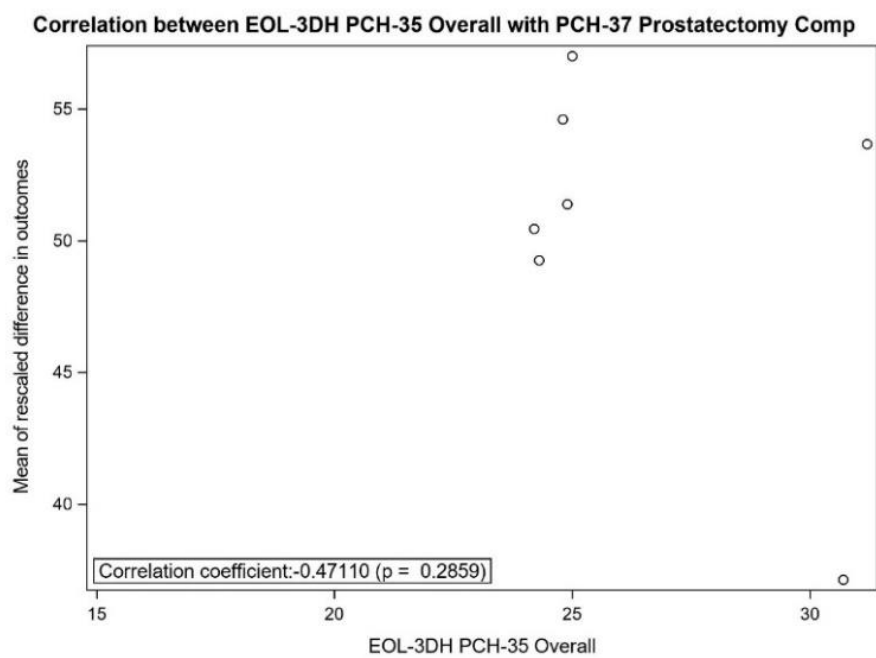


Figure 50: PCH-35 Overall with PCH-37

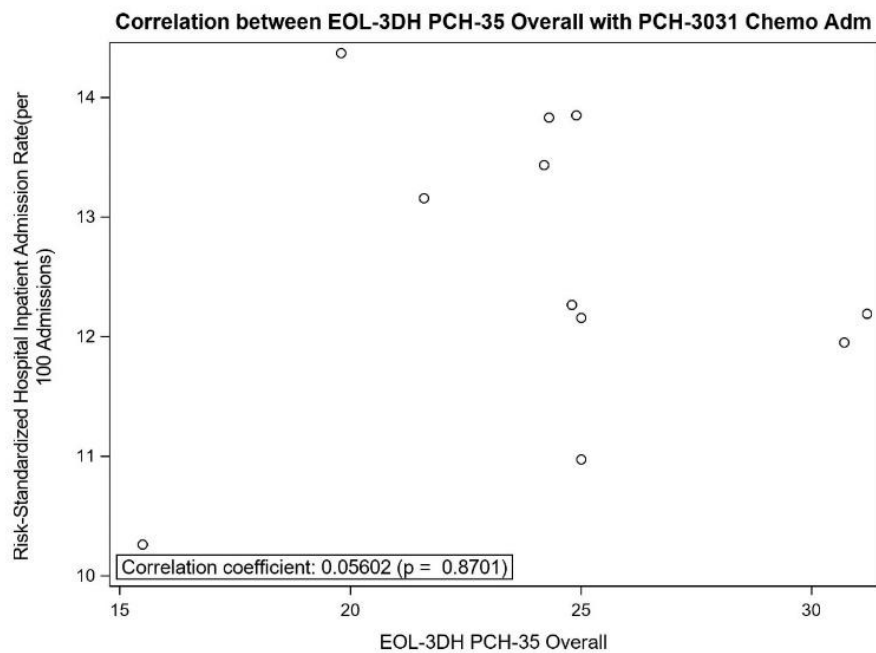


Figure 51: PCH-35 Overall with PCH-3031 Admits

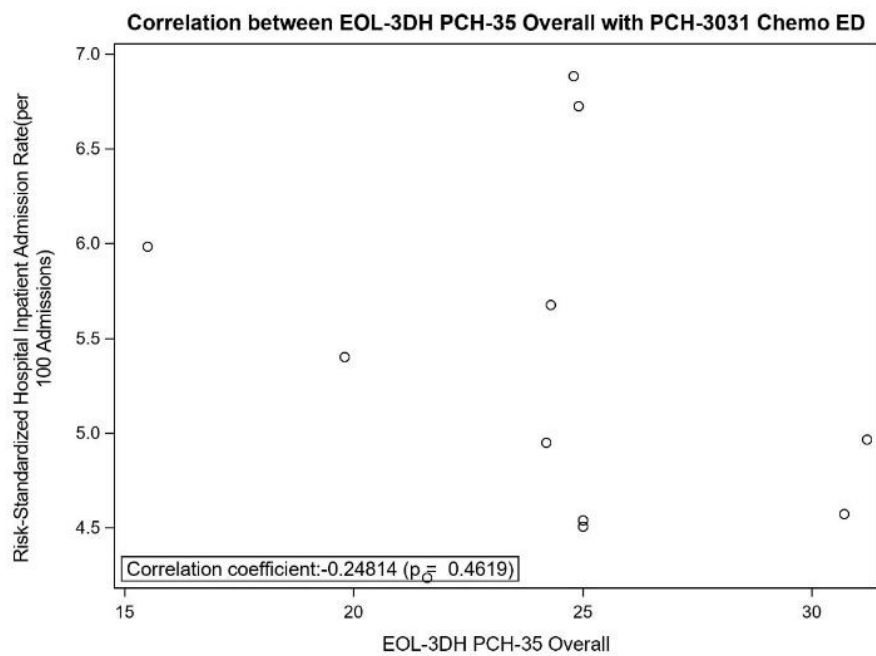


Figure 52: PCH-35 Overall with PCH-3031 ED Visits

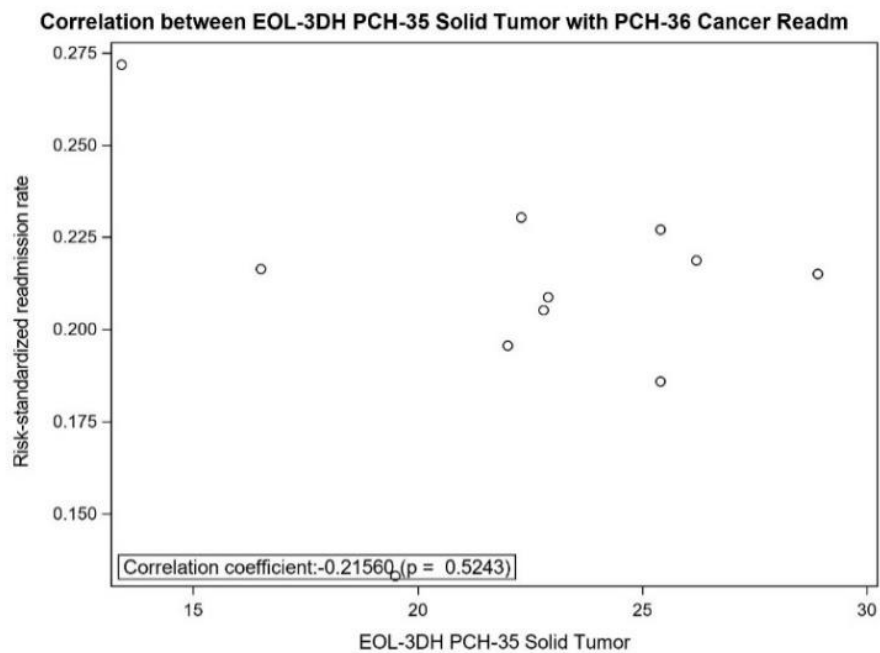


Figure 53: PCH-35 Solid Tumor with PCH-36 Readmits

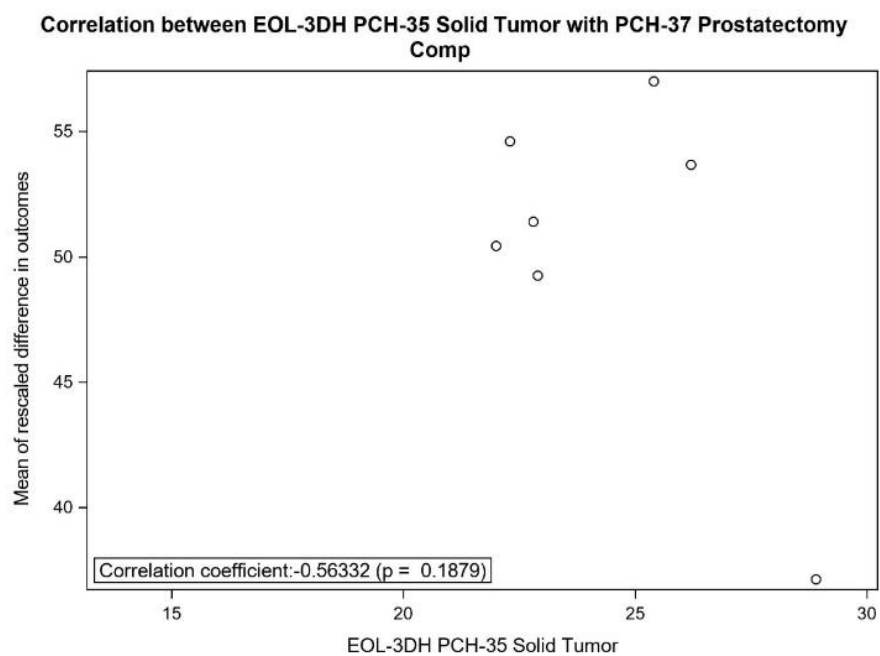


Figure 54: PCH-35 Solid Tumor with PCH-37

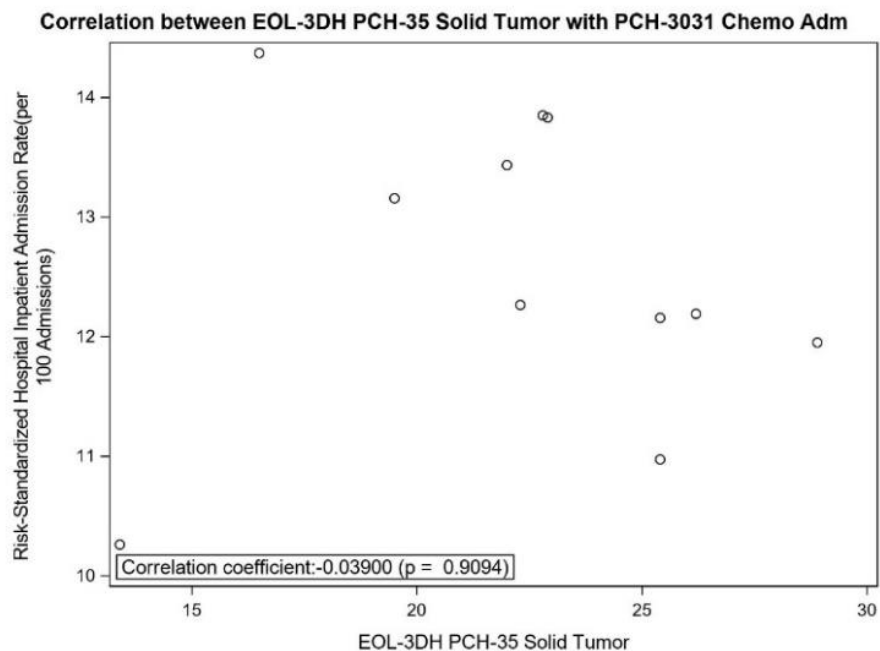


Figure 55: PCH-35 Solid Tumor with PCH-3031 Admits

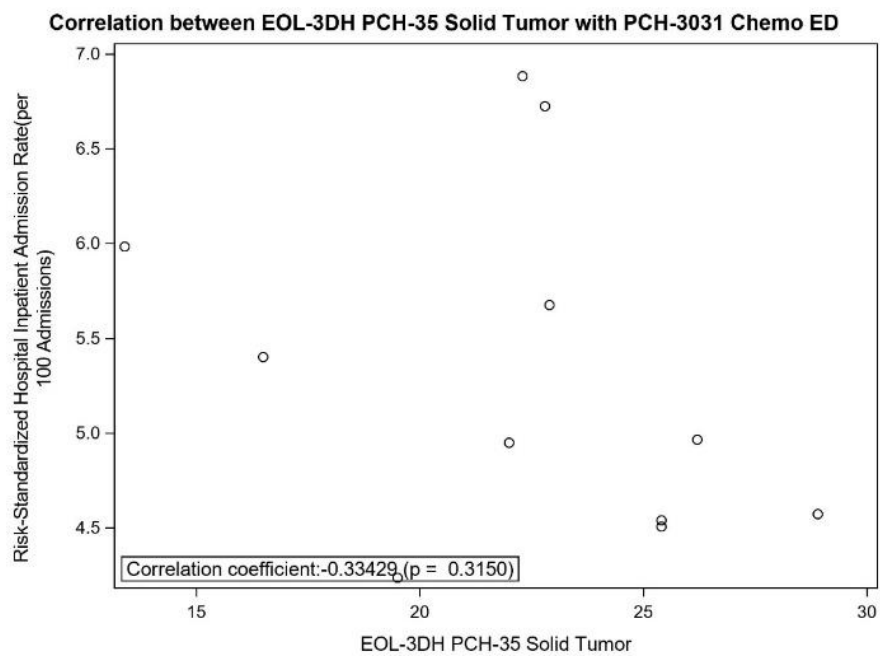


Figure 56: PCH-35 Solid Tumor with PCH-3031 ED Visits

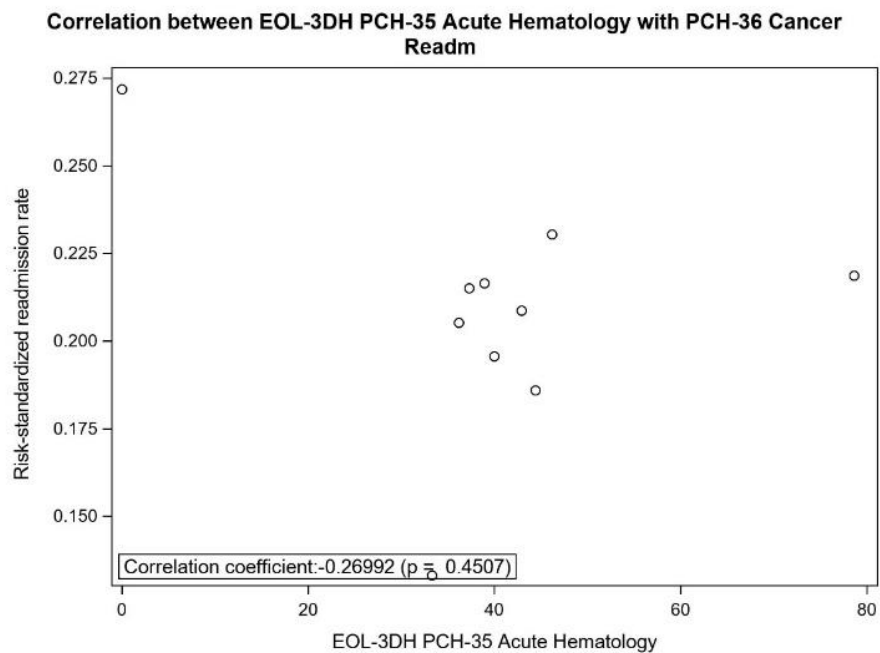


Figure 57: PCH-35 Acute Hematology with PCH-36 Readmits

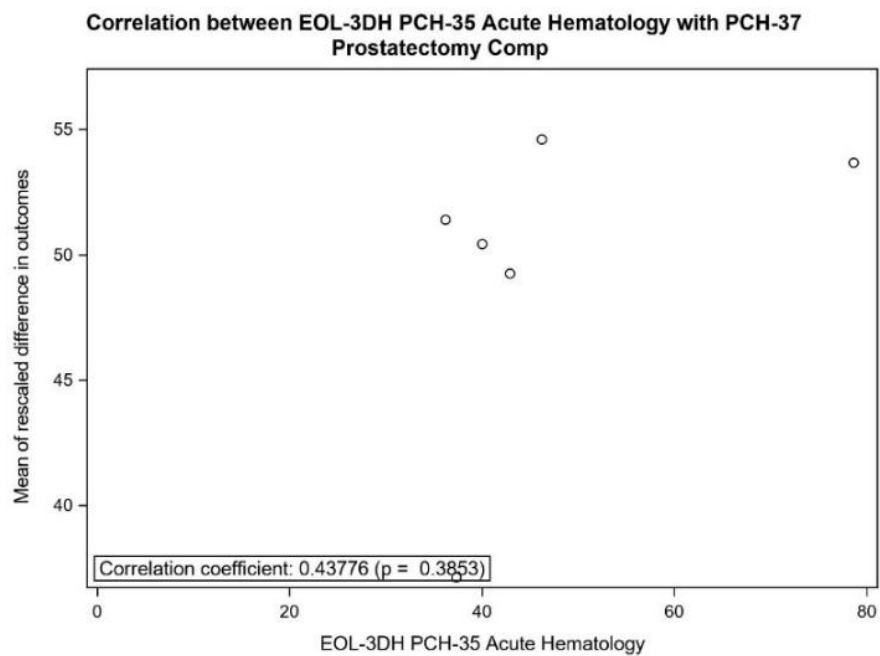


Figure 58: PCH-35 Acute Hematology with PCH-37

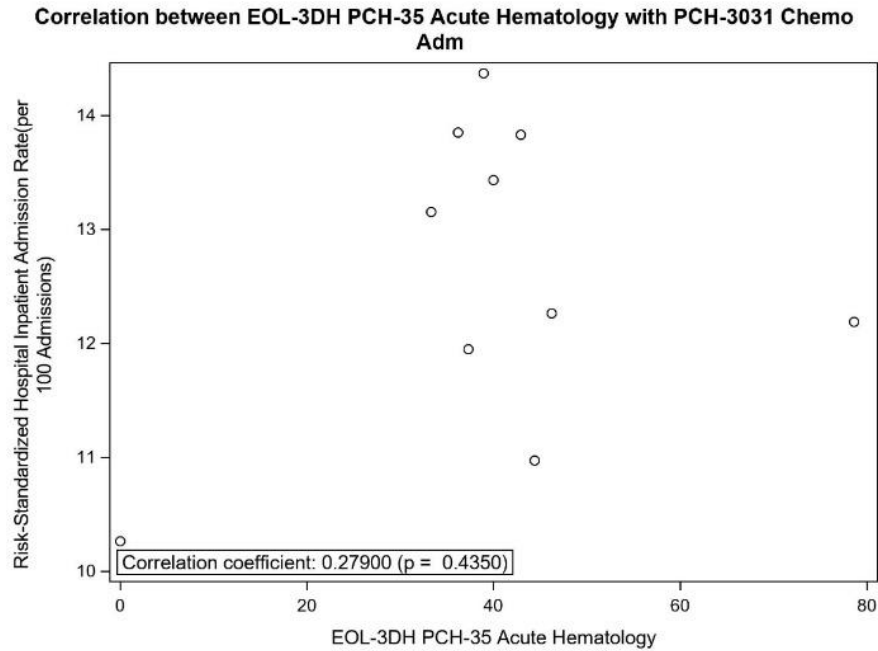


Figure 59: PCH-35 Acute Hematology with PCH-3031 Admits

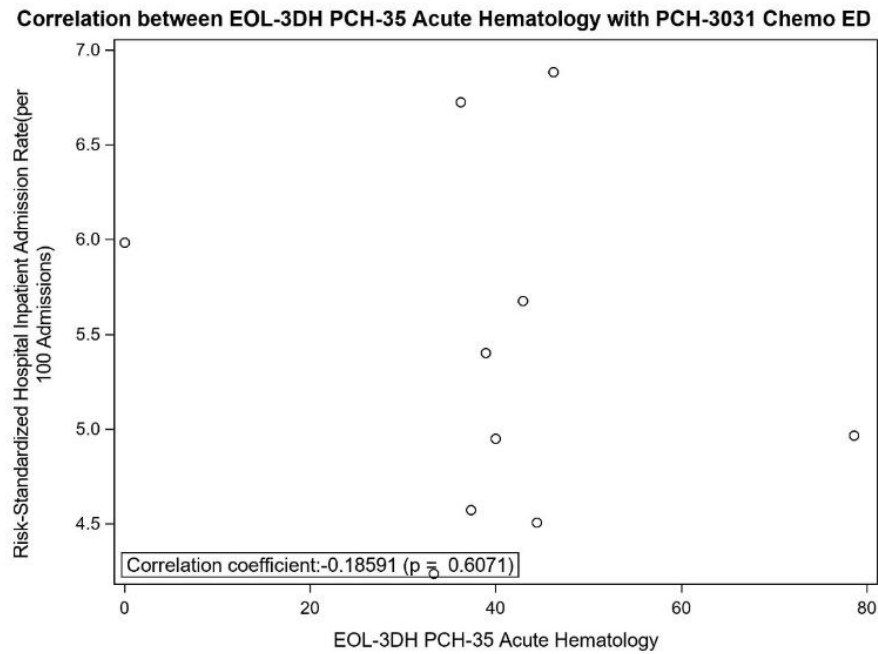


Figure 60: PCH-35 Acute Hematology with PCH-3031 ED Visits

Correlation between EOL-3DH PCH-35 Non Acute Hematology with PCH-36 Cancer Readm

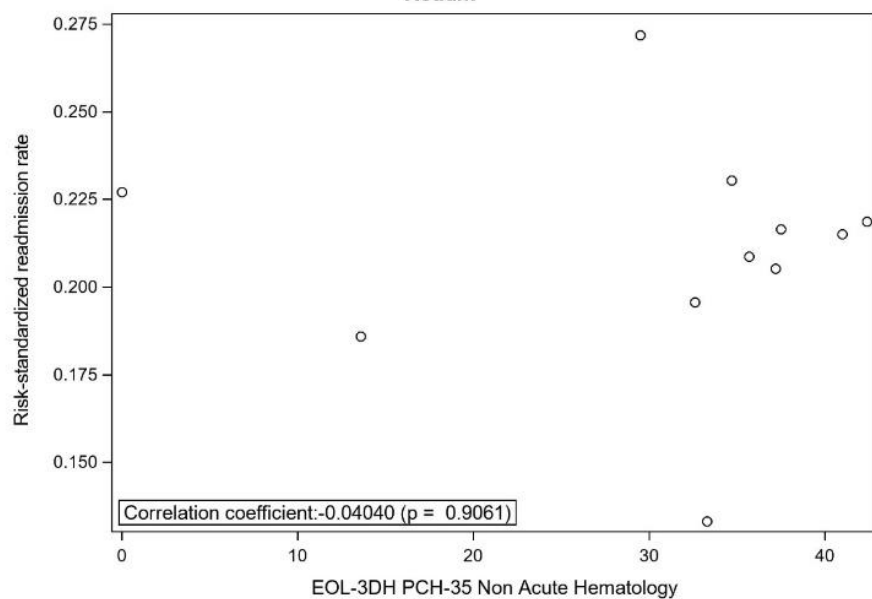


Figure 61: PCH-35 Non-Acute Hematology with PCH-36 Readmits

Correlation between EOL-3DH PCH-35 Non Acute Hematology with PCH-37 Prostatectomy Comp

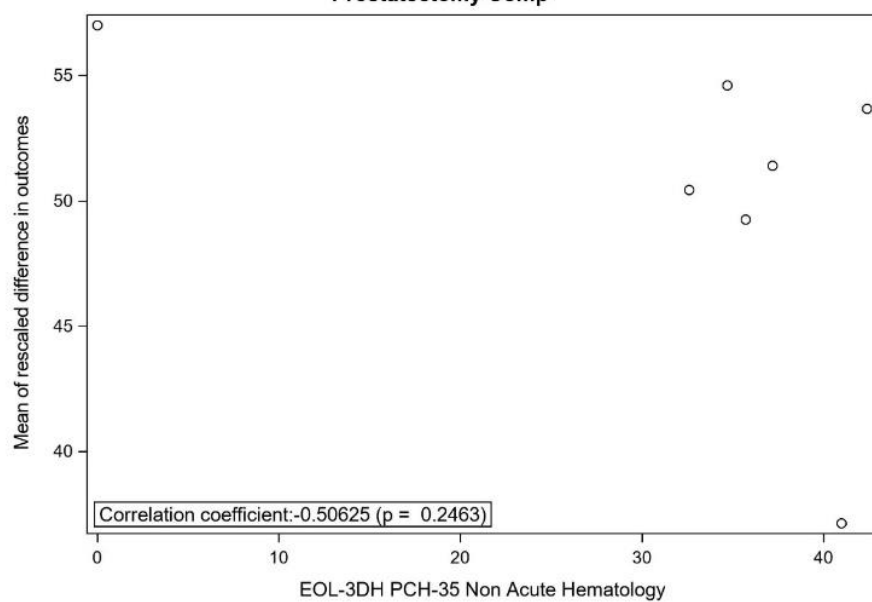


Figure 62: PCH-35 Non-Acute Hematology with PCH-37

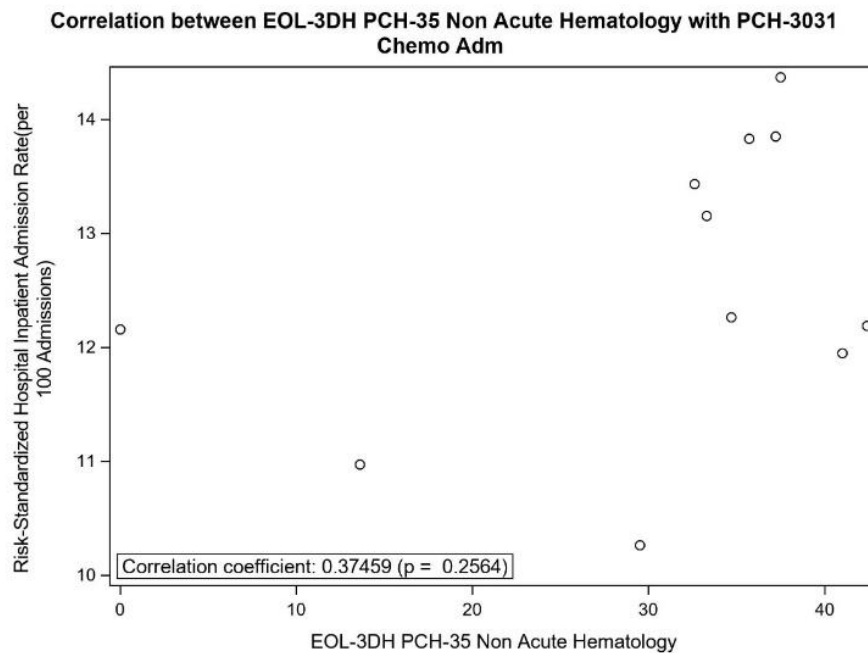


Figure 63: PCH-35 Non-Acute Hematology with PCH-3031 Admits

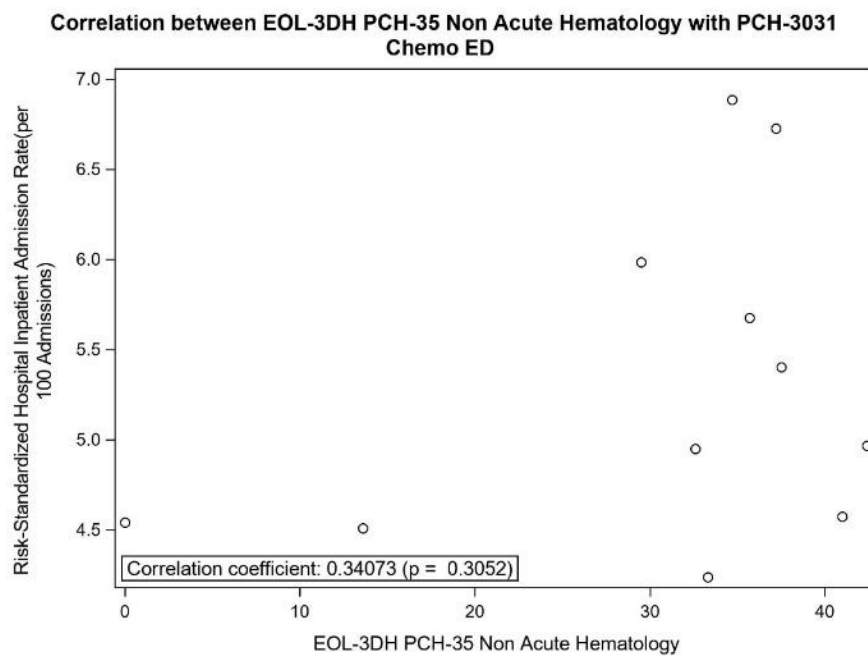


Figure 64: PCH-35 Non-Acute Hematology with PCH-3031 ED Visits

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