

Bayesian analytics to identify relationships between cancer treatment regimens, patient co-morbidities and specific toxicity risk: ToxScreen.care demonstration project



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2018

28-30 JUNE
VIENNA, AUSTRIA

SUPPORTIVE CARE
MAKES EXCELLENT
CANCER CARE POSSIBLE

Nothing to Disclose



Background

- Patients are not at equivalent risk for cancer-regimen related toxicities (CRRT).
- Multivariable regression models across heterogeneous populations and have collectively shown that model-based approaches can improve risk stratification.
- Multivariable regression models typically
 - focus on the prediction of singular endpoints
 - rely on the assumption of linearity

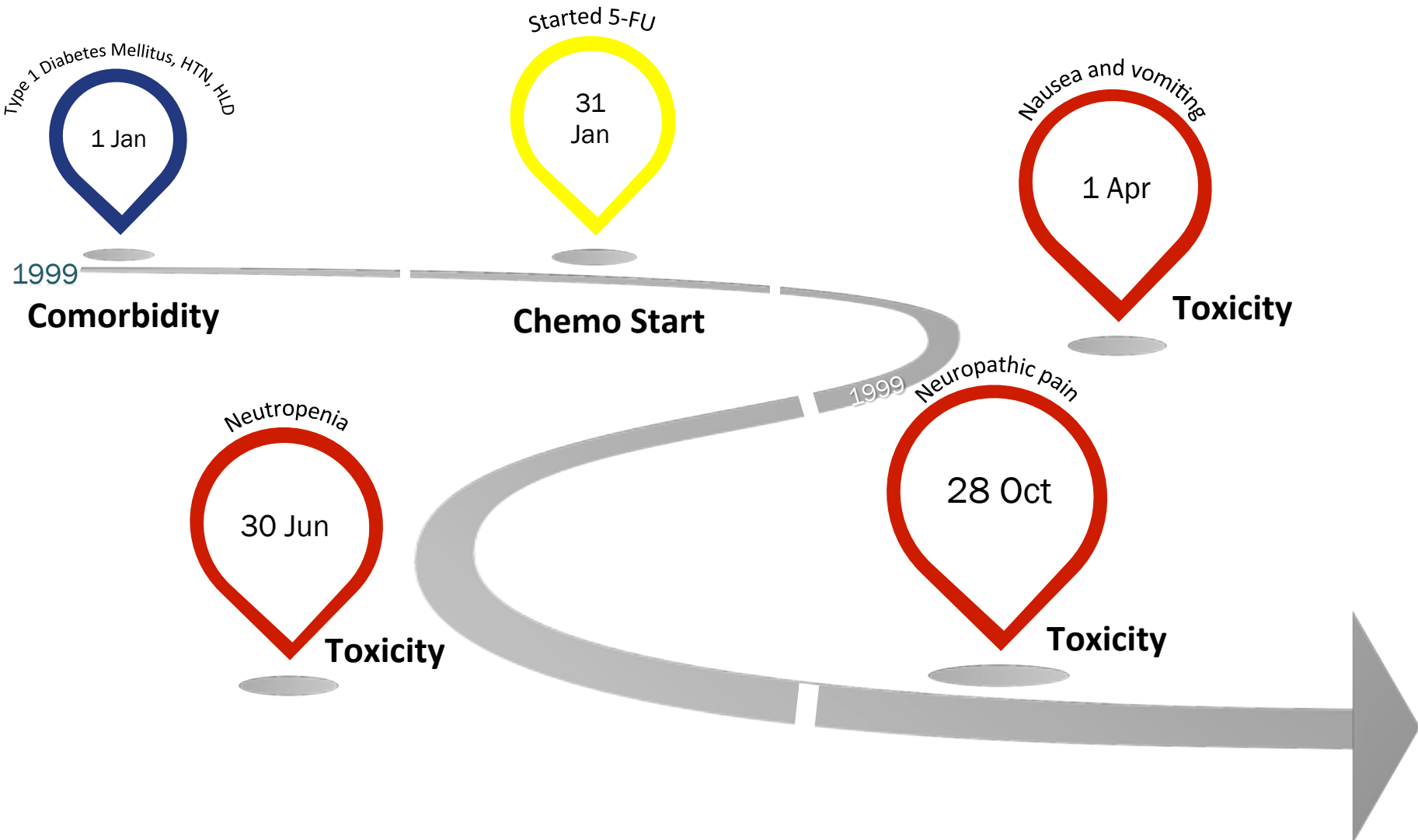
The Opportunity:

With the novel collection of Big Data in medicine, we can use personalized medicine algorithms to analyze the impact of synergistic variables which contribute to an individual's CRRT risk and unify outputs into a clinically actionable tool.

Methods

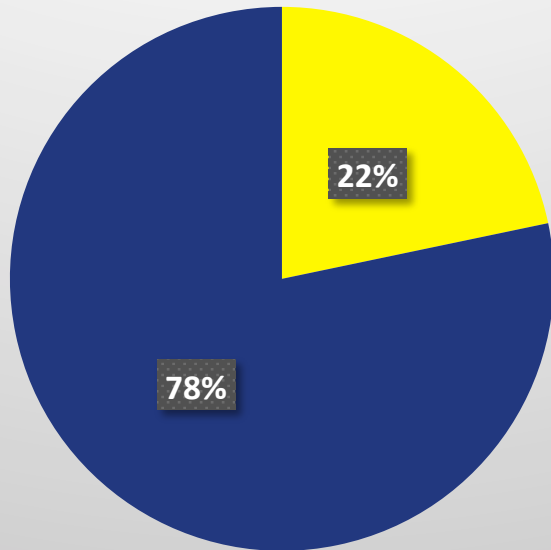
- Data retrieved from the NIH Biomedical Translational Research Information System using screening criteria of cancer diagnosis treated with chemotherapy (n=14,400).
- All patients on NIH protocols enrolled from 1999 vs. conventional regimens.
- Of 14,400 patients who were screened, 9209 met our criteria of including timestamped longitudinal data including:
 - Cancer diagnosis
 - Chemotherapy Regimen
 - Comorbidities
 - Toxicities

Methods: Definitions



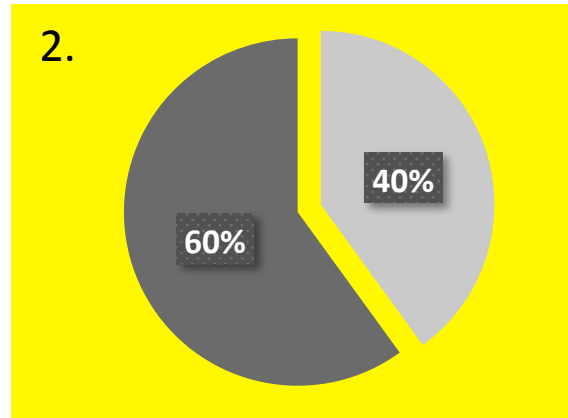
Methods: Predicting risk

1.



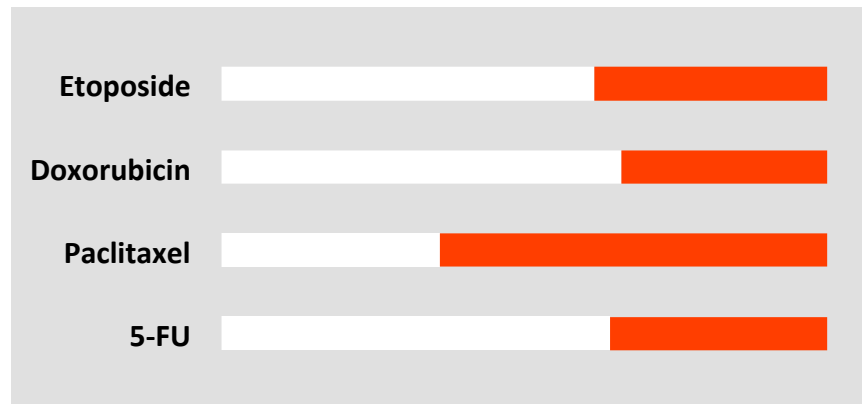
22% (N=2000) of patients were diagnosed with breast cancer

2.



Of the 2000 patients diagnosed with breast cancer, 40% presented with a comorbidity of Type II Diabetes Mellitus.

3. The ratio of patients that developed a toxicity of neutropenia differed for each regimen.



Risk metrics meaningful to patients

Absolute Risk: Chance of Toxicity With Med - Chance of Toxicity Without Med

Relative Risk: $\frac{\text{Chance of Toxicity With Med}}{\text{Chance of Toxicity Without Med}}$

20% vs. 30%

HIGH AR, LOW RR
HIGH Patient Impact

0.1% vs. 0.9%

LOW AR, HIGH RR
LOW Patient Impact





Visit <http://ToxScreen.care> to try the demonstration project

Welcome to ToxScreen

Toxscreen.care is a demonstration project that was created to assess the feasibility and potential utility of a novel, multi-variable web-based platform by which health providers could compare toxicity risks in patients about to undergo cancer therapy (CRRT).

Toxscreen's algorithms are based on data provided from the National Institutes of Health and consisted of 14,000 cancer patients of which 10,000 were randomly selected.

We focused on the following variables: tumor diagnosis, treatment regimen and comorbidities. And we created a program, embodied by this web-interface, to predict a patient's CRRT based on these variables.

Although the current iteration is limited by the scope of information provided by the NIH's unique cohort, it was critical in enabling proof-of- concept.

Additional, prospective clinical, genomic, demographic and epigenomic data which we hope to incorporate should increase the predictive value of the tool to help clinicians assess a patient's CRRT risk in an accessible, user-friendly, web- based interface.

To begin, enter the following,

Patient Cancer Diagnosis:



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To begin, enter the following,

Patient Cancer Diagnosis:

lymphoma



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Patient Cancer Diagnosis:

lymphoma

Choose Medications to Compare

cyclophosphamide

etoposide

doxorubicin

vincristine

etoposide doxorubicin

etoposide vincristine

doxorubicin vincristine

epoch

epoch-rituximab

paclitaxel

Continue to Toxicity Risk



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Patient Cancer Diagnosis:

Toxicity to Screen For:

Toxicity Suggestions:

- hypokalemia
- fever in other diseases
- constipation
- dehydration

Patient Comorbidities:

Risk: **Absolute** Relative

Comorbidity	etoposide	doxorubicin	vincristine
Baseline (307/307)	2.9%	5.5%	6.9%
anemia (75/307)	25.4%	15.5%	25.4%

19/212 with Tox after Med vs 2/95 with Tox w/o Med



Conclusions

We produced an online demonstration ([This platform can be easily translated to other patient databases and expanded to other medical fields:](http://URL>ToxScreen.care) of a clinical tool for data-driven personalized prediction of CRRT risk using Bayesian Analytics using a model capable of analyzing large amount of multifaceted/complex medical data.</p></div><div data-bbox=)

- Post-op surgical complications
- Antibiotic toxicities
- Anesthesia adverse effects

Next Steps

We will continue to develop an interface for clinicians to translate personalized medicine into their practice

Latent factor multiplex analysis for predicting chemotherapy toxicity

