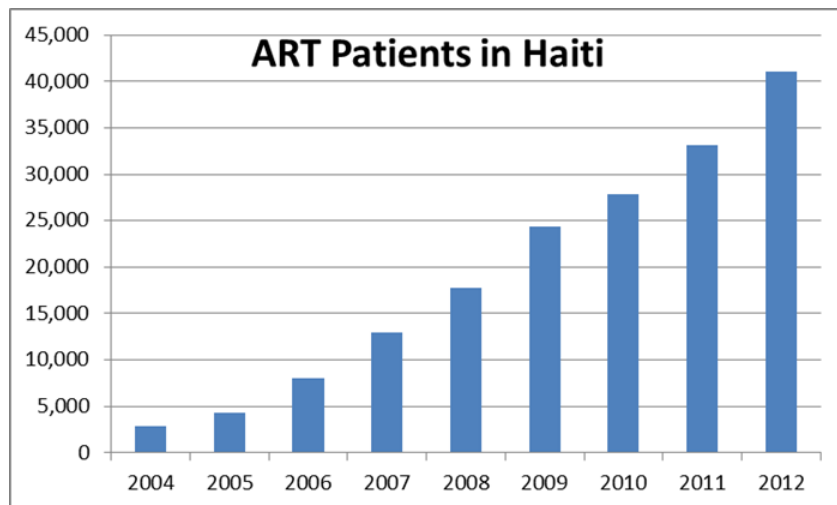# *Development and Validation of an Electronic Medical Record Based Alert for Risk of ART Failure in a Low-Resource Setting*

Nancy Puttkammer, PhD

9th International Conference on HIV Treatment and Prevention Adherence

9 June 2014

Background

ART Patients in Haiti

Reference: http://www.pepfar.gov/press/c19573.htm

Photo: I-TECH

- Rapid scale-up of ART in Haiti since 2004

- Viral load testing and second-line ART regimens are still expensive and not widely available

- High ART adherence is necessary for HIV viral suppression, but no perfect measures of ART adherence exist

iSanté Electronic Medical Record System and our Study Aim
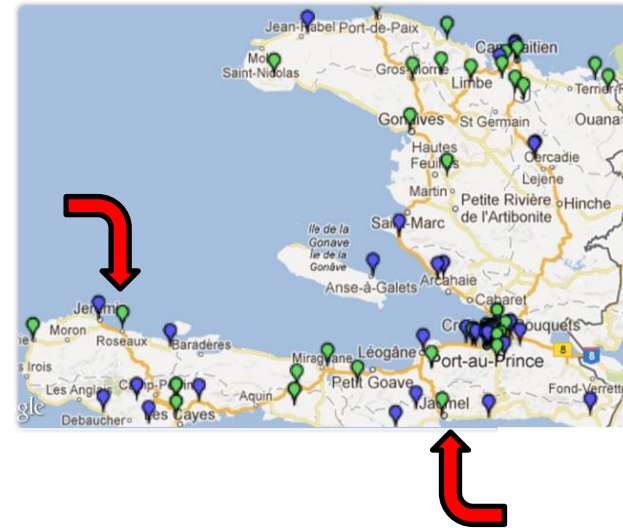
Aim: Develop and validate an alert for risk of ART failure using information on ART adherence and other patient characteristics.

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Study Methods

Step 1
- Identify best-performing adherence measure

Step 2
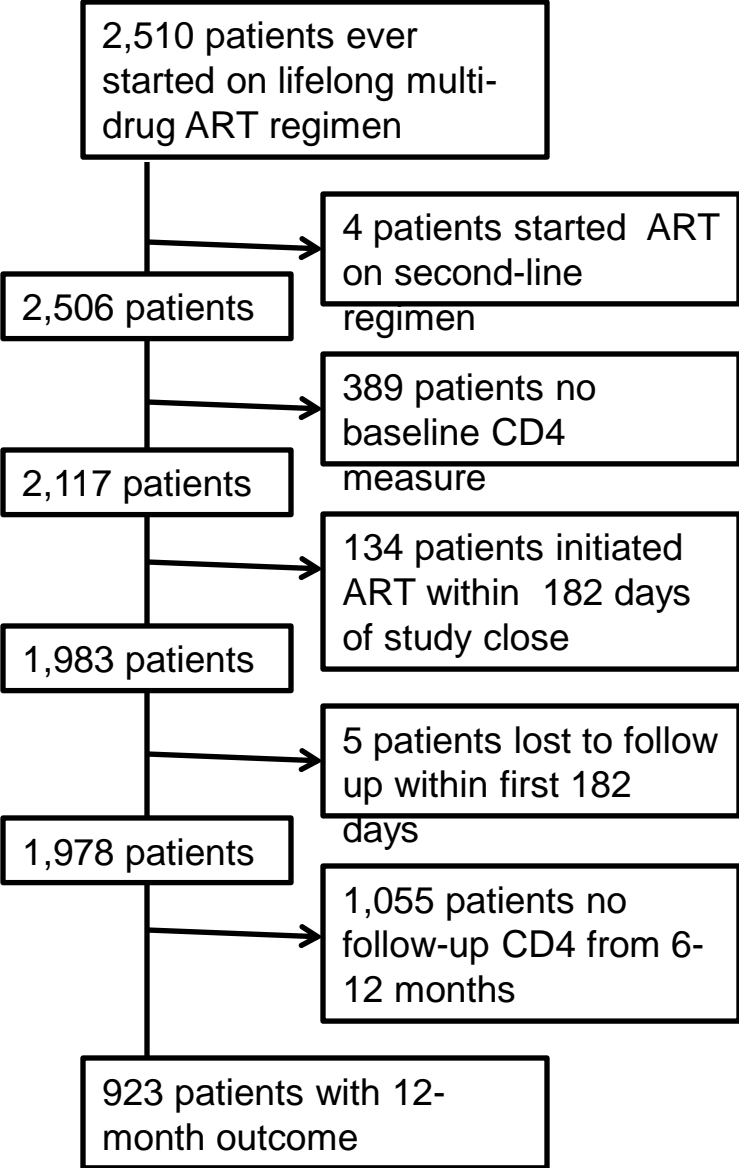- Identify other predictors

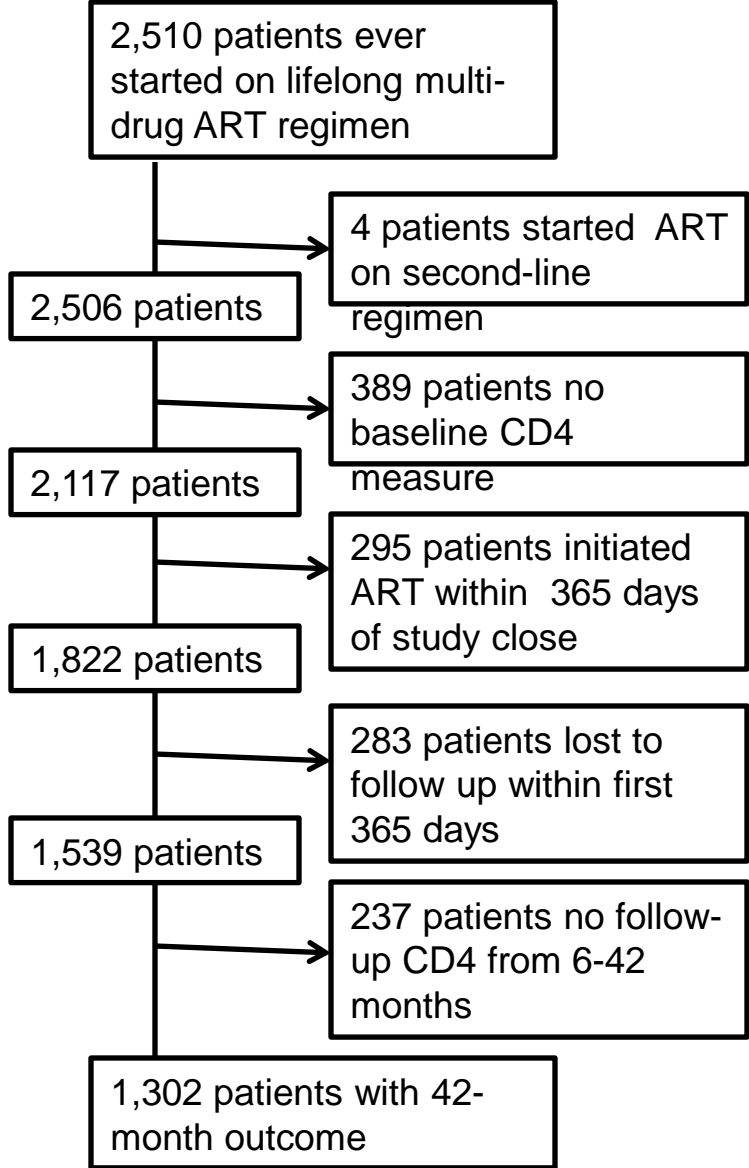**Step 3**
- Validate risk score algorithm

Step 4
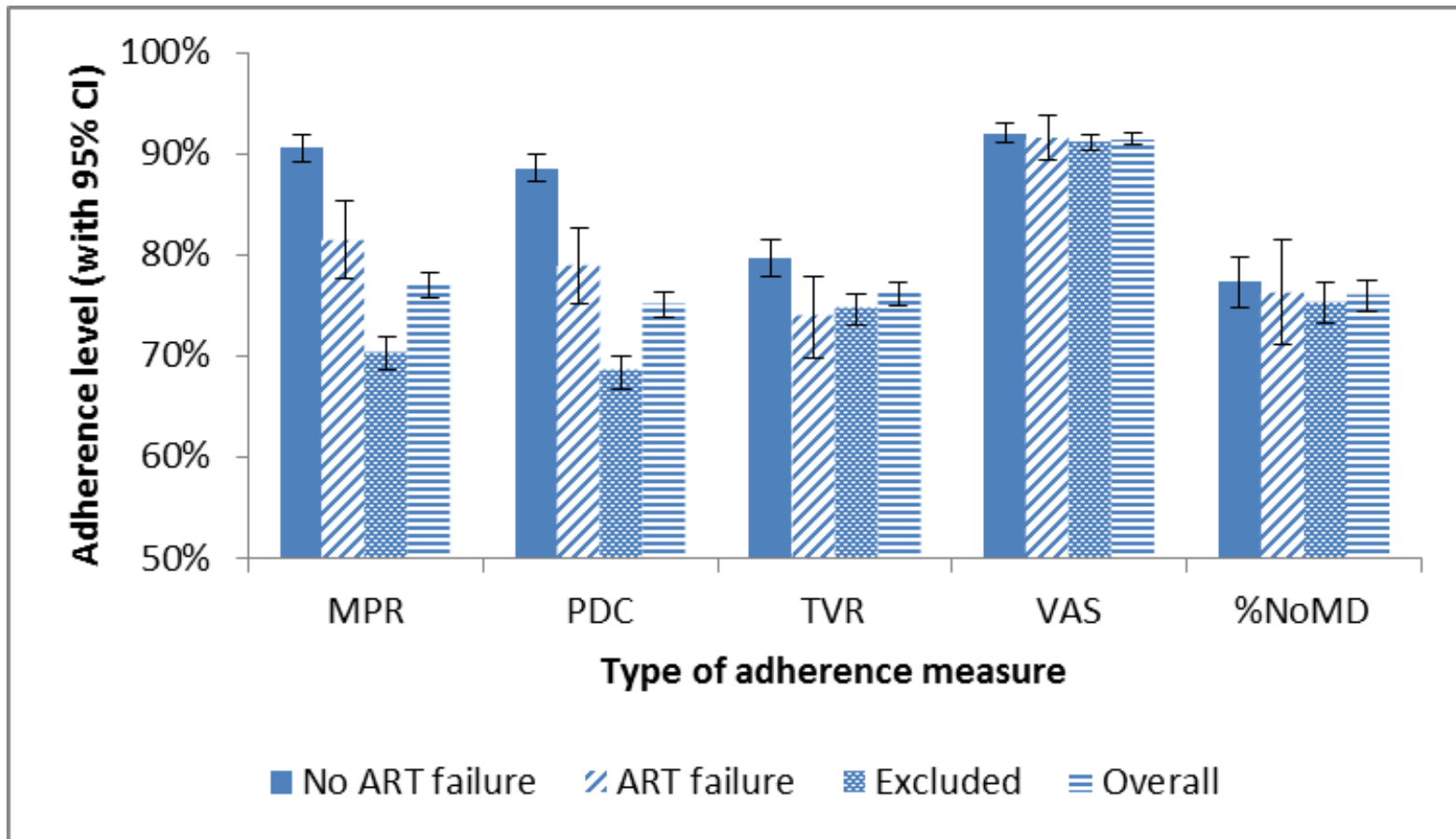- Test performance of risk score for long-term prediction of ART failure

Primary: 12-month outcome

2,510 patients ever started on lifelong multi-drug ART regimen

→ 4 patients started ART on second-line regimen

2,506 patients

→ 389 patients no baseline CD4 measure

2,117 patients

→ 134 patients initiated ART within 182 days of study close

1,983 patients

→ 5 patients lost to follow up within first 182 days

1,978 patients

→ 1,055 patients no follow-up CD4 from 6-12 months

923 patients with 12-month outcome

Secondary: 42-month outcome

2,510 patients ever started on lifelong multi-drug ART regimen

→ 4 patients started ART on second-line regimen

2,506 patients

→ 389 patients no baseline CD4 measure

2,117 patients

→ 295 patients initiated ART within 365 days of study close

1,822 patients

→ 283 patients lost to follow up within first 365 days

1,539 patients

→ 237 patients no follow-up CD4 from 6-42 months

1,302 patients with 42-month outcome

ART Adherence Measures

Pharmacy-based measures
   MPR=Medication possession ratio; sample size: n=2,458
   PDC=Proportion of days covered; sample size: n=2,458
   TVR= Timely visit ratio; sample size: n=2,242
Self-reported adherence measures
   VAS=Visual analogue scale; sample size: n=1,496
   %NoMD=Proportion of visits with no missed dose reported; sample size: n=1,505.
Comparison groups
   No ART failure (n=727) and ART failure (n=196) groups refer to patients in the primary analysis. Exluded group refers to patients
   excluded from the primary analysis (n=1,587). Overall group refers to the full population of adult ART patients (n=2,510).

Risk Score

Associated factors:

- Lower PDC
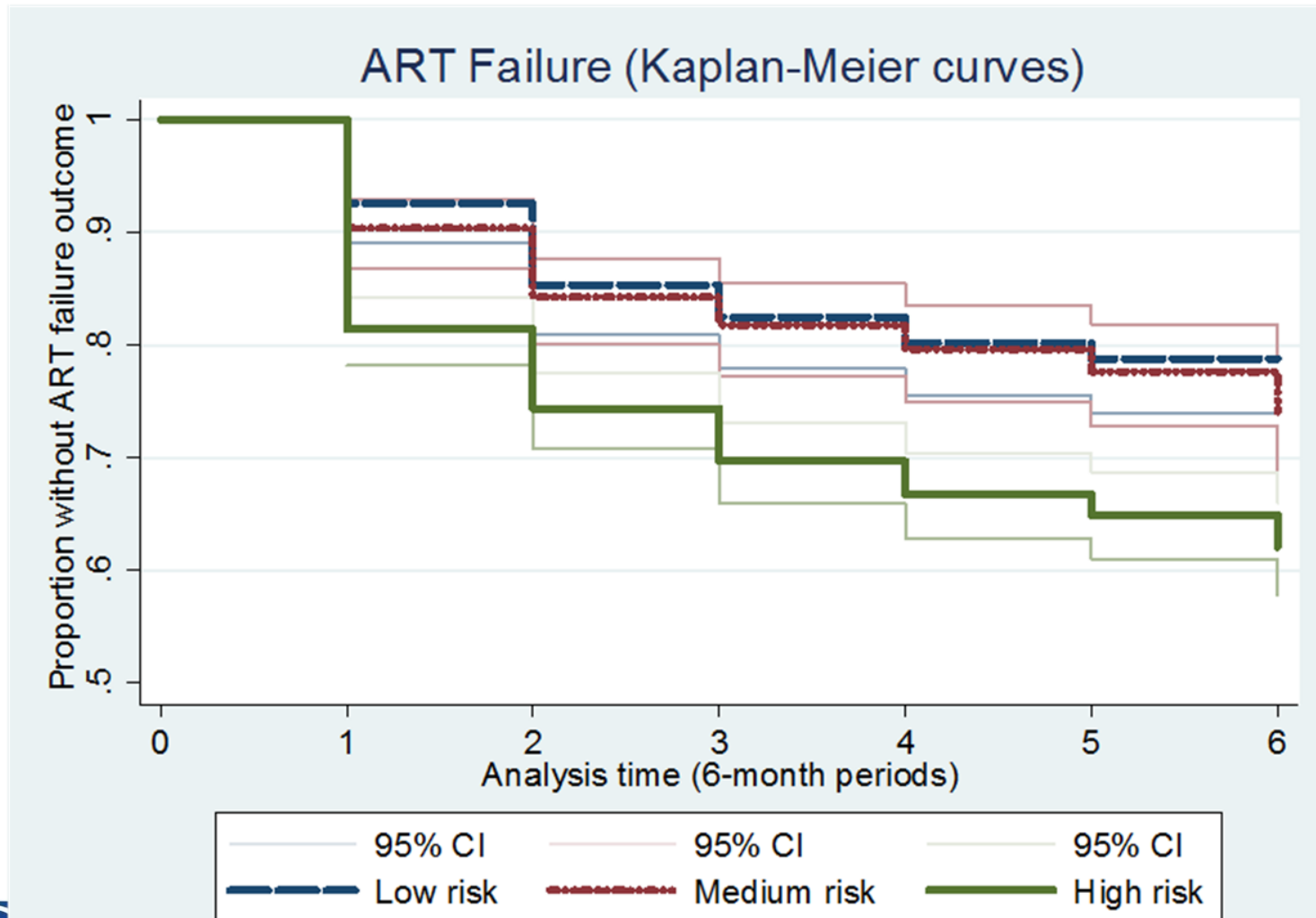- Higher baseline CD4
- Shorter pre-ART duration
- Male sex

$Risk\ Score$
$$= 7.7(pdc \leq 0.80) + 9.6(cd4 \geq 250)$$
$$+ 8.9(duration \leq 160) + 6.3(male\ sex)$$

Area under receiver operating curve (AUC)

- 0.67 (95% CI 0.61 – 0.73)

ART Failure by Risk Groups

ART Failure (Kaplan-Meier curves)

Applying Risk Categories in Practice

	All groups have positive "risk test" (no test)	Medium + high groups have positive "risk test"	High group has positive "risk test"
Test classification characteristics			
Sensitivity	100.0%	89.6%	70.8%
Specificity	0.0%	24.4%	53.7%
PPV	20.8%	23.8%	28.7%
NPV	NA	89.9%	87.5%
Correctly classified	20.8%	38.0%	57.3%
Hypothetical population of 1,000 with unlimited resources for targeting			
Total targeted	1000	785	514
Cases of failure among targeted	208	186	147
Cases of non-failure among targeted	792	599	367
Cases of failure missed	0	22	61
Hypothetical population of 1,000 but with resources to target only 500			
Total targeted	500	500	500
Cases of failure among targeted	104	119	143
Cases of non-failure among targeted	396	381	357
Cases of failure missed	104	89	65

Implications

- PDC measure performed best in alert

- Automated re-use of pharmacy data is efficient

- Drop routine data collection of self-reported adherence measures

- Re-direct personnel toward targeted follow-up, counseling and support

Photos: I-TECH

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Co-authors are shown in green.

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Jean Wysler Domercant, MD, MPH

Valierie Pelletier,, MD, MPH

Barbara Marston, MD

Dissertation Committee

Steve Zeliadt, PhD

Scott Barnhart, MD, MPH

Kenneth Sherr, PhD

Janet Baseman, PhD

Beth Devine, PhD

UW Center for AIDS Research Biometrics Core

Krista Yuhas, MPH

International Training and Education Center for Health (I-TECH)

Jean Gabriel Balan, MD

Hawa Camara, MPH

Mike Davisson, BSME

Emily deRiel, MPH

Nancy Rachel Labbe Coq, MD, MS

Rodney Destiné, MD, MPH

Jean Guy Honoré, MD, MPH

Nathaelf Hyppolite, MD, MS

Roges Lamothe, BA

Bill Lober, MD, MS

Atwood Raphael, MPH

Mary Tegger, ARNP, MPH

Steven Wagner, MS

Garry Zamor, BA

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Questions

Thank you!