Relapsed Patient Case Study: Circe

Optimizing Treatment for T-cell Lymphoma: How AI-Guided Decisions Extended Circe's Survival

Case Reporting Oncologist
Dr. Erica Moore, DVM, DACVIM (Oncology)

Case Writer
Dr. Rachel Venable, DVM, MS, DACVIM (Oncology)

Patient Profile

→ **Signalment**: "Circe" 5.5 year old, female spayed, Goldendoodle

Initial Presentation & Diagnosis

(Dec2023)

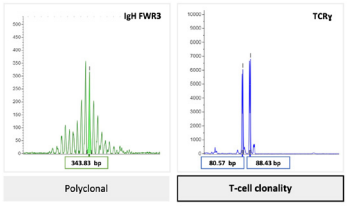
→ **Primary rDVM Findings**: Circe presented for hyporexia, increased thirst, and episodic diarrhea. Initial diagnostics revealed systemic lymphadenopathy, with cytology of a popliteal lymph node indicating probable lymphoma. Further biopsy confirmed high-grade lymphoma.

→ **Oncologist Evaluation**: Circe was evaluated for lymphoma. During the evaluation, additional diagnostics, including ImpriMed's Personalized Prediction Profile, were ordered.

ImpriMed Report #1

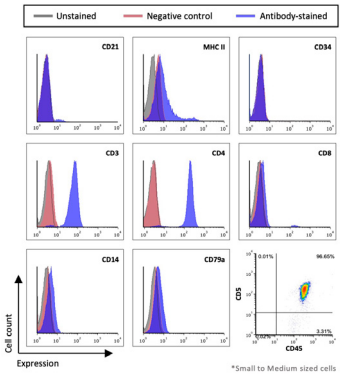
IMMUNOPROFILE

- PARR: T-cell clonality
- Flow cytometry: CD4 lymphocytosis with predominantly small cells and low MHC Class II expression



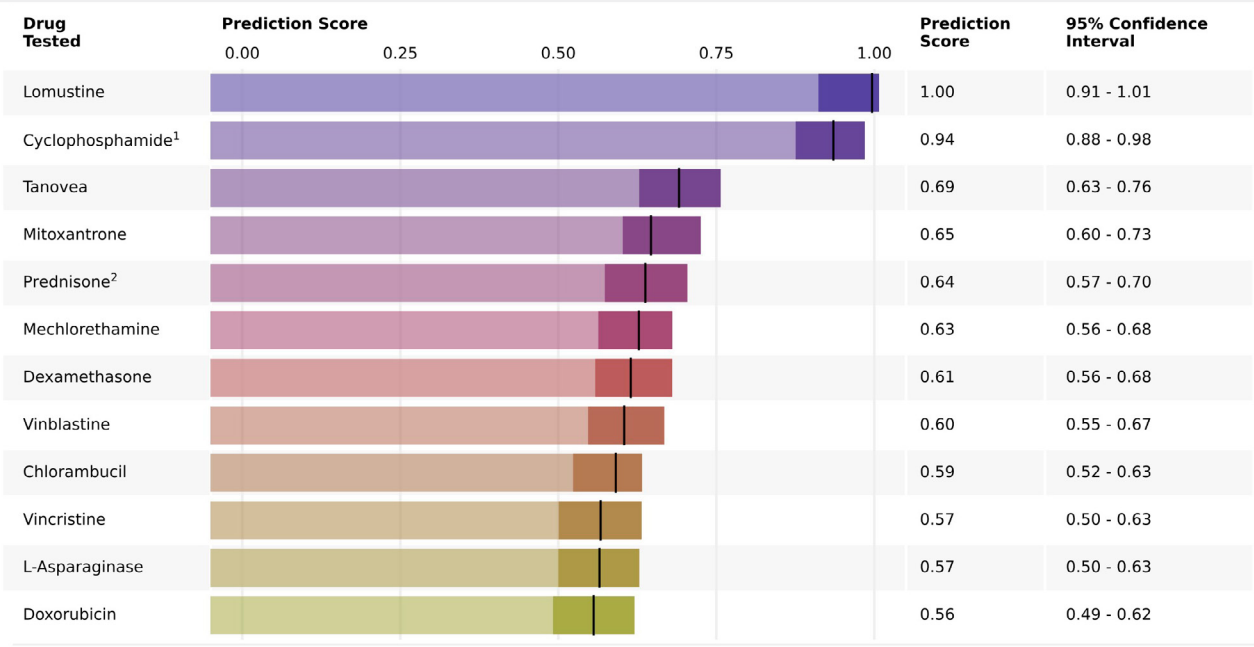
Specificity	Surface Antigens	S-M* sized cells	M-L** sized cells	Reference Interval
All cells		87%	13%	
B-cell	CD21	3%	2%	25-58%
B-cell	CD79a	9%	27%	-
Pan T-cell	**CD3**	**97%**	**99%**	**34-74%**
T-cell subset	**CD4**	**94%**	**99%**	**34-51%**
T-cell subset	CD8	3%	2%	13-30%
Pan T-cell	**CD5**	**96%**	**98%**	**50-74%**
Neutrophils	CD4+CD5-	0%	0%	<5%
T-zonal cells	CD5+CD45-	0%	0%	0%
Precursor cells	CD34	1%	0%	<2%
Monocytes	CD14	0%	1%	<5%

The percentage is a quantitative measure of antigen expression on the surface of the cells. Reference intervals for the lymphocytes were derived from the normal canine lymph node samples. Overexpression of any given antigen subset outside the reference range may indicate an abnormal condition.



*Small to Medium sized cells
**Medium to Large sized cells

SINGLE DRUG RESPONSE PREDICTIONS



1 Mafosfamide, a cyclophosphamide analog, was used to evaluate *in vitro* sensitivity of cyclophosphamide
2 Prednisolone, an active form of prednisone, was used to evaluate *in vitro* sensitivity of prednisone

Prediction scores were generated using AI models trained to predict clinical outcomes. A higher prediction score means that the patient has a higher likelihood of experiencing a positive clinical response (partial remission or complete remission) over the course of a few weeks. A drug with a prediction score above 0.5 is likely to elicit a positive clinical response. In the bar chart above, the prediction score is shown as a black vertical line near the end of each bar, and a weighted 95% confidence is shown in darker hues around that line.

EFFICACY SCORE (%)

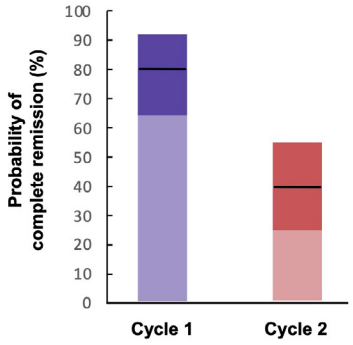
A higher efficacy score means that the patient has a higher likelihood of experiencing a positive clinical response. Efficacy scores were generated by mathematical models that relate ex vivo drug sensitivities to clinical responses. The drugs listed in this section of the report appear less frequently in our database, which makes mathematical modeling more suitable than AI methods for predicting clinical outcomes.

- Melphalan had an efficacy score in the "**Medium**" range (40-60%).

ImpriMed Report #1 *(Continued)*

CLINICAL OUTCOME PREDICTIONS FOR CHOP THERAPY

PROJECTED RESPONSE TO (L-)CHOP THERAPY

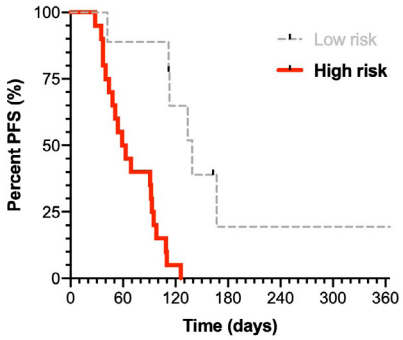


PREDICTIONS

- The probability of achieving complete remission (CR) by the end of the 1st cycle of therapy and maintaining CR until the end of the 1st cycle is **80%** with a 95% confidence interval (CI) of **65-92%**.
- The probability of achieving complete remission (CR) by the end of the 2nd cycle of therapy and maintaining CR until the end of the 2nd cycle is **40%** with a 95% CI of **25-55%**.

Please note that one cycle refers to the sequential administration of each of the 4-5 drugs in an (L-)CHOP protocol.

PROJECTED PROGRESSION-FREE SURVIVAL WITH 4 CYCLES OF (L-)CHOP THERAPY



HIGH RISK of Early Disease Progression

PREDICTIONS

- This patient is **likely** to experience disease progression within the first two months.
- The median progression-free survival of the **naïve T-cell** patient high risk to (L-)CHOP is 61 days and low risk is 139 days.

AI Model	ROC-AUC	PPV	NPV	Specificity
CHOP Survival	0.861–0.975	78–95%	83–89%	82–92%

Our CHOP protocol predictions are generated by artificial intelligence models trained on clinical outcomes and lab testing data from 256 naïve canine lymphoma patients. For the most accurate results, patients should be treated with standard CHOP or L-CHOP regimens.

How the predictions were used

→ **ImpriMed Analysis**: The Personalized Prediction Profile (PPP) suggested a high risk of early disease progression. The report guided the oncology team to modify the standard CHOP protocol to improve Circe's response. Single-agent response predictions indicated that Lomustine (CCNU) had the highest efficacy.

→ **Treatment Decision**: Instead of LOPP, they modified CHOP and substituted Doxorubicin with Lomustine. The oncologist replaced Doxorubicin with Lomustine given that Doxorubicin was shown to have the lowest prediction score of 0.56 whilst Lomustine had the highest prediction score of 1.0.

Treatment Adjustments & Progression

Monitoring & Adjustments:

→ Regular CBC monitoring indicated pancytopenia and suspected bone marrow involvement. Over time, Circe's platelet count showed improvement.

→ By her follow-up in January 2024, Circe had no palpable peripheral lymphadenopathy, indicating a strong initial response to therapy.

→ Lomustine was tolerated well, with continued monitoring for hepatotoxicity and bone marrow suppression.

→ **February 15, 2024**: "Per the owners, Circe is doing very well at home! She went on an adventure this morning and is her normal bright and happy self!"

→ **February 29, 2024**: "If in remission and doing well, consider going down to every other week (made the decision with owners). See ImpriMed for guidance when relapse therapy is needed."

→ **April 18, 2024**: "Since doing well and in apparent clinical remission, we will go every other week."

» The oncologist reduced the intensity of chemotherapy. Continued monitoring was recommended to adjust therapy as needed upon signs of disease progression.

→ **October 10, 2024**: Circe developed pancytopenia and anemia. Proceeded with L-asparaginase and scheduled re-check in one month.

→ **October 15, 2024**: Sent to ER for evaluation of epistaxis. Since being seen last, Circe has been declining at home. Owners opted for humane euthanasia rather than aggressive treatment.

Conclusion

The median survival time for dogs diagnosed with high-grade T-cell lymphoma is approximately 160 days after initial diagnosis. Thanks to early intervention, CHOP chemotherapy, and the use of ImpriMed's Personalized Prediction Profile (PPP) to guide treatment decisions, Circe survived for approximately 270 days post-diagnosis — outliving the expected median survival time for high-risk cases.

With the aid of ImpriMed's AI-driven drug response predictions, Circe's oncology team was able to:

✅ **Quickly identify which drugs will work for Circe**

✅ **Tailor treatments at relapse with high-efficacy options**

✅ **Extend survival beyond the typical prognosis**

Circe's case highlights the crucial role of precision medicine in veterinary oncology, ensuring each patient receives individualized, data-driven treatment for the best possible outcome.

"ImpriMed has been a very useful diagnostic tool over these last several years to guide treatment decisions for patients. For Circe, it helped us make an adjustment in first line therapy, and subsequently provided a longer survival time than expected for our patients with high grade T-cell lymphoma. This allowed Circe to not only live a longer life in the face of T-cell lymphoma, but enjoy life during and for several months after completion of her chemotherapy protocol. We loved getting to see and hear about all of her adventures! A big thanks to ImpriMed for the continued support and adding tools in our toolbox to better help our patients!

Dr. Erica Moore, DVM, DACVIM (Oncology)

IMPRIMED FACT SHEET

Founded in

2017

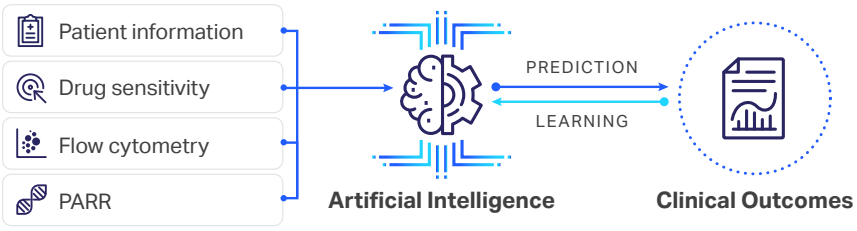
About Us

ImpriMed, a state-of-the-art veterinary precision medicine company, offers services from immunophenotyping by flow cytometry to our comprehensive personalized prediction profile. We focus on providing accurate information and actionable insights to help oncologists build personalized care plans. Whether you want to use a combination therapy or a single-agent therapy, our tests allow you to focus on the best course of treatment for each specific patient.

Advanced Anticancer Drug Response Prediction

`Only available from ImpriMed`

ImpriMed uses artificial intelligence (AI) to predict which drugs are most likely to be effective for a particular dog's lymphoma or leukemia.



ImpriMed Strengths

`Most comprehensive data in canine lymphoma`

9,000+ Patients

21,000+ Tests ordered and delivered

Experts in canine lymphoma drug response predictions

> I think personalized medicine is the way of the future. Being able to say, this is the weak spot of your cancer, we're going to exploit that and not give it any chance to come back. That's the goal. If we can avoid drugs that don't work, we should. If we can identify better working drugs, we should.

Dr. Kevin Choy, BSc, BVSc, MS, DACVIM
Seattle Veterinary Specialists,
BluePearl Veterinary Partners

`Doctors love ImpriMed`

300+ Veterinary oncologists ordered ImpriMed services

340+ Hospitals collaborated with ImpriMed to collect real-world clinical evidence

`We produce reliable and accurate predictions for your clients and patients`

- To quickly identify appropriate single agent therapies
- To predict drugs that show efficacy as well as those that show resistance
- To trace the evolution of a relapsed patient's cancer
- To identify CHOP failure patients at first or second relapse

`Easy to read and understand reports`

- Visual and numerical data
- Cutting-edge diagnostic technology

For More Information

Contact | sales@imprimedicine.com
Live Chat | https://www.imprimedicine.com
Phone | (650) 521-0165

ImpriMed, Inc.
1130 Independence Ave, Mountain View, CA 94043