

Implementing risk based care for CKD in Manitoba

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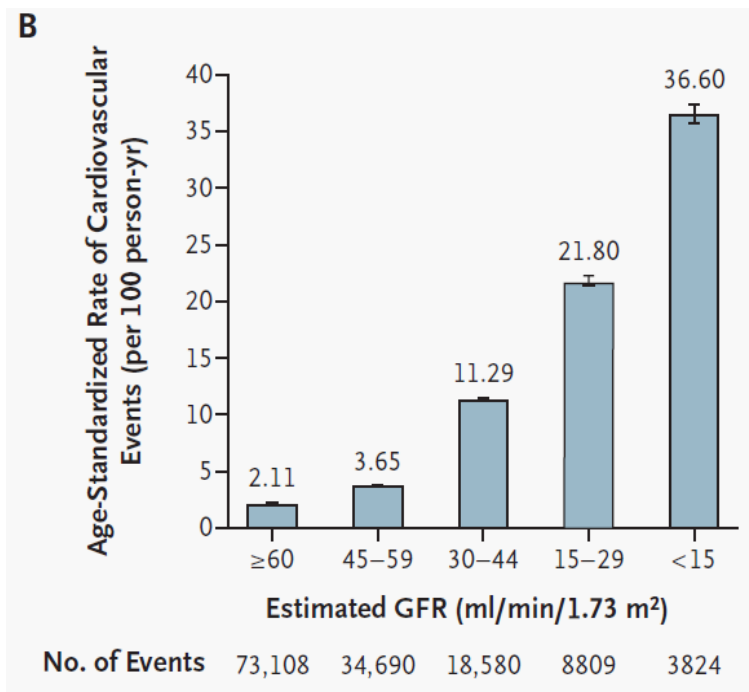
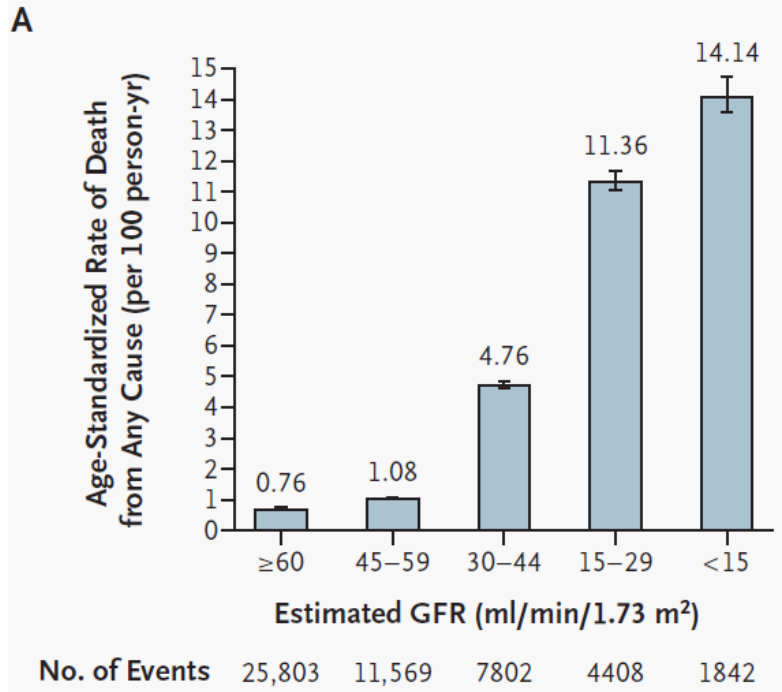
Chronic Kidney Disease

- Affects one in 10 individuals in Canada
- Disproportionately affects the elderly
- Disproportionately affects the aboriginal population
- Leads to kidney failure, cardiovascular disease, and higher risks of early death

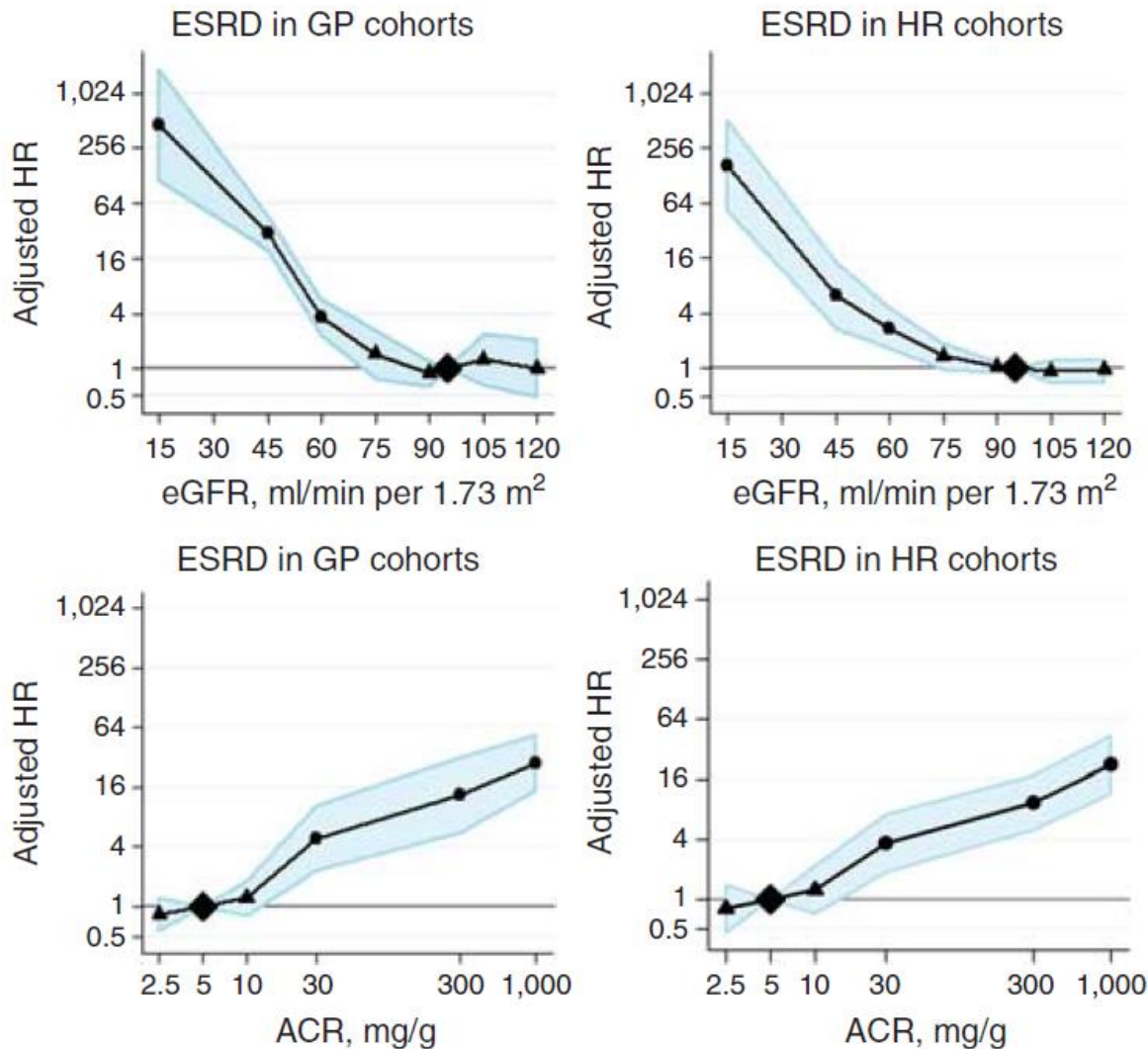
ORIGINAL ARTICLE

Chronic Kidney Disease and the Risks of Death, Cardiovascular Events, and Hospitalization

Alan S. Go, M.D., Glenn M. Chertow, M.D., M.P.H., Dongjie Fan, M.S.P.H., Charles E. McCulloch, Ph.D., and Chi-yuan Hsu, M.D.



Chronic Kidney Disease and Kidney Failure



KDIGO CKD Staging (2012-)

Composite Ranking for
Relative Risks by GFR
and Albuminuria:
KDIGO 2009

				Albuminuria Stages, Description and Range (mg/g)				
				A1		A2	A3	
				optimal and high-normal		high	very high and nephrotic	
				<10	10-29	30-299	300- 1999	≥2000
GFR Stages, Description and Range (mL/min/ 1.73m ²)	G1	high and optimal	>105					
			90-104					
	G2	mild	75-89					
			60-74					
	G3a	mild- moderate	45-59					
	G3b	moderate- severe	30-44					
	G4	severe	15-29					
G5	kidney failure	<15						

Why risk prediction

- Early and appropriate nephrology care
- Prognostic Information for patient and provider
- Clinical trial enrollment
- Dialysis resource management

Ideal Model

- Across spectrum of chronic kidney disease
- Electronic ascertainment and reporting
- Improve discrimination and reclassification beyond standard of care
- Externally validated in diverse patient populations

Patient Information		Specimen Information		Client Information	
LAST NAME, FIRST NAME		Specimen: 123456789		Client #: 11223344 L113XXX	
DOB: 01/01/1900	Age: 00	Requisition: 1234567		LAST NAME, FIRST NAME, MD	
Gender: M	Fasting: Y	Collected: 10/10/2010		FAMILY PRACTICE ASSOCIATES	
Phone: 800-555-1212		Received: 10/10/2010		1234 MAIN STREET	
Patient ID: 12345		Reported: 10/11/2010		TOWN, CITY, 123456	

Serum Tests

Creatinine	154	(Normal <90)
------------	-----	--------------

eGFR (Non-AA)	39ml/min	(Normal >60ml/min)
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Urine Tests

Albumin Creatinine Ratio	20mg/mmol	(Normal <2.8 mg/mmol)
--------------------------	-----------	-----------------------

Kidney Failure Risk

2 years	2.8%	
---------	------	--

5 years	8.9%	
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**Interpretation*

ONLINE FIRST

A Predictive Model for Progression of Chronic Kidney Disease to Kidney Failure

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AN ESTIMATED 23 MILLION people in the United States (11.5% of the adult population) have chronic kidney disease (CKD) and are at increased risk for cardiovascular events and progression to kidney failure.¹⁻³ Similar estimates of burden of disease have been reported around the world.⁴ Although there are proven therapies to improve outcomes in patients with progressive kidney disease, these therapies may also cause harm and add cost. Clinical decision making for CKD is challenging due to the heterogeneity of kidney diseases, variability in rates of disease progression, and the competing risk of cardiovascular mortality.^{7,8} Accurate prediction of risk could facilitate individualized decision making, enabling early and appropriate patient care.^{9,10}

Currently, there are no widely accepted predictive instruments for CKD progression; therefore, physicians must make ad hoc decisions about which patients to treat, risking delays in treatment in those who ultimately progress to kidney failure, or unnecessary treatment in those who do not progress. The severity of CKD has been recommended to guide treatment-related de-

See related articles.

Context Chronic kidney disease (CKD) is common. Kidney disease severity can be classified by estimated glomerular filtration rate (GFR) and albuminuria, but more accurate information regarding risk for progression to kidney failure is required for clinical decisions about testing, treatment, and referral.

Objective To develop and validate predictive models for progression of CKD.

Design, Setting, and Participants Development and validation of prediction models using demographic, clinical, and laboratory data from 2 independent Canadian cohorts of patients with CKD stages 3 to 5 (estimated GFR, 10-59 mL/min/1.73 m²) who were referred to nephrologists between April 1, 2001, and December 31, 2008. Models were developed using Cox proportional hazards regression methods and evaluated using C statistics and Integrated discrimination improvement for discrimination, calibration plots and Akaike Information Criterion for goodness of fit, and net reclassification improvement (NRI) at 1, 3, and 5 years.

Main Outcome Measure Kidney failure, defined as need for dialysis or preemptive kidney transplantation.

Results The development and validation cohorts included 3449 patients (386 with kidney failure [11%]) and 4942 patients (1177 with kidney failure [24%]), respectively. The most accurate model included age, sex, estimated GFR, albuminuria, serum calcium, serum phosphate, serum bicarbonate, and serum albumin (C statistic, 0.917; 95% confidence interval [CI], 0.901-0.933 in the development cohort and 0.841; 95% CI, 0.825-0.857 in the validation cohort). In the validation cohort, this model was more accurate than a simpler model that included age, sex, estimated GFR, and albuminuria (integrated discrimination improvement, 3.2%; 95% CI, 2.4%-4.2%; calibration [Naimark and D'Agostino χ^2 statistic, 19 vs 32]; and reclassification for CKD stage 3 [NRI, 8.0%; 95% CI, 2.1%-13.9%] and for CKD stage 4 [NRI, 4.1%; 95% CI, -0.5% to 8.8%]).

Conclusion A model using routinely obtained laboratory tests can accurately predict progression to kidney failure in patients with CKD stages 3 to 5.

JAMA. 2011;305(15):doi:10.1001/jama.2011.451

www.jama.com

isions.¹¹ Severity is commonly staged according to the level of glomerular filtration rate (GFR) estimated from serum creatinine. Reporting estimated GFR when serum creatinine is measured has increased awareness of CKD and referrals to nephrologists, but estimated GFR is not sufficient for clinical decision making.^{12,13}

Recent studies have shown that albuminuria provides additional prognostic information for progression to kidney failure.¹⁴ Some studies have examined the use of estimated GFR and albuminuria in prediction models, with additional

clinical and laboratory data, but these models are either specific to a particular type of kidney disease or not externally validated.^{7,13-18} The ideal model to

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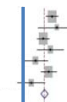
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A prediction model for progression of CKD to Kidney Failure

- Patients with CKD Stages 3 – 5
- Followed by nephrologists in Ontario and British Columbia, Canada
- 8,391 participants with 1,563 kidney failure events
- Multiple lab based prediction models

Kidney Failure Risk Equation (KFRE)

- We developed laboratory based prediction models that accurately predict the progression of CKD (C statistics 0.84 – 0.91)
- Our preferred models use routinely collected laboratory data
 - 3 variable KFRE – Age, Sex, eGFR
 - 4 variable KFRE – Age, Sex, eGFR, ACR
 - 8 variable KFRE – + Calcium, Phosphorous, Bicarbonate and Albumin



Knowledge Translation

eEquation. Applying the Five Year Kidney Failure Risk Prediction to an Individual Patient

The equation of the five year kidney failure risk predictor is:

$$\begin{aligned}
 P &= 1 - S_0(t)^{\exp f(x)} \\
 &= 1 - S_{ave}(t=1826)^{\exp f(x) - f_0(x)} \\
 &= 1 - S_{ave}(t=1826)^{\exp\{-0.49360*[(GFR/5)-7.22]+0.16117*(male-0.56)+0.35066*[\ln(ACR)-5.2775]-0.19883*[(age/10)-7.04]-0.33867*(albumin-3.99)+0.24197*(phosphorous-3.93)-0.07429*(bicarbonate-25.54)-0.22129*(calcium-9.35)\}} \\
 &= 0.07
 \end{aligned}$$

Risk Factor	Units	(Type Over Placeholder Values in Each Cell)	Notes
Age	years	50	
Sex	male (m) or female (f)	m	
Estimated GFR	ml/min/1.73 m ²	30	
Urine Albumin Creatinine Ratio	mg/g	50	
Calcium	mg/dl	9.8	
Phosphorous	mg/dl	3.8	
Albumin	g/dl	4	
Bicarbonate	meq/l	26	

Five year risk of kidney failure

10.7%

Knowledge Translation



Apps » Device » Discipline » Calculate » References » Company »

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Kidney Failure Risk Equation

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By clicking on the "Submit" button below, you acknowledge that you have read, understand, and agree to be bound by the terms of the [QxMD Online Calculator End User Agreement](#).

Use the Kidney Failure Risk Equation to determine 2 and 5 year probability of treated kidney failure (dialysis or transplantation) for a patient with CKD Stage 3 to 5.

Age (yrs)	<input type="text"/>	
Sex	Male <input type="button" value="v"/>	
GFR (ml/min/1.73m ²)	<input type="text"/>	
Urine Albumin:Creatinine Ratio	<input type="text"/>	<input checked="" type="radio"/> mg/g <input type="radio"/> mg/mmol
Calcium	<input type="text"/>	<input checked="" type="radio"/> mg/dL <input type="radio"/> mmol/L
Phosphorus	<input type="text"/>	<input checked="" type="radio"/> mg/dL <input type="radio"/> mmol/L
Albumin	<input type="text"/>	<input checked="" type="radio"/> g/dL <input type="radio"/> g/L
Bicarbonate (mmol/L)	<input type="text"/>	

Submit

Cancel

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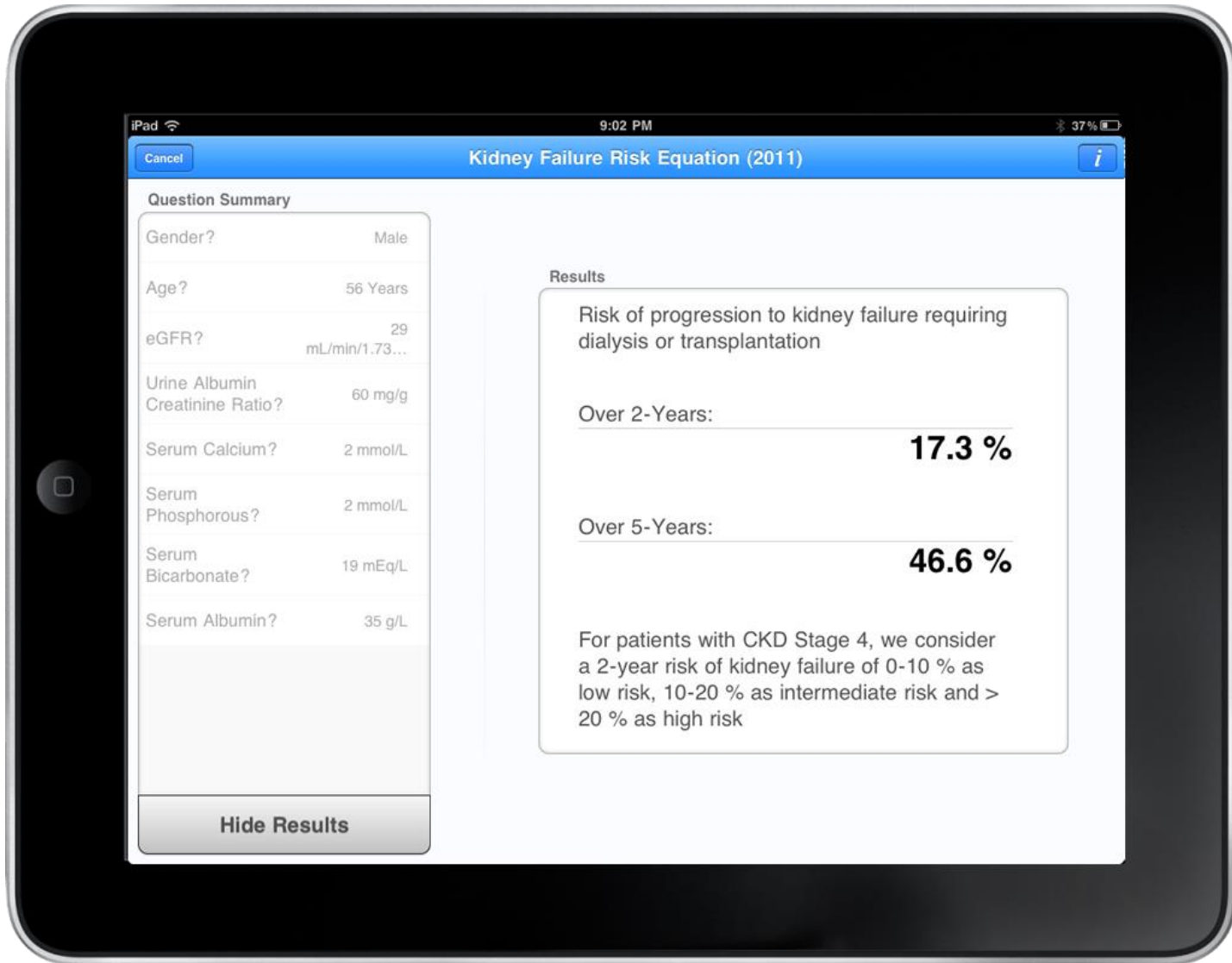
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Knowledge Translation - Output



Progress To-Date and Future Directions

- Equation is accessed online > 30,000 times a month
- Decision Analysis Re: Utility as a dialysis access planning tool
- Quality Improvement Project: Utility as a consult triage tool
- External validation in diverse CKD populations

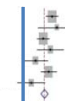
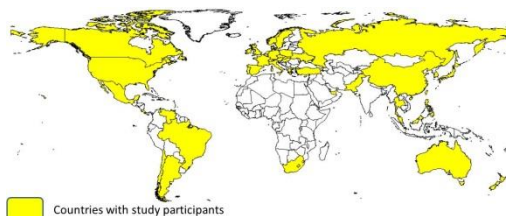
Original Investigation

Multinational Assessment of Accuracy of Equations for Predicting Risk of Kidney Failure

A Meta-analysis

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Tangri et al. JAMA 2016



Study Populations – N America

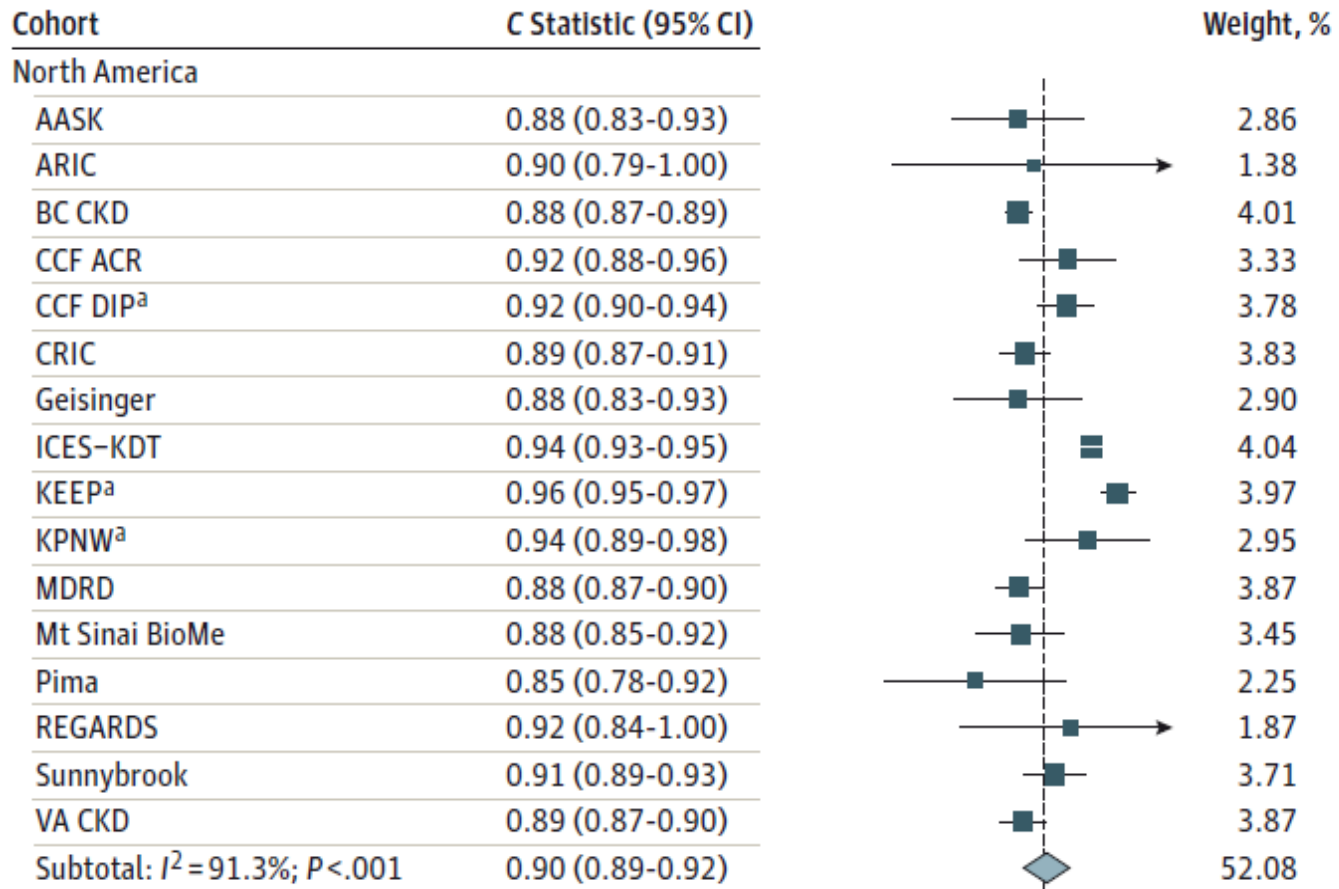
Source	Cohort	No of Participants	F/U Time, years, Median (IQI)	Age (years)	eGFR (ml/min/1.73m ²) (SD)	Albuminuria, N (%)*	Kidney Failure Events
North America	AASK**	898	8 (4, 10)	55 (11)	40 (12)	592 (66%)	303
	ARIC	722	12 (7, 14)	67 (5)	50 (10)	192 (27%)	112
	BC CKD**	11,131	3 (2, 5)	70 (13)	31 (11)	7928 (71%)	2,091
	CCF ACR**	4,102	2 (1, 4)	71 (11)	48 (10)	1643 (40%)	101
	CCF DIP**	12,275	3 (1, 4)	72 (13)	46 (11)	2835 (23%)	300
	CRIC**	3,099	6 (4, 7)	59 (11)	40 (11)	1866 (63%)	796
	Geisinger**	20,720	4 (2, 6)	70 (10)	51 (8)	1961 (44%)	453
	ICES-KDT**	100,569	4 (2, 6)	73 (11)	46 (12)	3961 (33%)	3,093
	KEEP	16,425	4 (2, 6)	69 (12)	48 (10)	478 (32%)	500
	KPNW**	1,486	5 (3, 6)	73 (10)	45 (11)	921 (85%)	100
	MDRD**	1,459	6 (3, 12)	52 (13)	33 (14)	970 (63%)	1,041
	Mt Sinai BioMe**	3,574	2 (1, 5)	65 (13)	42 (14)	3961 (39%)	525
	Pima	78	3 (1, 5)	58 (14)	36 (15)	74 (95%)	53
	REGARDS	3,158	7 (5, 8)	72 (9)	47 (11)	1079 (36%)	240
	Sunnybrook**	3,098	3 (2, 5)	71 (14)	37 (13)	1378 (75%)	382
	VA CKD	434,810	4 (3, 4)	75 (9)	47 (11)	14084 (41%)	8,836
Sub-Total		617,604	4 (3, 6)	74 (10)	46 (11)	79573 (41%)	18,926

Study Populations – Non NA

CRIB**	382	3 (1, 7)	61 (14)	21 (11)	259 (84%)	190
GCKD	3927	2 (2, 3)	62 (11)	42 (10)	2163 (56%)	89
GLOMMS-1	1,007	4 (1, 6)	71 (13)	31 (9)	701 (70%)	122
Gonryo	1,088	3 (1, 5)	66 (13)	32 (16)	343 (95%)	345
HUNT	1,060	13 (6, 14)	75 (8)	49 (9)	313 (30%)	55
Maccabi	58,630	5 (3, 6)	73 (11)	49 (10)	10938 (35%)	1383
MASTERPLAN**	579	6 (4, 6)	61 (12)	35 (12)	314 (54%)	134
MMKD	140	4 (2, 5)	49 (11)	30 (15)	133 (95%)	70
NephroTest**	1,317	3 (2, 6)	61 (14)	35 (13)	857 (69%)	292
NZDCS	8,865	7 (4, 8)	71 (11)	43 (15)	1099 (15%)	808
Okinawa83	1,698	17 (17, 17)	69 (10)	51 (8)	599 (35%)	55
Okinawa93	15,162	7 (7, 7)	70 (10)	52 (7)	1090 (7%)	131
RENAAL**,†	1,434	3 (2, 4)	60 (7)	37 (11)	1434 (100%)	335
Severance	3,173	10 (9, 12)	60 (10)	54 (7)	384 (12%)	92
SRR CKD**	5,291	2 (1, 3)	69 (14)	24 (9)	4335 (82%)	802
Sub-Total	103,753	4 (3, 7)	71 (12)	47 (12)	24962 (34%)	4,903
Overall Total	721,357	4 (3, 7)	74 (10)	46 (11)	104534 (40%)	23,829

Discrimination

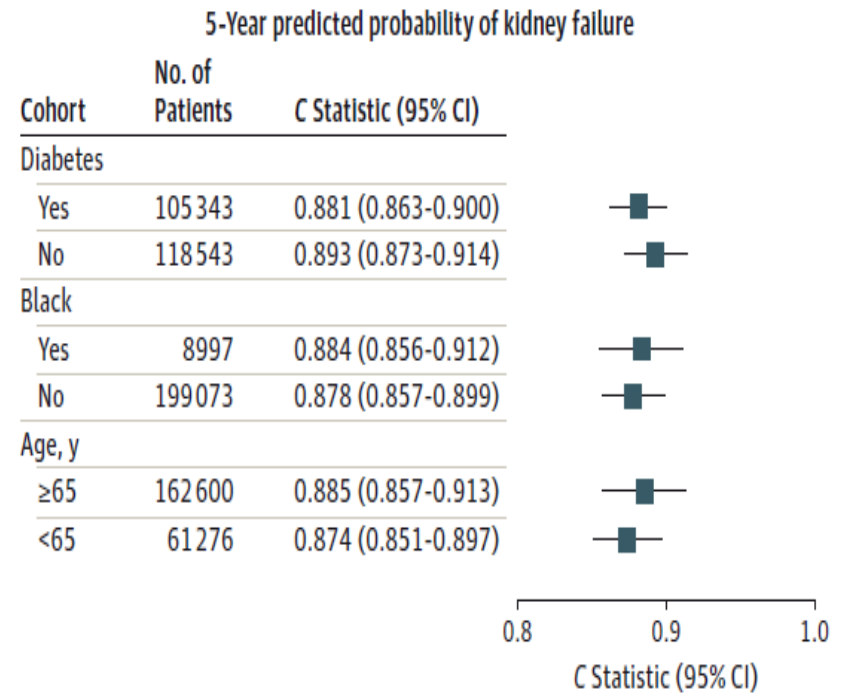
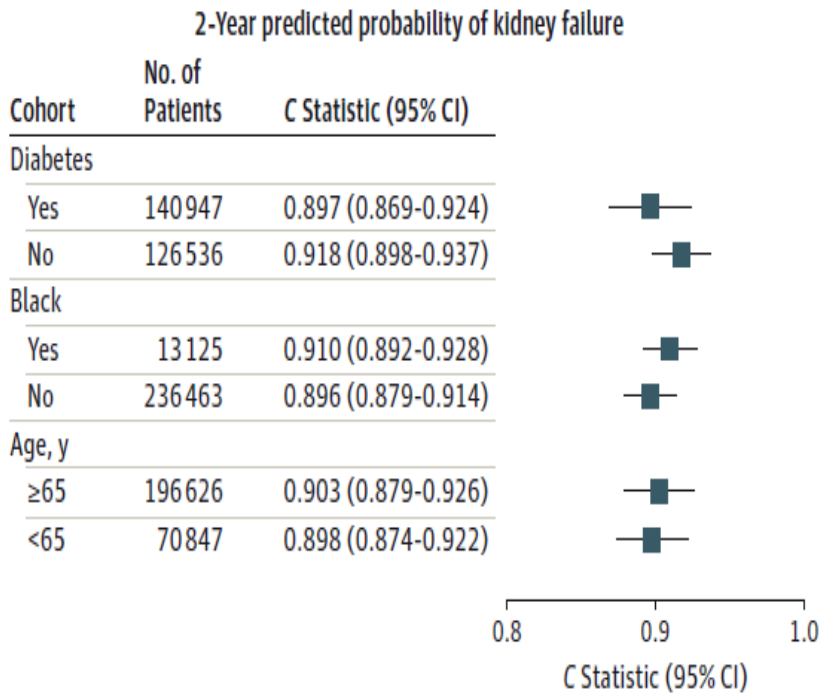
Figure 1. Discrimination Statistics (C Statistics) for Original 4-Variable Equation at 2 Years by Cohort



Discrimination in Subgroups

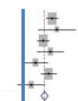
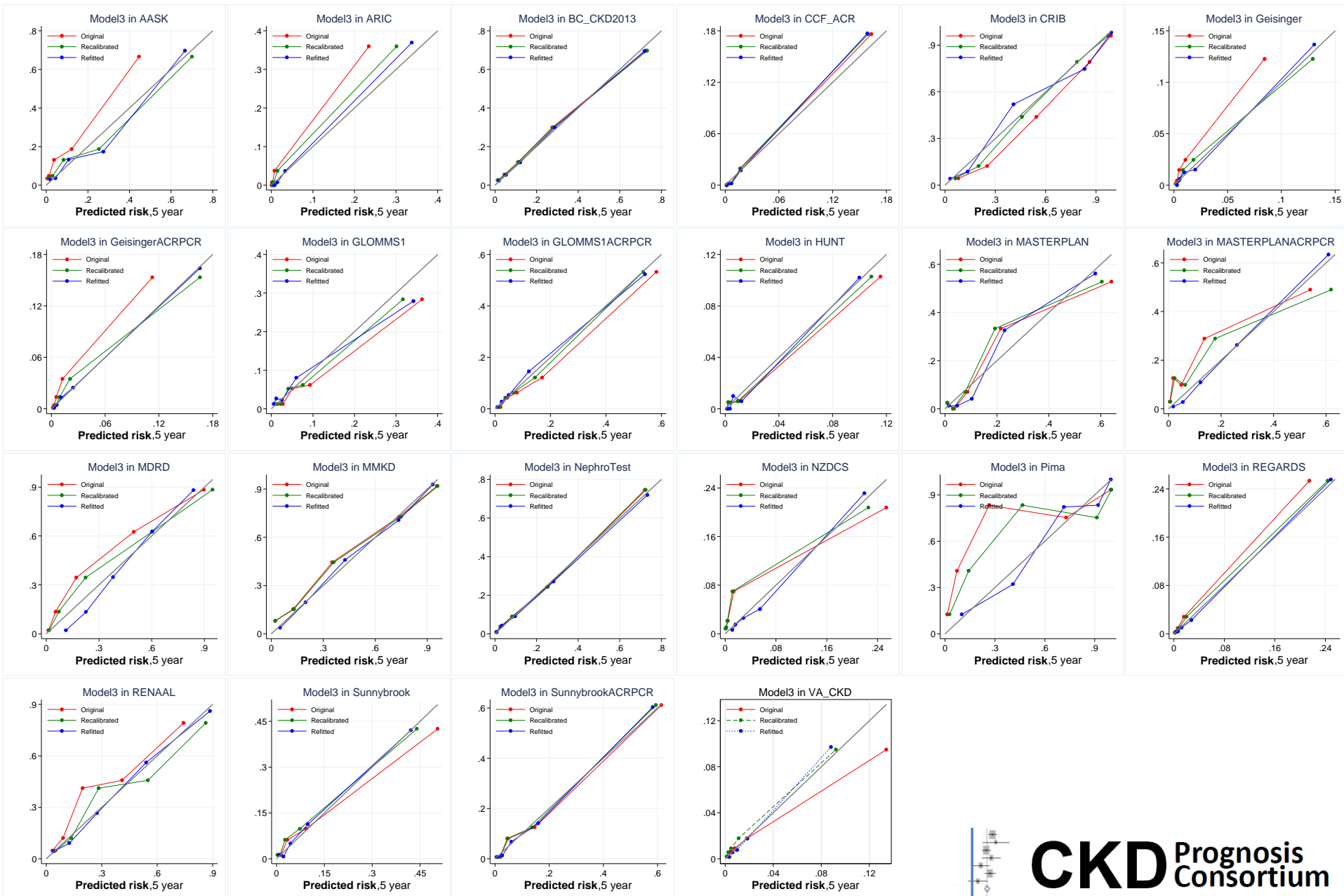
Figure 3. Discrimination Statistics (C Statistics) for Original 4-Variable and 8-Variable Equations at 2 and 5 Years by Subgroup

A 4-Variable equation



B 8-Variable equation

Calibration for 4-var Model (5 year)



4 Variable Equation



URINE

+



SEX

+



AGE

+

GFR

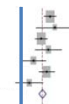
GLOMERULAR
FILTRATION RATE

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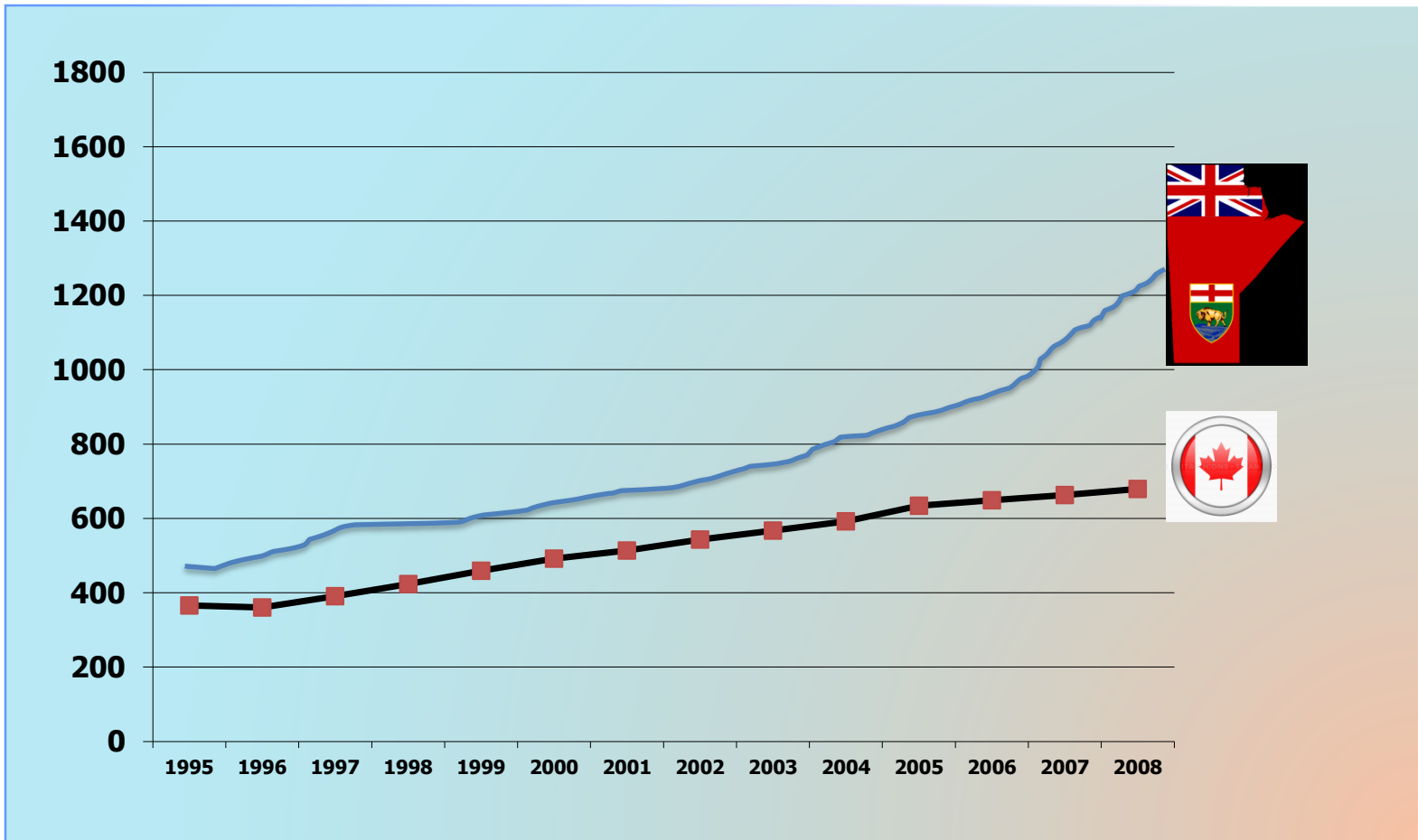
THE PROJECTED RISK OF KIDNEY FAILURE

Conclusions

- The KFREs accurately predict the risk of kidney failure requiring dialysis in patients with CKD Stages 3-5 for up to 5 years
- Risk prediction is accurate across multiple countries and subpopulations
- The KFRE is simple and highly accurate and can be integrated into clinical practice



Kidney Failure in Manitoba



Reporting of Kidney Function (eGFR)

- Manitoba adopted routine reporting of eGFR in Oct 2010
- A new website and referral pathways were developed in collaboration with nephrologists, primary care providers and health administrators
- An education campaign was launched to coincide with reporting of eGFR

Outpatient Nephrology Referral Form

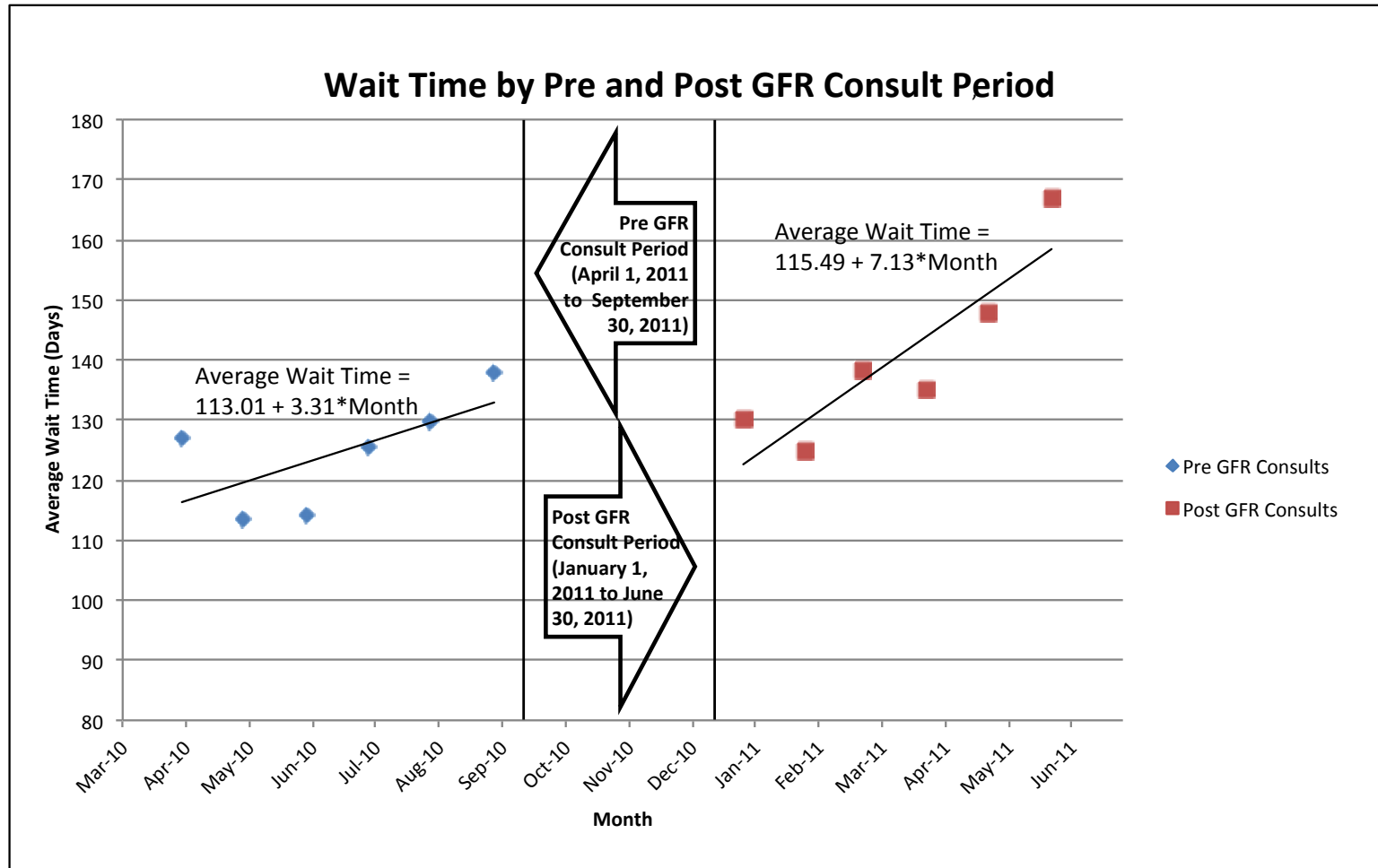
Your referral will be triaged as **URGENT** or **ELECTIVE** based on 2010 Nephrology Referral Pathways criteria which are available at Manitoba Renal Program's website at www.kidneyhealth.ca/pathways or by calling 787-7382.

Referring MD: _____ Ph. _____ Fax. _____

Patient Name		Phone
PHIN		Address
<input type="checkbox"/> Please select (✓) either urgent or elective:		REFERRAL SITE PREFERENCE (check one) <input type="checkbox"/> Health Sciences Centre Fax: (204) 787-7366 <input type="checkbox"/> St. Boniface Hospital Fax: 204) 233-2770 <input type="checkbox"/> Seven Oaks Hospital Fax: (204) 697-4204 <input type="checkbox"/> Brandon Regional Health Centre Fax: (204) 726-8797 <input type="checkbox"/> Dr. _____
EMERGENT REFERRAL (< 24 HOURS) DO NOT FAX REFERRAL	eGFR <15 mL/min with indications (see referral pathway) for emergent dialysis PAGE NEPHROLOGIST ON CALL AT: Health Science Centre (204) 787-2071 St. Boniface Hospital (204) 237-2053 Brandon (204) 578-4000 or (204) 571-7139	
<input type="checkbox"/> URGENT REFERRAL (< 4 weeks)	Reason for Urgency (check all that apply) <input type="checkbox"/> Hematuria, suspected GN (eGFR or proteinuria criteria below, or ANA>1:80, or decreased complements) <input type="checkbox"/> eGFR decline by > 20% in 1-30 days <input type="checkbox"/> Proteinuria in non-diabetic (ACR or PCR > 300 mg/mmol)	IMPORTANT! For us to triage your patient you must complete and append results of: ◆ Urinalysis ◆ Spot urine for ACR or PCR ◆ eGFR (also serum urea, creatinine) at least two values ◆ CBC
<input type="checkbox"/> ELECTIVE REFERRAL (< 6 months)	<input type="checkbox"/> eGFR 30-59.9 mL/min and declining > 10 % per year <input type="checkbox"/> eGFR < 30 mL/min <input type="checkbox"/> Proteinuria in non-diabetic (ACR or PCR > 200 mg/mmol) <input type="checkbox"/> Hematuria <input type="checkbox"/> Other Reason: _____ _____	Consider ordering and send reports when available: ◆ Serum and Urine Protein Electrophoresis (> 40 years of age) ◆ Kidney Ultrasound

Please append all supporting documentation:
TESTS • MEDICAL HISTORY • MEDICATIONS

The 2011 Manitoba Experience



*No statistically significant difference in slope or intercept ($p=0.08$ & $p=0.77$); Intercept is defined as March 2010 for Pre GFR line of best fit and December 2010 for Post GFR line of best fit.

**Average wait time was calculated by taking weighted average wait time from four locations.

Referral Pathways - 2011

- Site based referrals
- Urgent referrals seen within 4-8 weeks
- Semi-urgent and non-urgent referrals seen on a first come first served basis
- Median wait list time – 230 days

Triage Flow Chart

Nephrology consult received

Complete referral?
- Reason for referral
- eGFR
- ACR or PCR

NO → Fax consult back to GP with an “incomplete referral letter”

YES

Risk factors
- eGFR <15
- K⁺ >6
- Nephrotic Range Proteinuria
- Hematuria
- PKD
- Pregnancy

YES → Book emergently
- Request further info

NO

Refer back to GP with “low risk letter”

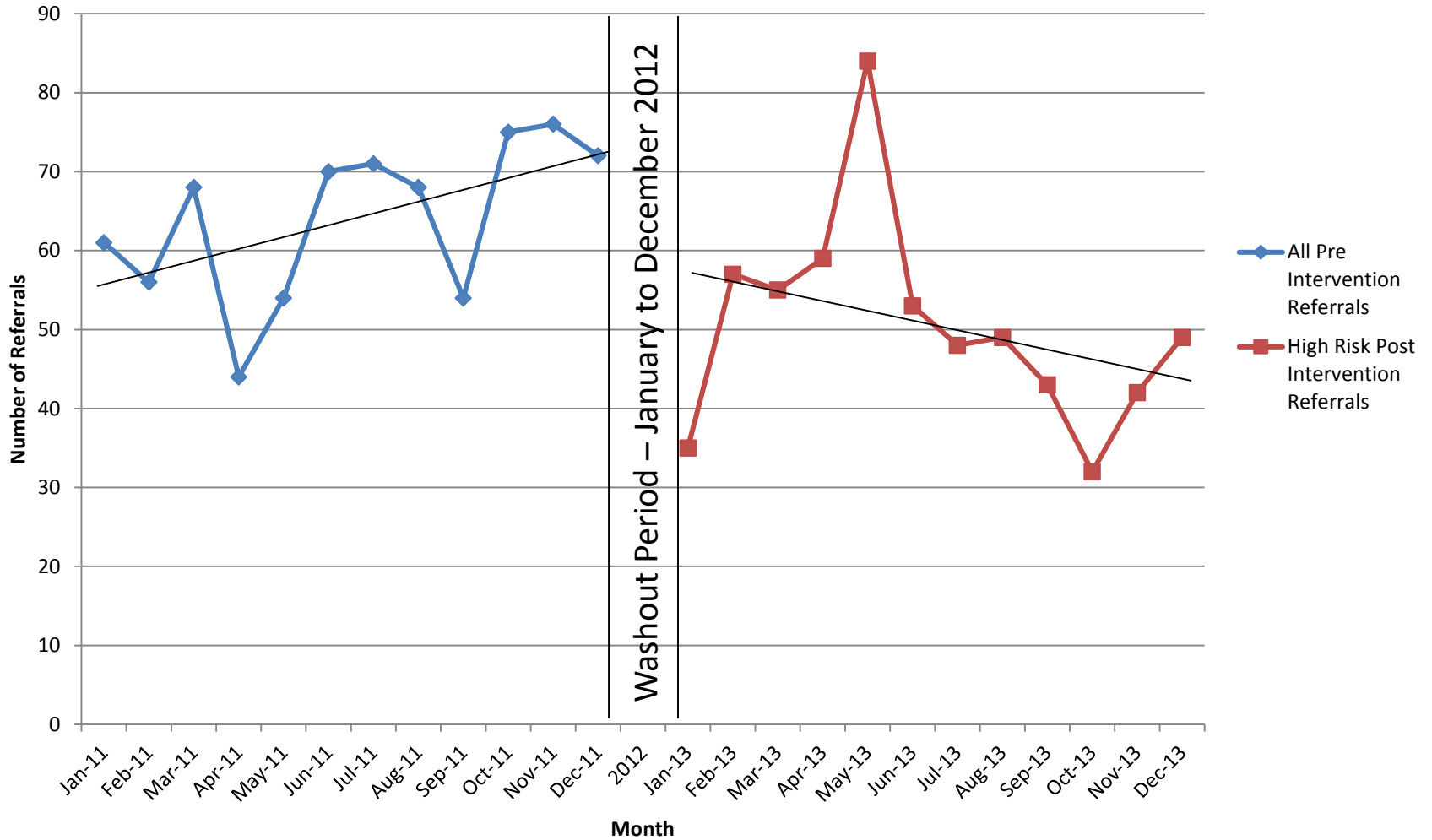
< 3%

Risk assessment
(Kidney Failure Risk Equation)

> 3%

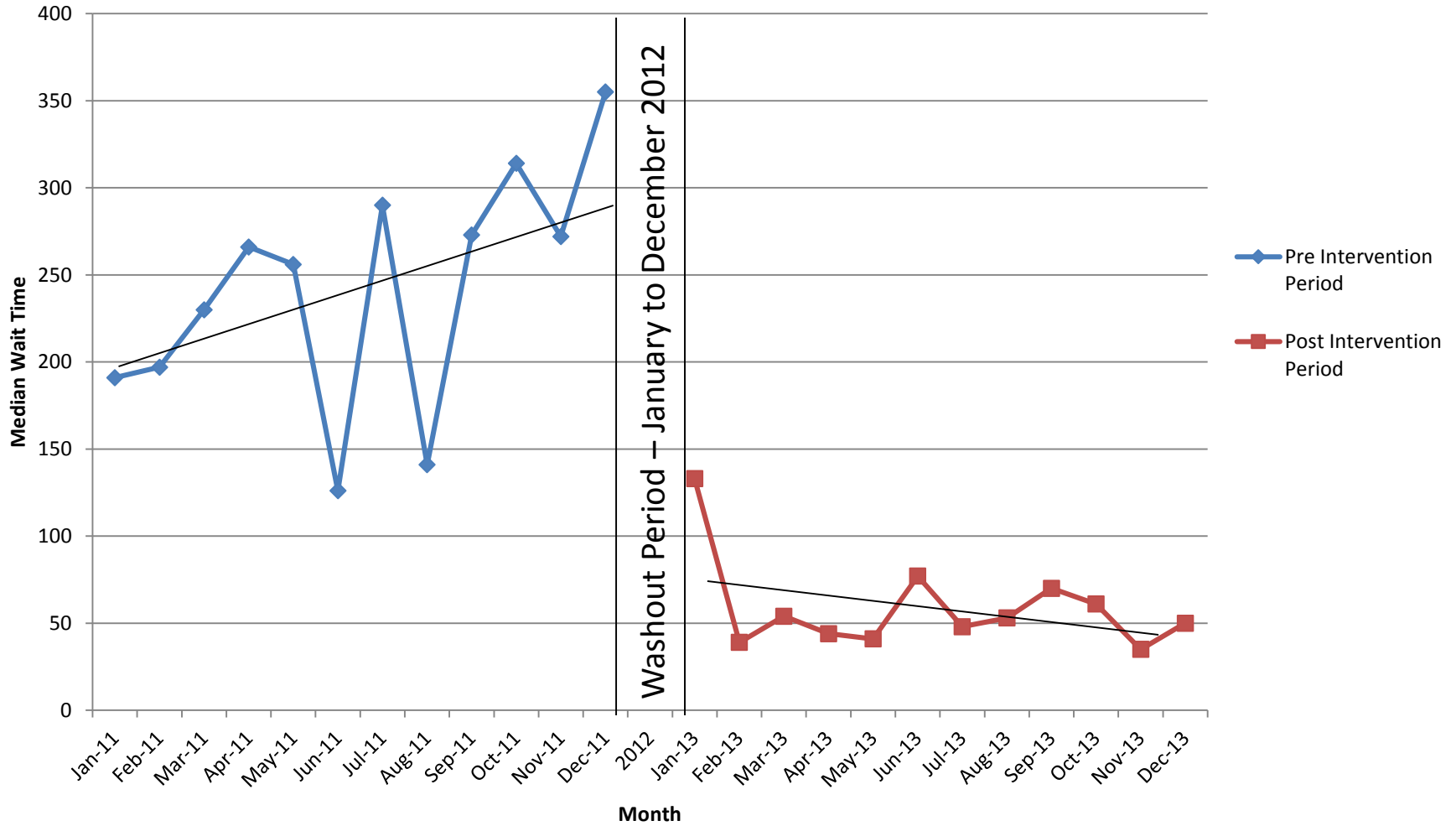
Book
- 3-10% = non-urgent (<6 mo)
- >10% = urgent (<4 wks)

Change in Referrals (Pre and Post Screening Intervention)



*Intervention resulted in a change in # of referrals ($p=0.1$) and change in referral trend (slope) post-intervention ($p=0.06$)

Change in Wait Time (Pre and Post Screening Intervention)



*Intervention resulted in statistically significant change in wait time ($p < 0.001$) and change in wait time trend (slope) post-intervention ($p = 0.029$)

Discussion

- eGFR reporting led to significant increases in referrals and wait times for nephrology care in Manitoba
- Implementation of a risk based triage system reduced wait times
- Most patients triaged as low risk are unlikely to progress
- Provider satisfaction (family physician and nephrologist) with risk based triage was high

Discussion

- A risk based triage system based on the KFRE is both feasible and highly effective at improving wait times for nephrology care
- Further implementation of risk based triage and treatment pathways is the next step

How will we do this

- Revamp the Manitoba Renal Program website (kidneyhealth.ca)
- Implement automated calculating and reporting of Kidney Failure risk in all community laboratories
- Engage patients and family physicians to develop and evaluate our intervention

Revamp kidneyhealth.ca

- Report patient referral guidelines to the public with updated triage flow chart
- Patient-friendly infographics on facts and figures of CKD including KFRE calculation
- Post guidelines for management of CKD specifically depending on level of Kidney Failure risk

New Online Tools for Primary Care Kidney Health Management and Referrals

- Visit **kidneyhealth.ca**
- Click **'Primary Care'**
- Referral form shortcut still available

The screenshot displays the homepage of kidneyhealth.ca, the Manitoba Renal Program website. The header includes the logo, navigation links (HOME, ABOUT US, KIDNEY DISEASE, NEWS & EVENTS), and a search bar. A red navigation bar contains links for PRIMARY CARE PROVIDERS (highlighted with a yellow circle), PATIENTS AND CAREGIVERS, and MRP STAFF PORTAL. Below the navigation bar is a featured article titled 'THE KIDNEY HEALTH PLAYBOOK' with a 'CLICK HERE' button. The main content area is divided into 'NEWS & EVENTS' and a sidebar. The 'NEWS & EVENTS' section features two articles: 'Career Changes, Cancer and Beekeeping? Dialysis Nurse Takes on Life's Twists' (dated NOVEMBER 2017) and 'Dialysis Patients & Emergency or Urgent Care' (dated SEPTEMBER 2017). The sidebar contains social media icons, a 'Take the Kidney QUIZ' button, a 'Info for Primary Care PROVIDERS' button, a 'Patient Referral FORM' button (highlighted with a yellow circle), and a 'Patient STORIES' button.

New Online Tools for Primary Care Kidney Health Management and Referrals

Tool 1:

Online Kidney Disease Referral Pathway Tool

The screenshot displays the website for kidneyhealth.ca, specifically the Manitoba Renal Program. The page features a navigation menu with links for HOME, ABOUT US, and KIDNEY. A prominent blue button labeled "MRP STAFF PORTAL" is visible in the top right corner. Below the navigation, there are sections for "DOWNLOADS (PDF)" and "KIDNEY FAILURE RISK TOOLS & REFERRAL PATHWAYS". The "KIDNEY FAILURE RISK TOOLS & REFERRAL PATHWAYS" section includes a form for inputting patient data. The form fields are: eGFR (set to < 15), ACR (set to < 100mg/mmol), and Hematuria (set to Yes). A blue "Next Steps" button is located below the form. A white pop-up box is overlaid on the form, containing the text: "If abnormal eGFR OR ACR OR hematuria, order Renal Ultrasound and CBC, serum urea, electrolytes – Na, K, Cl, HCO₃, calcium, phosphorous, glucose, albumin. If over 40 y/o obtain serum and urine protein electrophoresis." Below the form, there is a list of links: "Explaining eGFR and the Risk Equation", "MRP Kidney Disease Referral Pathway", "MRP Chronic Kidney Disease Stages", "Proteinuria Conversion Table", "MRP Referral Form", and "Staff Resources". A disclaimer is located at the bottom of the page, stating that the information is based on scientific evidence and is subject to change without notice.

New Online Tools for Primary Care Kidney Health Management and Referrals

- Enter eGFR, ACR and if Hematuria present
- Click 'Next Steps'

The image displays three sequential screenshots of a web-based form for kidney health management. Each screenshot shows the same form with different elements highlighted or active.

Screenshot 1: The 'eGFR' dropdown menu is open, showing three options: '< 15', '15 - 59.9', and '> 59.9'. The 'eGFR' field is set to '< 15'. The 'ACR' field is set to '<100mg/mmol' and the 'Hematuria' field is set to 'Yes'. A 'Next Steps' button is visible at the bottom left.

Screenshot 2: The 'ACR' dropdown menu is open, showing two options: '<100mg/mmol' and '>100mg/mmol'. The 'ACR' field is set to '<100mg/mmol'. The 'eGFR' field is set to '< 15' and the 'Hematuria' field is set to 'Yes'. A 'Next Steps' button is visible at the bottom left.

Screenshot 3: The 'Next Steps' button is highlighted with a yellow circle. The 'eGFR' field is set to '< 15', the 'ACR' field is set to '<100mg/mmol', and the 'Hematuria' field is set to 'Yes'. The 'Next Steps' button is highlighted with a yellow circle.

New Online Tools for Primary Care Kidney Health Management and Referrals

- Get a course of action to follow - whether referral or primary care management

eGFR < 15 ACR <100mg/mmol Hematuria Yes

eGFR = estimated Glomerular Filtration Rate ACR = Albumin Creatinine Ratio

Next Steps

RESULTS

YOUR PATIENT HAS CKD OR AKI

1. Discontinue nephrotoxic medications (i.e. NSAIDs).
- 2. REFER TO NEPHROLOGY EMERGENT – PAGE NEPHROLOGIST AND/OR SEND PATIENT TO EMERGENCY ROOM.**
3. [Click for referral form](#)/ Contact Information.

DIABETIC NEPHROPATHY MANAGEMENT GUIDELINES

NON-DIABETIC CKD MANAGEMENT GUIDELINES

New Online Tools for Primary Care Kidney Health Management and Referrals

eGFR ACR Hematuria

eGFR = estimated Glomerular Filtration Rate ACR = Albumin Creatinine Ratio

[Next Steps](#)

RESULTS

YOUR PATIENT LIKELY HAS CKD

Repeat eGFR from serum creatinine, urea, electrolytes – Na, K, Cl, HCO₃, ACR at least once within 2 weeks. Renal ultrasound.

Does eGFR decline by > 20% in 1- 30 days OR decrease > 10% /yr OR is eGFR < 30?

If Diabetic, see [Diabetic Nephrology Management Guidelines](#). If non-diabetic, see [Non-Diabetic CKD Management Guidelines](#).

DIABETIC NEPHROPATHY MANAGEMENT GUIDELINES

New Online Tools for Primary Care Kidney Health Management and Referrals

eGFR ACR Hematuria

eGFR = Estimated Glomerular Filtration Rate ACR = Albumin Creatinine Ratio

[Next Steps](#)

RESULTS

YOUR PATIENT HAS CKD OR AKI OR GLOMERULONEPHRITIS

1. Discontinue nephrotoxic medications (i.e. NSAIDs).
2. [Refer to Nephrology](#).
3. [Calculate Kidney Failure Risk for CKD](#)
The Kidney Failure Risk Equation (KFRE) is for patients with Chronic Kidney Disease Stages 3-5 (eGFR <60). It is NOT to be used for patients with acutely declining renal function or increasing proteinuria.
4. Repeat eGFR/serum creatinine & serum electrolytes at least Q 1-4 weeks until seen by nephrology. Renal ultrasound. Forward all blood and urine test results to nephrology. Page on call nephrologist if:
 - a) Acute kidney injury or acute glomerulonephritis is suspected or you are not sure.
 - b) Evidence of worsening renal function.

If Diabetic, see [Diabetic Nephrology Management Guidelines](#). If non-diabetic, see [Non-Diabetic CKD Management Guidelines](#).

DIABETIC NEPHROPATHY MANAGEMENT GUIDELINES

NON-DIABETIC CKD MANAGEMENT GUIDELINES



New Online Tools for Primary Care Kidney Health Management and Referrals

Tool 2:

Kidney Failure Risk Equation Tool

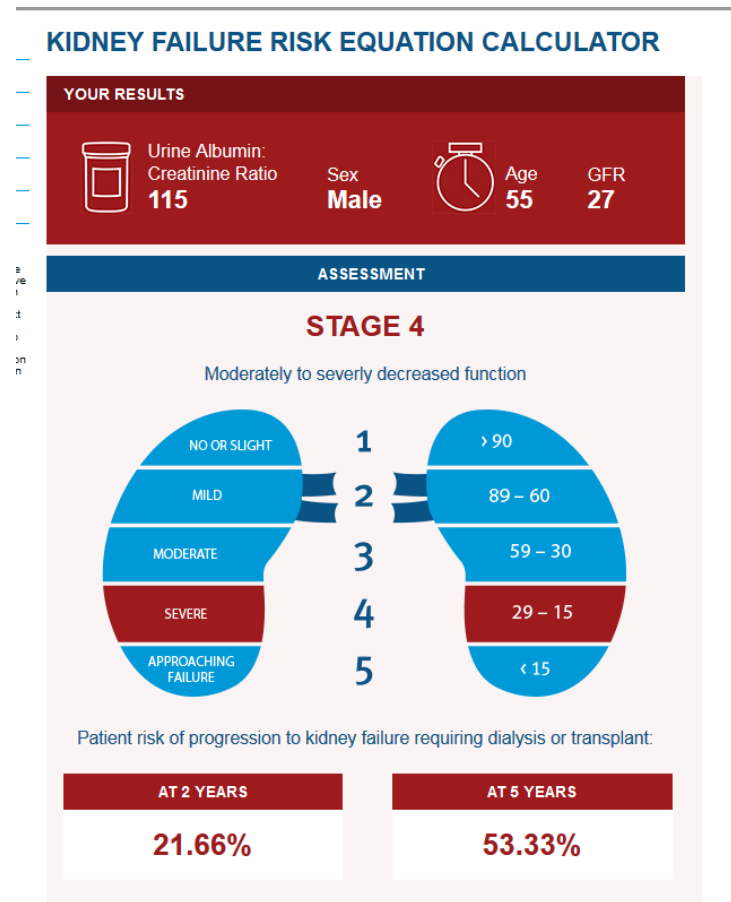
- Identifies risk of kidney failure within three and years and current stage of kidney disease (if present).
- More information available at kidneyfailurerisk.com

The screenshot shows the 'KIDNEY FAILURE RISK TOOLS & REFERRAL PATHWAYS' header with a 'NEPHROLOGY REFERRAL SHEET' icon. Below is the 'KIDNEY FAILURE RISK EQUATION CALCULATOR' form. It includes input fields for Age, Sex (set to Male), GFR (MI/Min/1.73M2), and Urine Albumin: Creatinine Ratio (mg/mmol). A blue 'Calculate' button and a purple 'Edit' link are present. A disclaimer at the bottom states: 'Disclaimer: The Kidney Failure Risk Equation* (KFRE) is for patients with Chronic Kidney Disease Stages 3-5 (eGFR <60). It is NOT to be used for patients with acutely or sub-acutely declining renal function or increasing proteinuria.'

New Online Tools for Primary Care Kidney Health Management and Referrals

Tool 2:

Kidney Failure Risk Equation Tool Results



New Online Tools for Primary Care Kidney Health Management and Referrals

Referral Form:

- Pick site
- Fax
- (Right click/save for fillable pdf)

Kidney Failure Risk Tools & Referral Pathways **kidneyhealth.ca**
Outpatient Nephrology Referral Form manitoba renal program

Detailed 2016 Nephrology Referral Pathways are available at: www.kidneyhealth.ca/pathways

Referring MD: _____ Ph. _____ Fax. _____

Patient Name: _____ Phone: _____

PHIN: _____ Address: _____

Please complete and append results of:

- Past medical history
- Medications list
- eGFR (also serum urea, creatinine) at least two values
- CBC
- Urinalysis
- Spot urine for ACR

Consider ordering and send reports when available:

- Serum and Urine Protein Electrophoresis (> 40 years of age)
- Kidney Ultrasound

REFERRAL SITE PREFERENCE (check one)

St. Boniface Hospital - Fax to (204) 233-2770

Health Sciences Centre - Fax to (204) 787-7366

Seven Oaks Hospital - Fax to (204) 697-4204

Brandon Regional Health Centre Fax to (204) 726-8797

Dr. _____

EMERGENT REFERRAL (< 24 HOURS)

DO NOT FAX REFERRAL

eGFR <15 mL/min with indications (see referral pathway) for emergent dialysis

PAGE NEPHROLOGIST ON CALL AT:

Health Sciences Centre (204) 787-2071

St. Boniface Hospital (204) 237-2053

Brandon (204) 578-4000 or (204) 571-7139

NON-EMERGENT

Reason for Urgency (check all that apply)

eGFR <30 mL/min

KFRE >3% / 5 year

eGFR decline by >20% in 1-30 days (acute kidney injury)

Proteinuria (ACR >100 mg/mmol)

Hematuria, suspected GN (eGFR or proteinuria criteria below, or ANA > 1:80, or decreased complements, or ANCA positive or normal urological evaluation)

Other (REASON) _____

Signature: _____ Date: _____

1 - ACR = Albumin to Creatinine Ratio. 2 - eGFR = estimated Glomerular Filtration Rate automatically calculated from serum Creatinine by MDRD Formula.

N.B. The noted appointment wait times are target benchmarks, but each patient will be triaged at time of referral. Appointment times may vary. Until your patient is assessed by a nephrologist, you (referring physician) are responsible for monitoring (and forwarding) your patient's blood and urine tests at regular intervals as suggested in the MRP Kidney Disease Referral Pathway. You should contact the nephrologist with any new concerns.

Engagement with Patients and Physicians

- Web site – www.kidneyfailurerisk.com
- Increase Awareness of Kidney Failure risk
- Feedback from patients on how they would like Kidney Failure risk presented
- Feedback from family physicians on design of referral pathways

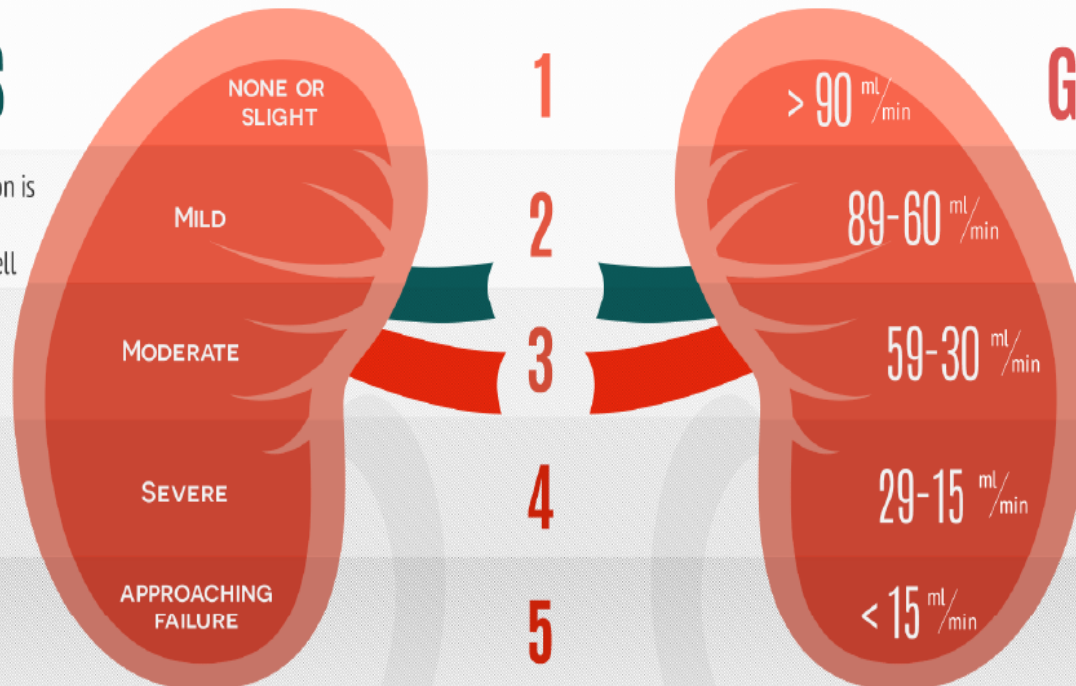
Patient Education Tools

THE FACTS & FIGURES OF CHRONIC KIDNEY DISEASE (CKD)

Chronic kidney disease (or CKD) is a condition where your kidneys gradually lose function over time.

CKD STAGES

Your kidneys' primary function is to filter and excrete waste products. To find out how well your kidneys are doing we measure the quantity of waste that circulates in your blood.



GFR GLOMERULAR FILTRATION RATE

This is a test used to check how well the kidneys are working by estimating how much waste is in your blood. The more waste products in your blood the lower the filtration rate of your kidneys.

Patient Education

CAUSES

The two main causes of CKD are diabetes and hypertension, which are responsible for up to two-thirds of all cases. Immune inherited causes and other reasons are responsible for the rest.



	DIABETES	45%
	HYPERTENSION	25%
	IMMUNE/ INHERITED	15%
	OTHER	15%

10%^{CKD}

OF

North Americans have CKD and more than 26 million have some form of the disease.



25%⁶⁵⁺

OF

North Americans over the age of 65 have some form of CKD.



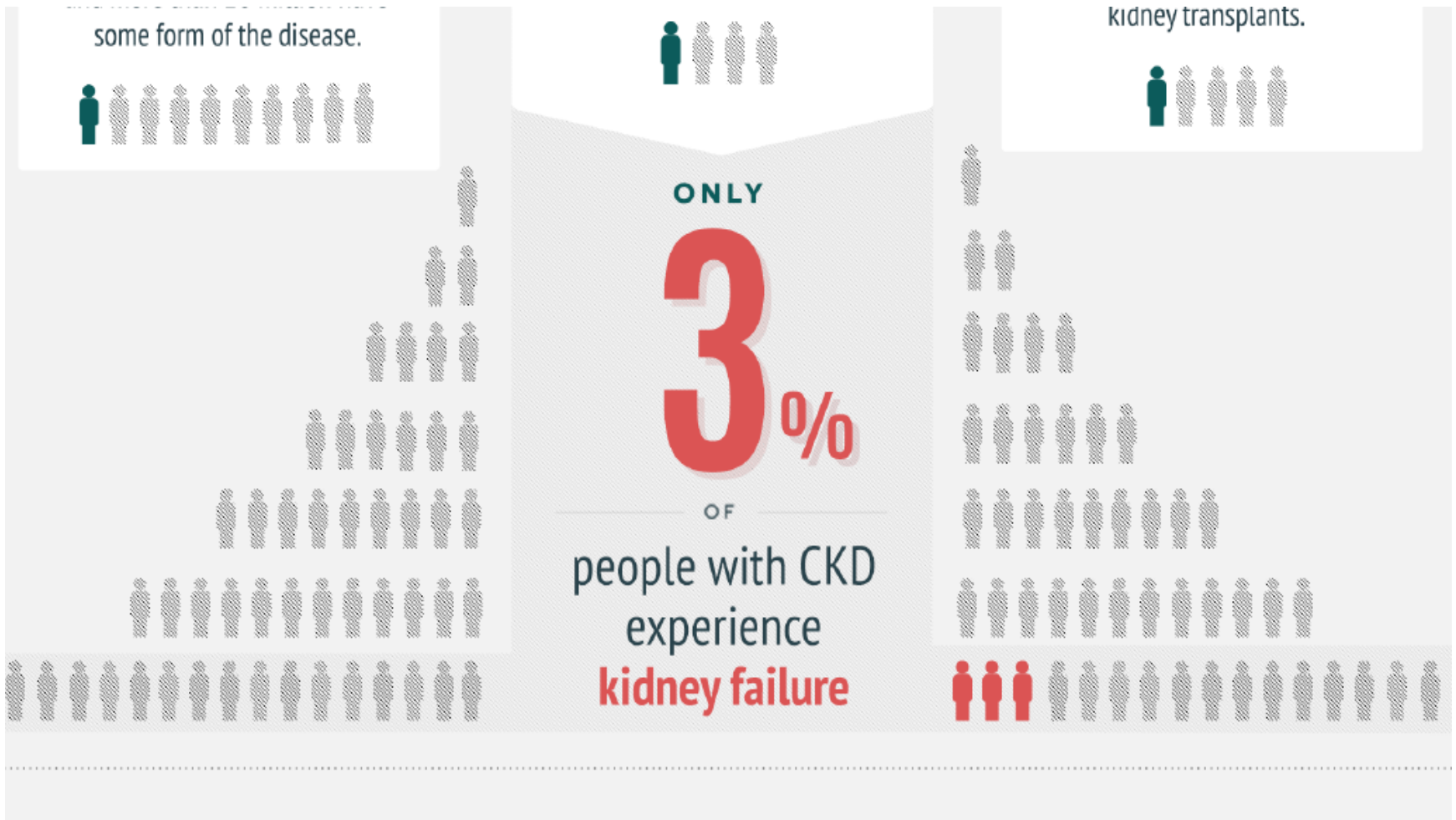
20%^{clock icon}

OF

North Americans with kidney failure are awaiting kidney transplants.



Patient Education



Risk Equation

KIDNEY FAILURE RISK CALCULATION

Using the patients **Urine**, **Sex**, **Age** and **GFR**, the kidney failure risk equation provides the 2 and 5 year probability of treated kidney failure for a potential patient with CKD Stage 3 to 5.



The equation has been validated in **more than 30 countries** worldwide, making it the most accurate and efficient way of finding out the patient disease levels.

 COUNTRIES PARTICIPATING IN VALIDATION

Personalized Medicine

YOUR RESULTS



200
URINE ALBUMIN

M
SEX



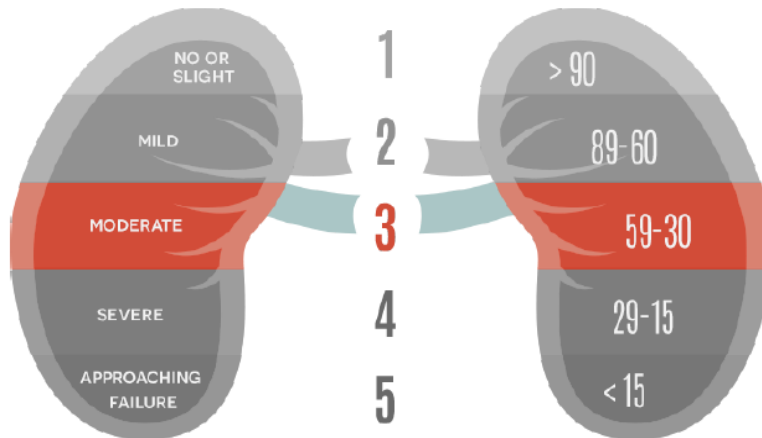
40
AGE

43
GFR

ASSESSMENT

STAGE 3

MODERATE DECREASE IN FUNCTION



Patient risk of progression to kidney failure requiring dialysis:

AT 2 YEARS

AT 5 YEARS

7%

20.4%

0-5 % AS LOW RISK 5-15 % AS INTERMEDIATE RISK 15 % AS HIGH RISK.

Deliverables

- More timely referrals of high-risk patients
- Fewer referrals of low-risk patients
- Decreased wait time to see a kidney specialist
- Cost savings for the Manitoba healthcare system



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Manitoba Renal Program