

# Tale of Many Functions; Funding, Kidney Services and outcomes : The BC Provincial Renal Agency



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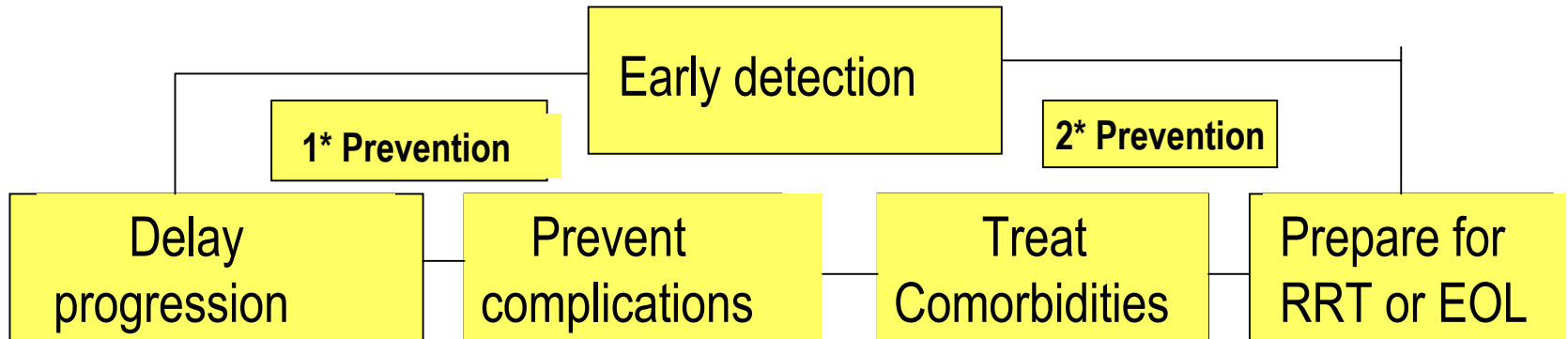


**The need for optimal and  
coordinated management of  
chronic kidney disease:  
philosophy, structure and outcomes**

# Optimal care

- **For individuals**
- **Predicated on appropriate identification**
- **Adequate resources and support**
- **Part of a comprehensive strategy**
  - **Public awareness**
  - **Public policy**
  - **Education**
  - **Research**

# Care Goals and elements of CKD Programs



Education    Patient independence    Communication    Tools

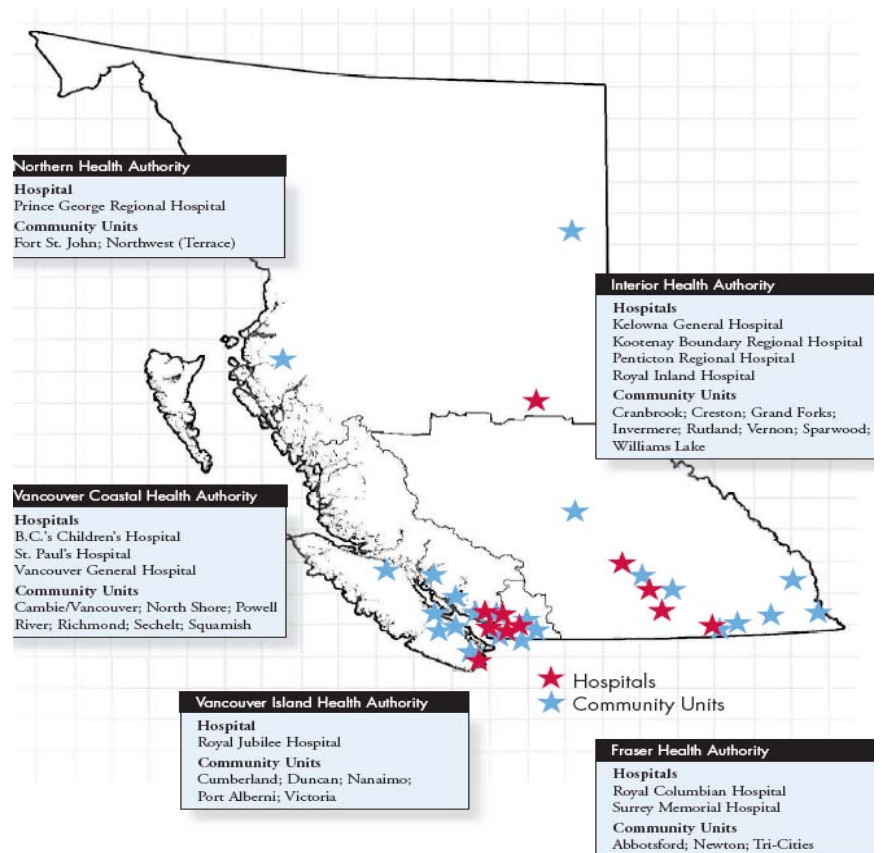
Longitudinal follow up of complex condition by trained interdisciplinary team

# Chronic Kidney Disease

- **Growing numbers**
- **Expensive care which is life saving**
  - Dialysis , transplantation
- **High cardiovascular risk**
  - High resource consumers
- **Model of complex patient group with track-able outcomes**
- **Identifiable group of care providers**

# British Columbia Provincial Renal Agency (BCPRA) Service Delivery Framework

- Coordinates and facilitates service delivery across HAs
  - Multiple interfaces
- Land mass ~ UK + Western Europe
- 4.2 Million pop
  - 2000+ Dialysis pts
  - 8000+ registered CKD
  - 2000 Tx pts



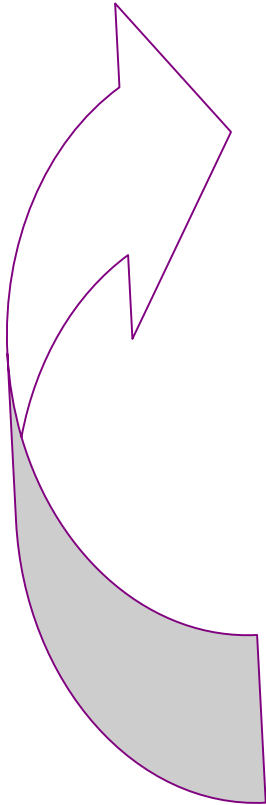
# Service Delivery Structure

- **BCPRA coordinates and facilitates service delivery across**
  - 11 hospitals and 24 community dialysis units
  - \$\$ follows pts
- **Clinical programs include:**
  - Chronic Kidney Disease / Kidney Care clinics
  - In-hospital and Community Dialysis Units
  - Independent Dialysis
    - Peritoneal Dialysis
    - Community, Facility-based Hemodialysis
    - Home-based Hemodialysis options
      - Centrally coordinated, regionally implemented

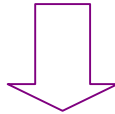
# Integrated information system: Unique and innovative PROMIS

- **Pt Registration Record and Outcome Management Information System**
- Only province-wide integrated registry for kidney disease patients in Canada (and internationally)
- **Comprehensive database:**
  - clinical care
  - administrative needs
  - clinical research
- **IMIS supports numerous activities**
  - patient care and financial modeling
  - health outcomes research and application
  - implementation of new, integrated care delivery systems
  - drug standardization, optimization
  - Quality improvement projects

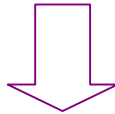
# An Integrated Quality Improvement Cycle



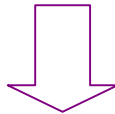
- **Key clinical/performance indicators**
- **Innovative patient care initiatives**



- **Data (PROMIS)**



- **Data analysis (BCPRA, Professional groups and Health Authority Renal Programs)**



- **Develop action plans**
- **Track outcomes**

# High-level example of indicators

- **Patient related**
  - Adequate removal of toxins by treatment
  - Meeting of clinical targets
- **Financial**
  - Ability to fund growth/new initiatives
  - Cost effective therapy options
- **Processes**
  - Expansion of independent care
  - Improvement to vascular access services
  - Funding of key fundamental services
- **Learning & Growth**
  - CQI
  - Research and implementations

# Growing Patient Population

Increase in kidney patients	July 2002	July 2007	Average % increase per year
<b>CKD 3-5 Non dialysis: Kidney care clinics/MD offices</b>	<b>2,356</b>	<b>8,106</b>	<b>28%</b>
<b>Hospital-based hemodialysis</b>	<b>915</b>	<b>1,096</b>	<b>4%</b>
<b>Community-unit hemodialysis</b>	<b>478</b>	<b>690</b>	<b>8%</b>
<b>Home-based hemodialysis</b>	<b>20</b>	<b>131</b>	<b>65%</b>
<b>Peritoneal dialysis</b>	<b>527</b>	<b>645</b>	<b>4%</b>



# CKD Strategy in BC: Interventions and Evaluation

## Intervention

## Evaluation

### Laboratory

GFR reporting

# tests

Standardize creatinine

# individuals

tested

### Guidelines

Develop

lab compliance

Disseminate

Referral patterns

(Revised 2008)

Test ordering

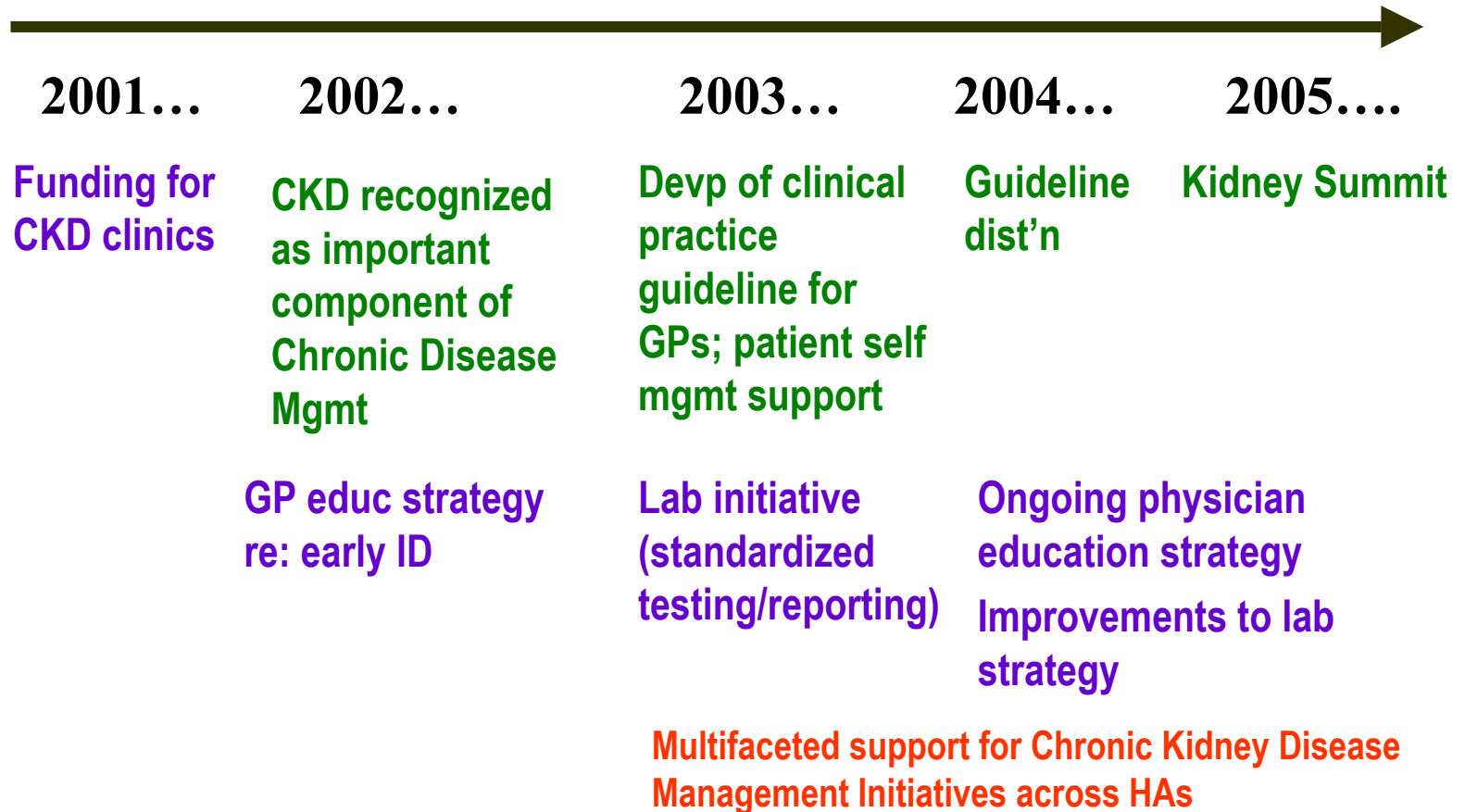
New dialysis

rate

### Education

Co-ordinated program MD Surveys: pre

# Reflections: Comprehensive CKD Initiative



# Clinical Practice Guideline

- Collaborative development by multidisciplinary group
- Supported and disseminated by the Ministry of Health to all MDs in the province x 2
- Access on website
- 7 recommendations for investigation & management (at-risk and diagnosed)
- Includes tools for MDs and patients

## GUIDELINES & PROTOCOLS

### ADVISORY COMMITTEE

#### Identification, Evaluation and Management of Patients with Chronic Kidney Disease

##### Scope

The first part of this guideline provides recommendations for the investigation and management of adult patients at risk of, and those diagnosed with, chronic kidney disease (CKD). The second part of the guideline describes care objectives for patients with CKD, focusing on approaches, interpretations of tests, and systems that should be in place to improve the likelihood that appropriate, evidence-based care is provided.

##### PART 1: INVESTIGATION OF PATIENTS AT RISK FOR KIDNEY DISEASE

##### RECOMMENDATION 1: Identify high-risk populations

Identify patients at risk of kidney disease based upon a directed medical and surgical history including comorbidities (e.g. diabetes, cardiovascular disease), as well as dietary, social, demographic, and cultural factors, a review of symptoms, and physical examination.

High-risk populations include those:

- with diabetes
- with a diagnosis of hypertension +/- cardiovascular disease
- with a family history of kidney disease
- belonging to specific high-risk ethnic groups: First Nations and Pacific Islanders.

Note: Age greater than 60 years is associated with an increased risk of impaired kidney function. However, there is insufficient evidence at this point to recommend screening all individuals over 60 solely on the basis of age.

##### RECOMMENDATION 2: Screen high-risk populations

Screen high-risk populations every 1-2 years depending upon clinical circumstances (e.g. yearly for persons with diabetes) using serum creatinine and random urine tests (see below for details).

The estimated Glomerular Filtration Rate (eGFR), computed from the serum creatinine value, is the best laboratory marker for kidney disease. Most laboratories in BC now automatically report eGFR when a serum creatinine is ordered. (See Calculating eGFR Conversion Table.)

- **Persistent eGFR values < 60 mL/min indicate substantial reduction in kidney function.**
- Urine test abnormalities, even with persistent eGFR values  $\geq$  60 mL/min, indicate abnormal kidney function, either as an isolated condition or as a symptom of a systemic disease.

# Patient Materials

- **Clinical guideline includes patient flow sheets and a Guide for Patients on managing health**
- **Also includes patient log sheet to track key info, including medication use**
- **MOHS CDM website includes range of patient information on CKD and links to self-mgmt resources**
- **Chronic Disease Management strategy**

## Chronic Kidney Disease

### A GUIDE FOR PATIENTS

#### What is chronic kidney disease (CKD)?

Kidneys are as important to your health as your heart or your lungs. Shaped like kidney beans and about the size of your fist, your kidneys are located on either side of your spine under the lower ribs. Their main task is to remove waste products from your blood. Your kidneys also produce important hormones that regulate some of your body's functions and help balance water and minerals in your body.

Chronic kidney disease (CKD) refers to a medical condition where your kidneys' ability to filter wastes from your body is impaired. CKD usually starts slowly and progresses over a number of years. If diagnosed and treated early, CKD may be slowed down or stopped. However, if it keeps getting worse, CKD may lead to kidney failure, also called End-Stage Renal Disease (ESRD). If you have ESRD, treatment options include dialysis or a kidney transplant. These treatments can help you stay healthy and continue your daily activities.

There is no cure for CKD – the goal of treatment is to keep the kidneys functioning as long as possible by detecting and treating the disease at its early stages. Sometimes, if treated early, all that may be needed is a change in your diet, control of your blood pressure and/or some specific medication.

#### What are the symptoms of kidney disease?

CKD is a silent disease. Most people do not have any symptoms in the early stages. Symptoms begin when most of your kidney function is lost. Symptoms that may show up as your kidney function deteriorates include frequent headaches, fatigue, and itching all over the body.

As kidney disease worsens, the body is unable to get rid of waste products and excess water. This condition is called uremia. In addition to earlier symptoms, you may experience:

- Frequent urination or passing less urine
- Swelling in legs, ankles, feet, face, and/or hands
- Metallic or bad taste in mouth
- Nausea and vomiting
- Loss of appetite
- Shortness of breath
- Feeling cold
- Trouble concentrating, dizziness
- Leg pain/muscle cramps

#### Who is at risk of developing CKD?

The leading causes of kidney failure are **diabetes** and **high blood pressure**. These conditions interfere with the filtering ability of the kidneys and can lead to kidney failure. Early diagnosis and careful management of these conditions can delay and even prevent the onset of kidney failure. Talk to your doctor if you have diabetes or hypertension. Other factors that increase a person's risk of developing CKD include:

- Family history of kidney disease (e.g. polycystic kidney disease)
- Certain ethnic groups (First Nations, Pacific Islanders)
- Overuse of anti-inflammatory drugs and pain-killers
- Infection or injury to the kidneys (e.g. glomerulonephritis)

#### How can I prevent or control CKD?

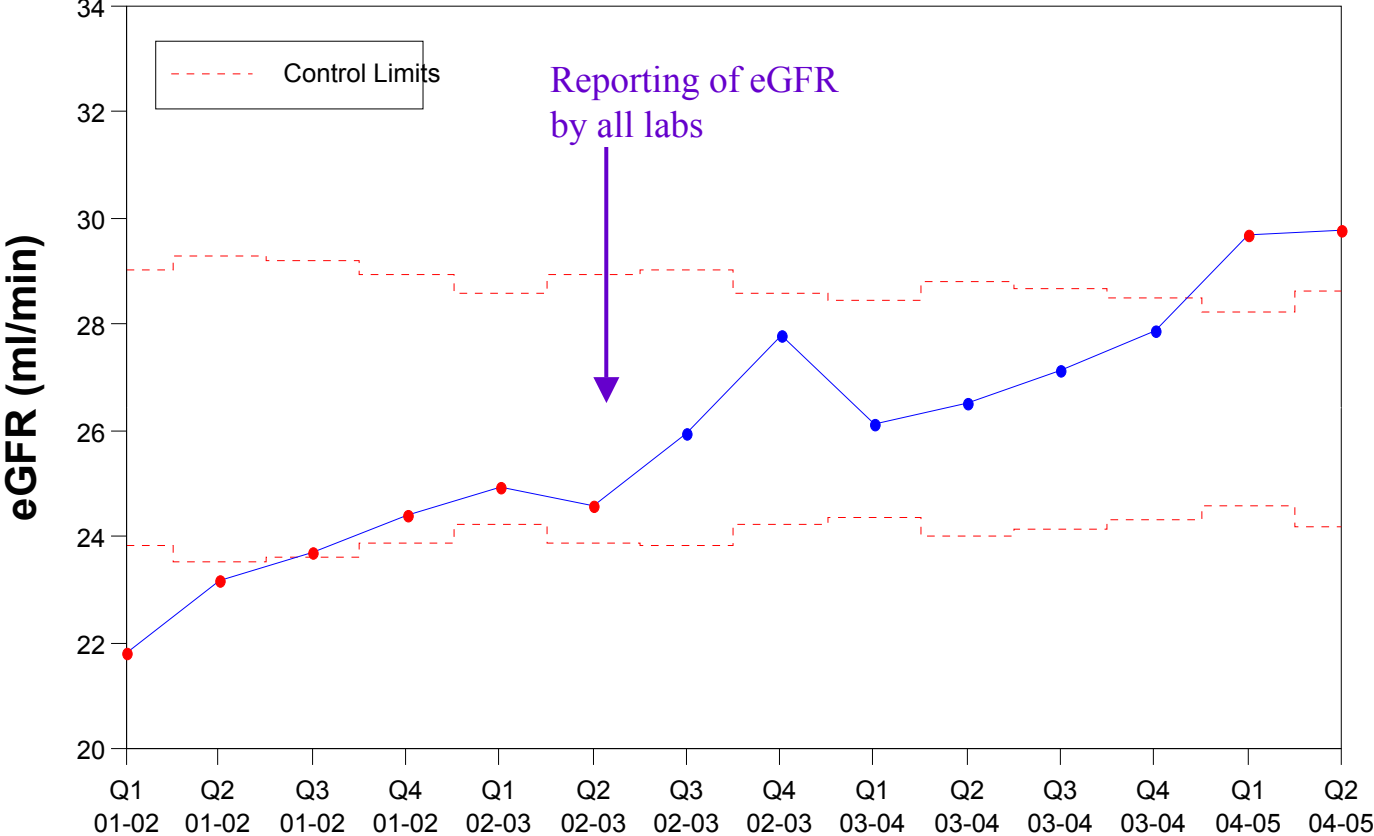
There is no cure for CKD, but by learning more about your illness and taking an active part in managing your health you may be able to keep your kidneys functioning longer. Consider using the *Chronic Kidney Disease Patient Log* to monitor your progress. You can take this log with you when you visit your doctor. Other important things you can do include:

- **Control diabetes**  
If you have diabetes, keep your blood glucose levels as close to normal as possible. Along with taking your medications as prescribed, keep your weight under control and exercise regularly. Your doctor should routinely test whether your kidneys are functioning properly.

**Early measurements.....**  
**? successes**

# Over the last 2 years, the mean eGFR at CKD registration has increased

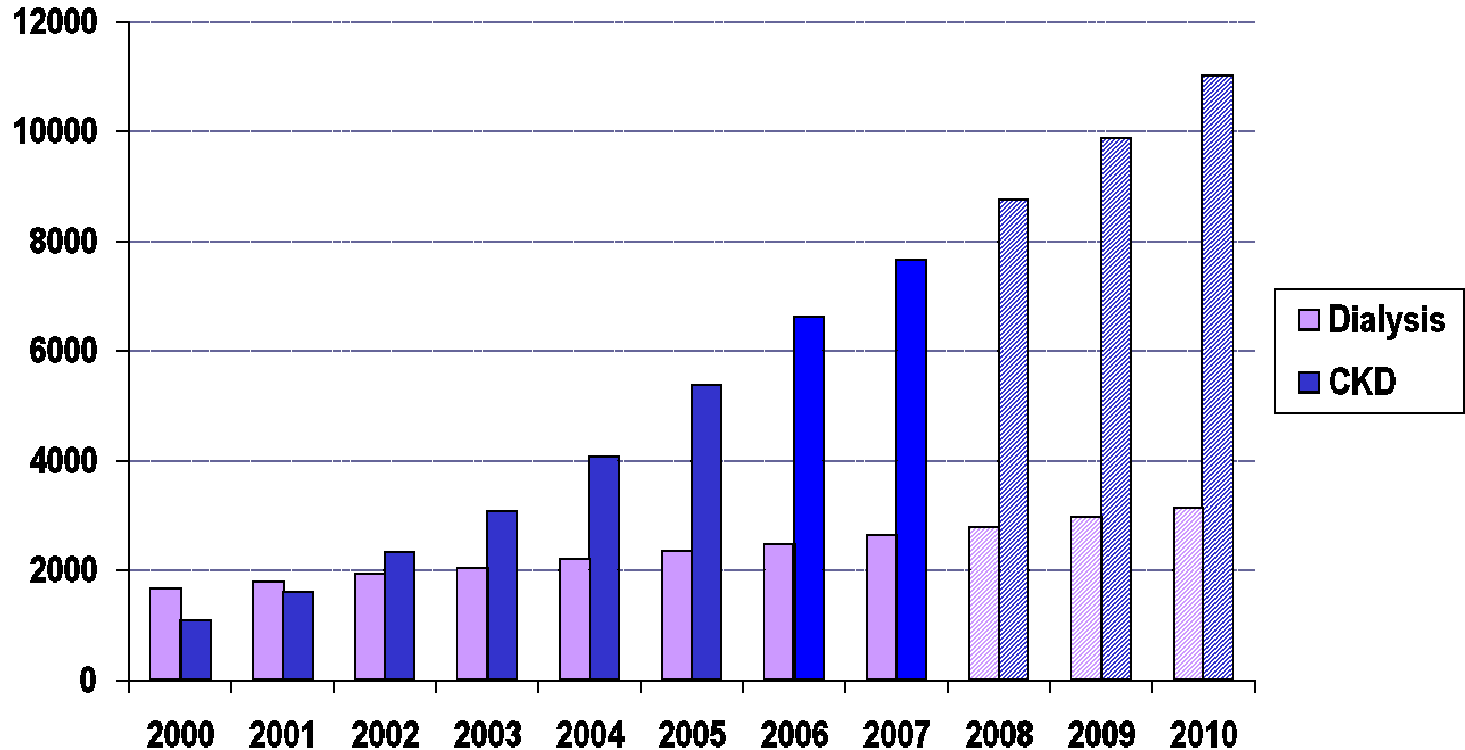
### Mean eGFR at CKD Registration



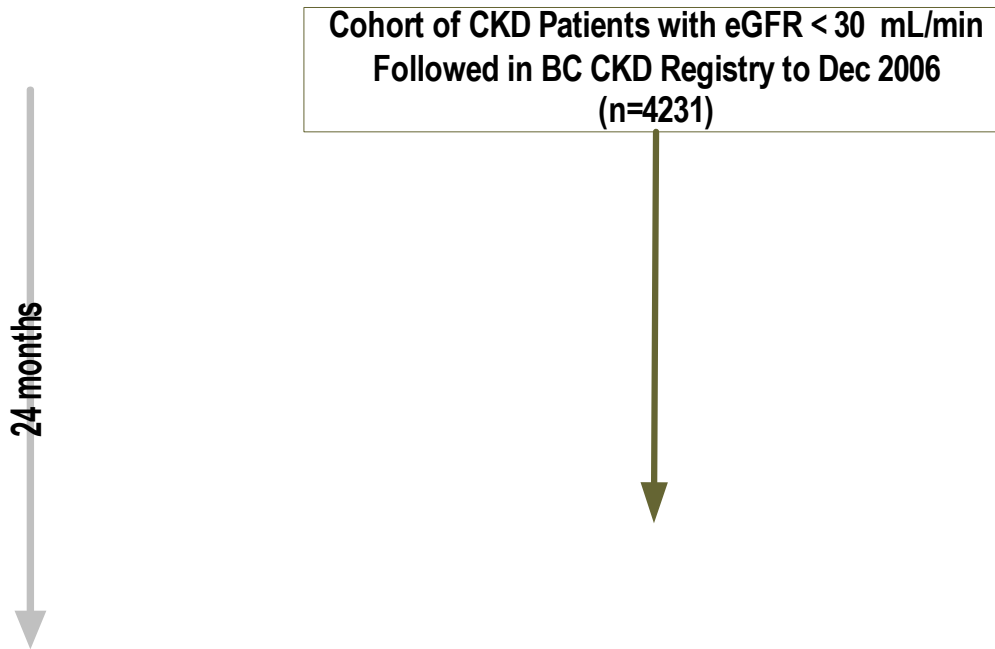
# Early Intervention and cost avoidance

- **Early identification and treatment of CKD**
  - Result: dialysis growth reduced from 12% to 6-8% per year (patients receive treatment/education to delay disease progression)
- **Growth reduction represents cost avoidance of > \$1.6 million/year (based on 06/07 costs).**
  - \$1.6 million represents the cost of **188 dialysis patient years** versus **1,848 "CKD" patient years** (those not on dialysis)

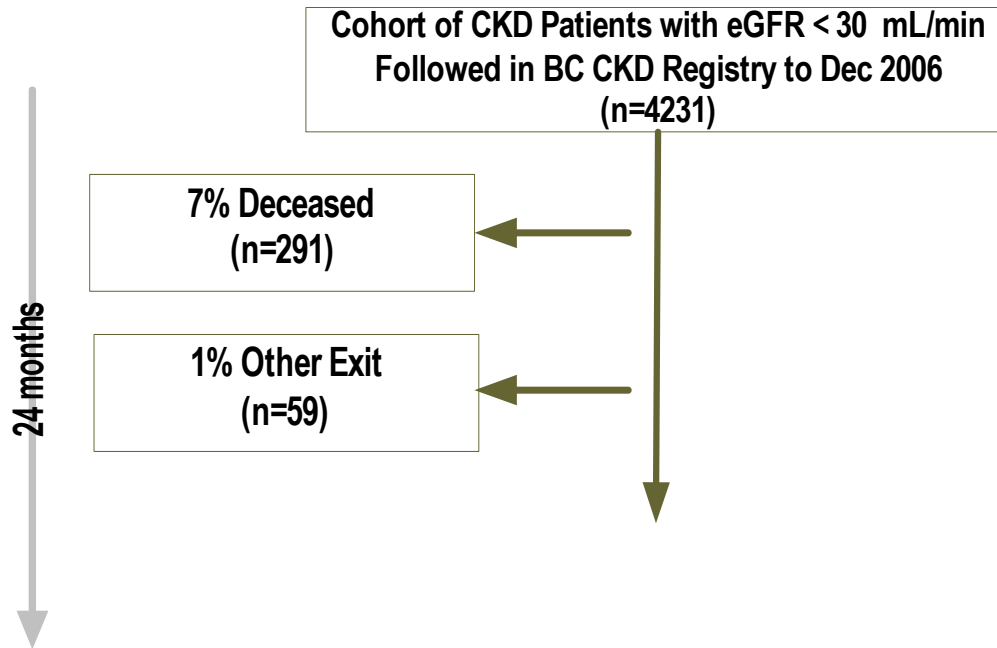
# Despite exponential growth of CKD, dialysis growth remains constant



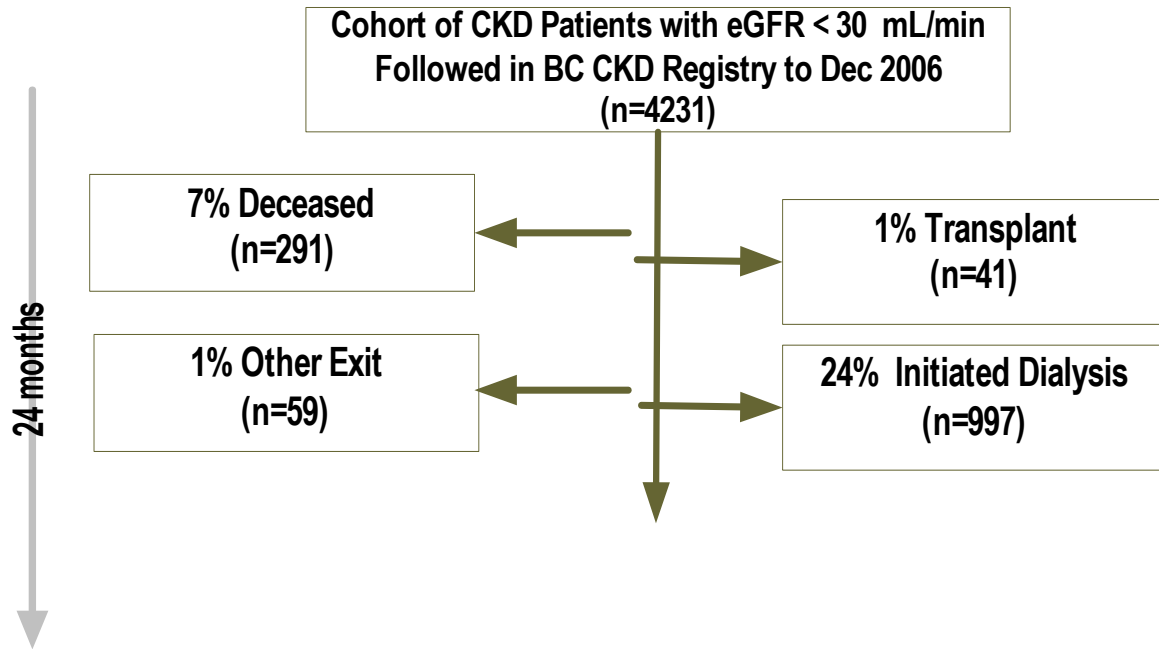
# Provincial Outcomes: Overall



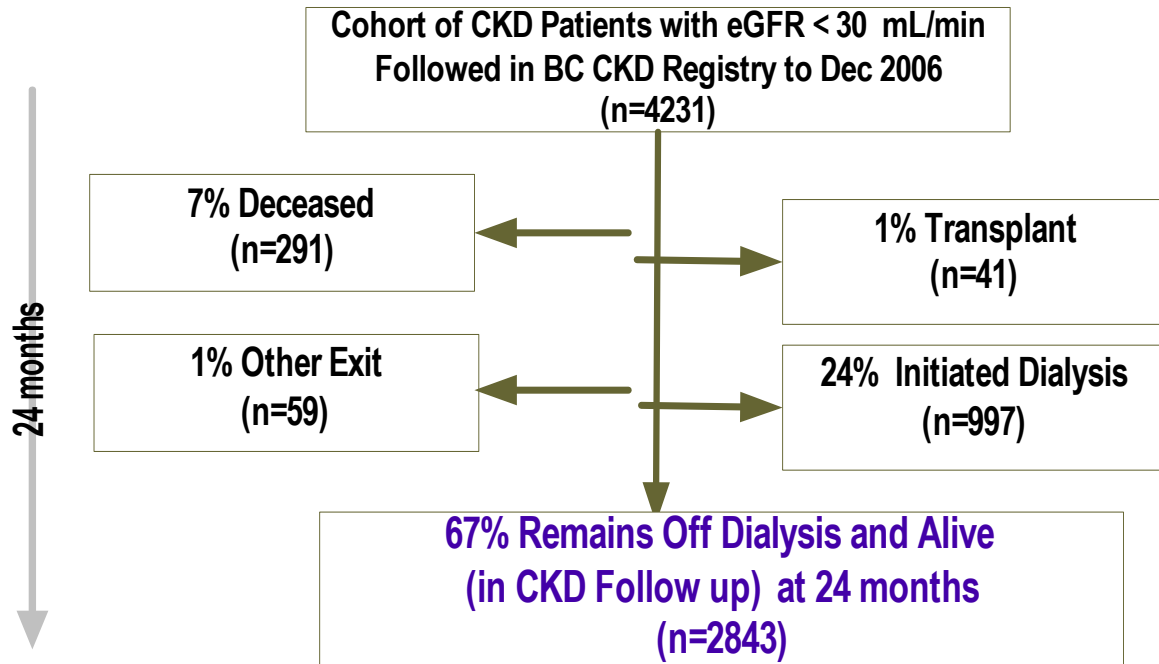
# Provincial Outcomes: Overall



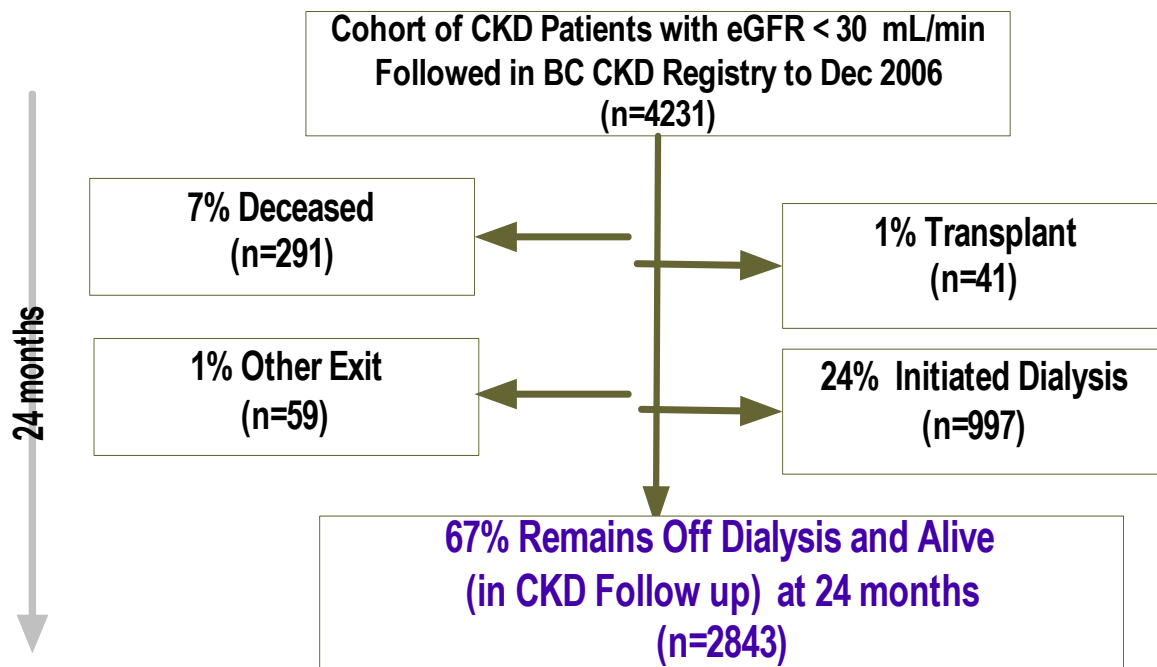
# Provincial Outcomes: Overall



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# Provincial Outcomes: Overall



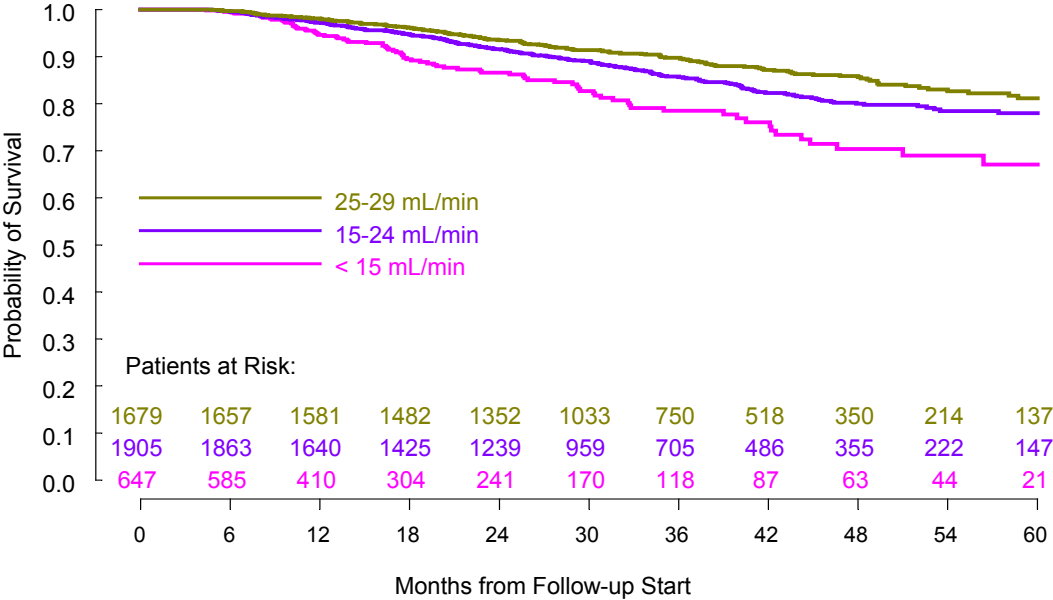
**During total of 11216 patient years of follow-up:**

<b>1608 dialysis initiations</b>	<b>(143 per 1000 pt years)</b>
<b>71 transplants</b>	<b>( 6 per 1000 pt years)</b>
<b>510 deaths</b>	<b>(45 per 1000 pt years)</b>

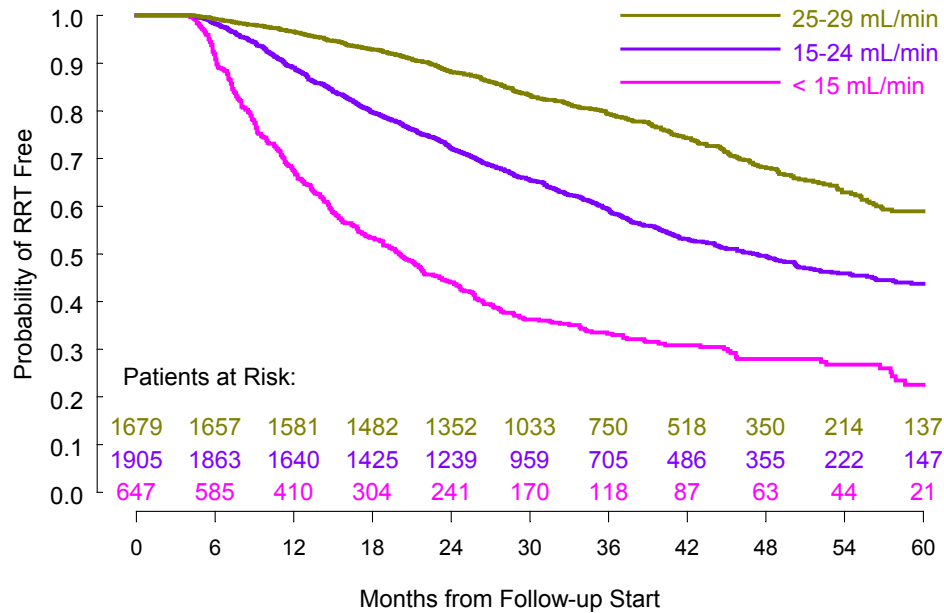
# Rates of Progression

- **GFR slope**  
**Median: -2.06 (P<sub>25</sub>: -5.22, P<sub>75</sub>: 0.43)**  
**ml/min/ year**
- **28 % 0 ml/min/ year progression**
- **46 % 0.1 – 5.0 ml/min / year**
- **26 % > 5 ml/min / year**

# Death Prior to RRT by GFR

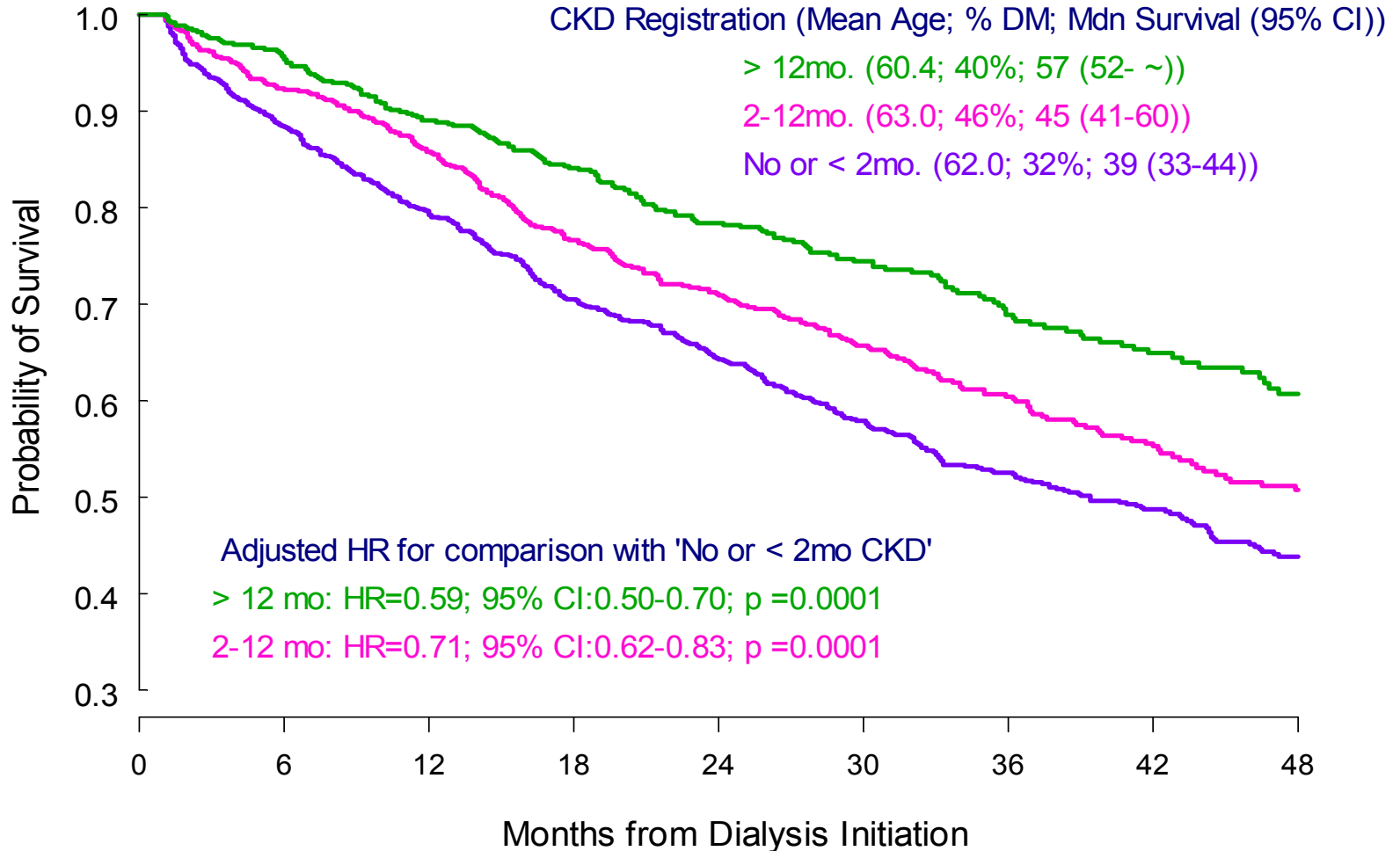


# Probability of staying off RRT by GFR



# Early Intervention = Longer Survival Rates

(as measured by CKD registration)



**Kidney Function Clinic Program  
Vancouver BC**

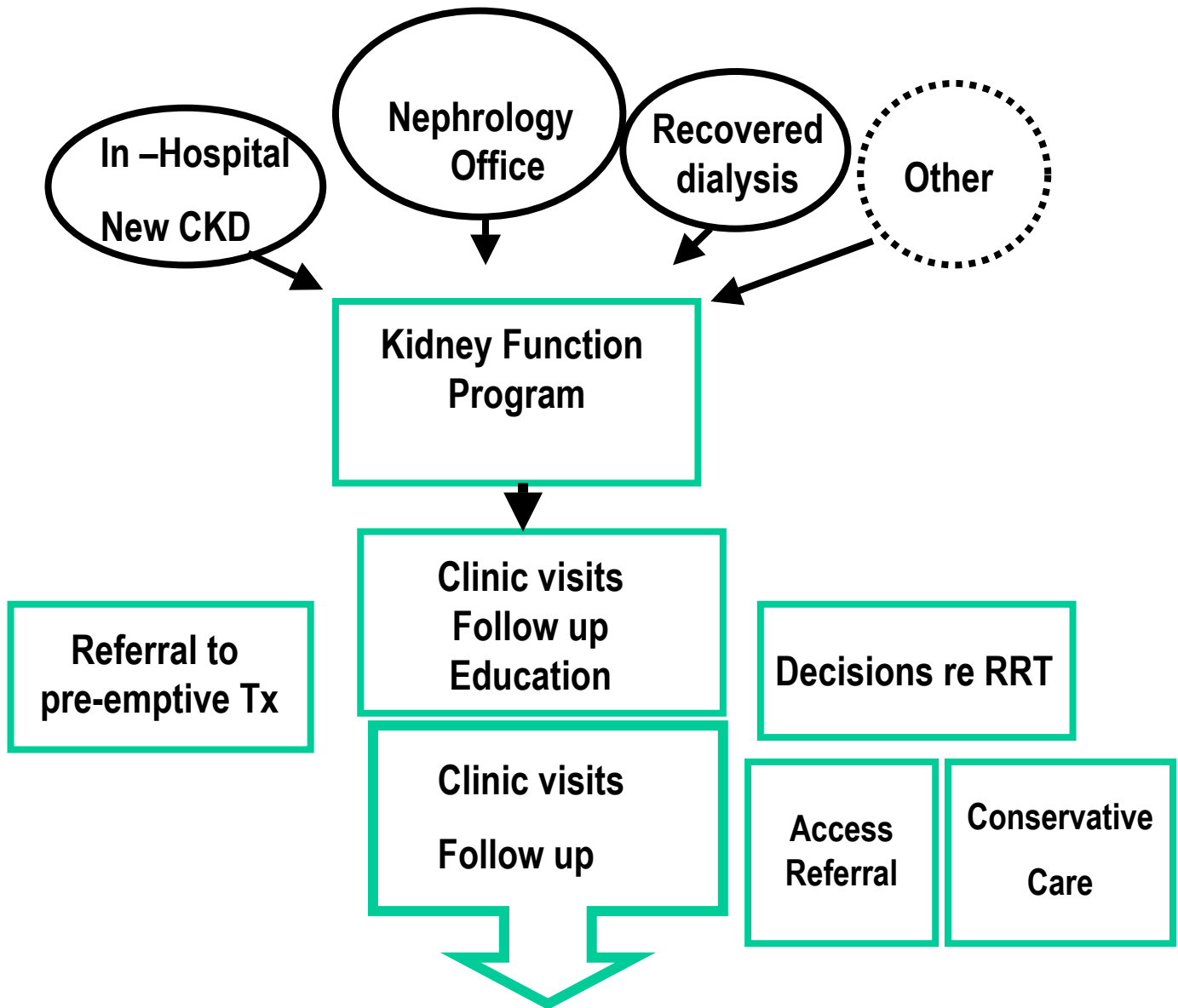
**“One model of coordinated care”**

# Philosophy and Care principles

- **Overarching Philosophy**
  - maintenance of health
    - irrespective of rate of renal decline
    - maximize independence and understanding
    - involvement of families
  - preparation for RRT ( Dialysis or Transplant)
    - requires > 12 months to be effective
    - requires repetition ( adult learning principles)
    - should be discussed early
- **Involvement in clinical research studies**
  - Optimized pt care
  - Integrates discovery, education and care

# Components KF Program

- **Longitudinal follow-up by trained team of individuals :**
  - MD, Nurse, Dietitian, Pharmacist, Social worker
  - Data entry/unit clerk
- **Protocolized laboratory and clinic visit**
- **Attention to all CVD and CKD comorbidities**
- **Vaccination program**
- **Education program**
  - Self management
  - Diet, medication, exercise, smoking cessation
  - Renal replacement options : dialysis, Tx and conservative



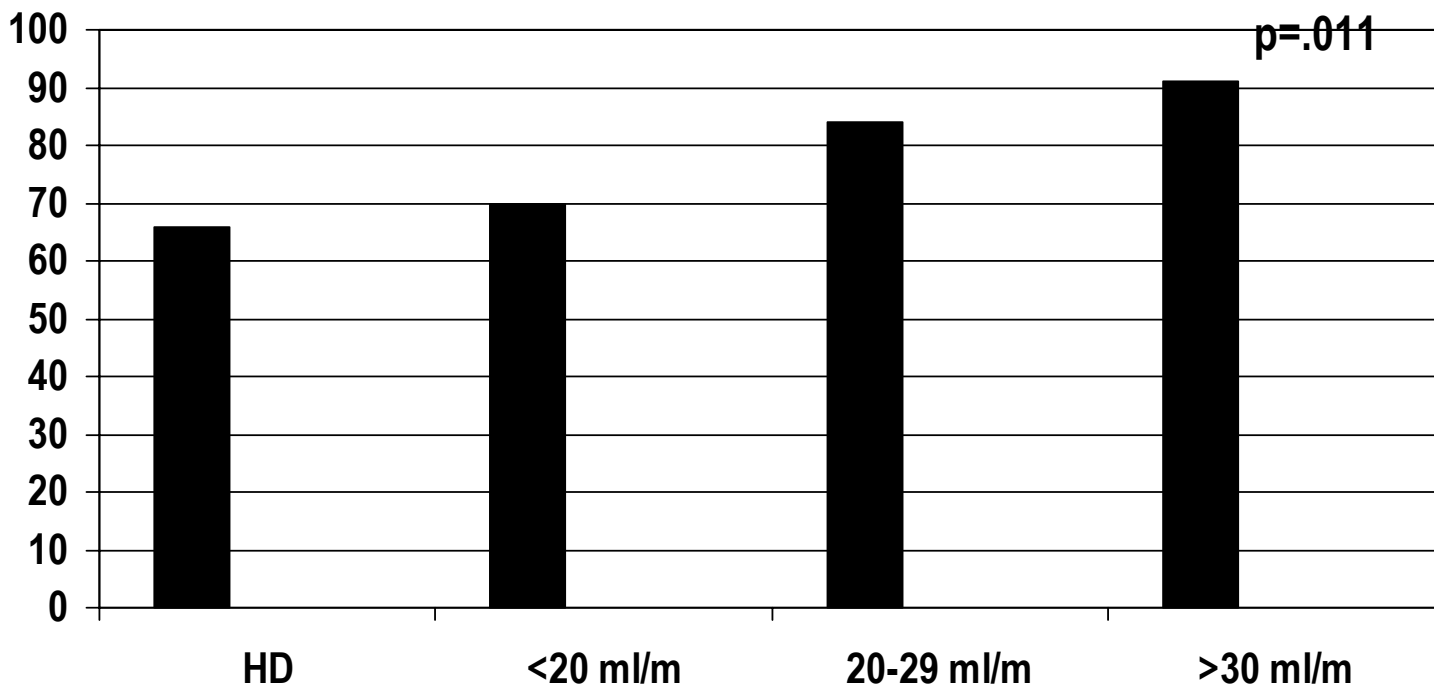
# Tools Used

- **Pre-printed orders and worksheets**
  - ensures desired management, including frequency of interactions ( Lab, clinic etc)
  - pre-printed laboratory orders: regular intervals
  - Vascular access/ Transplant team referral
  - Outcomes of education session re: RRT
- **Preprinted information letters for pts**
  - translated versions available
- **Web-based Electronic database:**
  - ~ EMR: uploads from labs, hospitals etc

**The outcomes that we can  
measure.....**

# Hepatitis B Vaccination Program: Sero-Conversion is related to GFR level

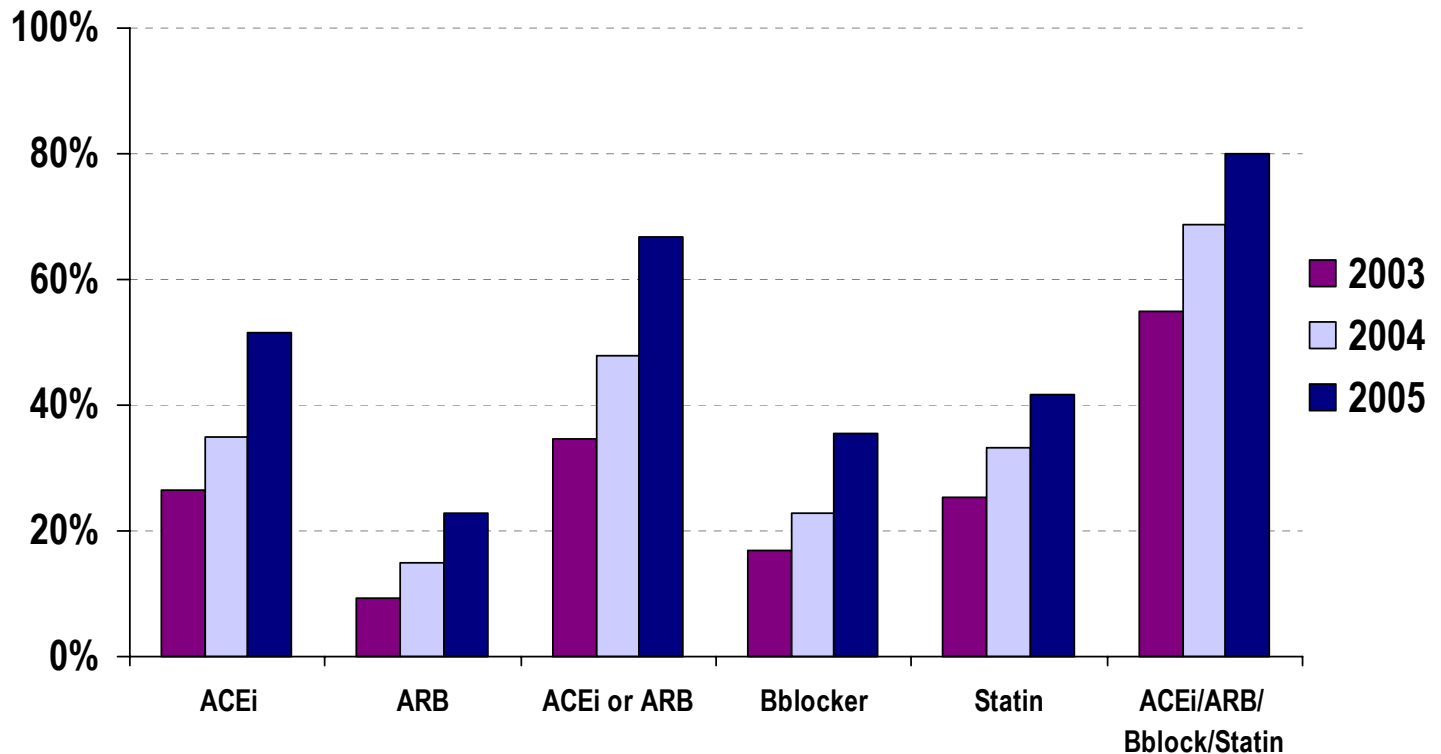
N= 165 consecutive pts



DaRoza et al AJKD 2003

# Use of Cardio-protective Medications

## BC CKD Patients Attending Multidisciplinary Clinics



# The impact of multidisciplinary approach to CKD

- **N = 288 pts**
- **Exposures compared**
  - Nephrologist alone
  - Nephrologist and Multidisciplinary clinic ( formal )
- **Description**
  - Similar time of exposure ( 40 months median)
  - Similar referral base (geographical )
  - Same institution, same MD's: Access to all resources
- **Outcomes:**
  - Status at time of dialysis start
  - Mortality post dialysis start

# Results Demographics N= 288

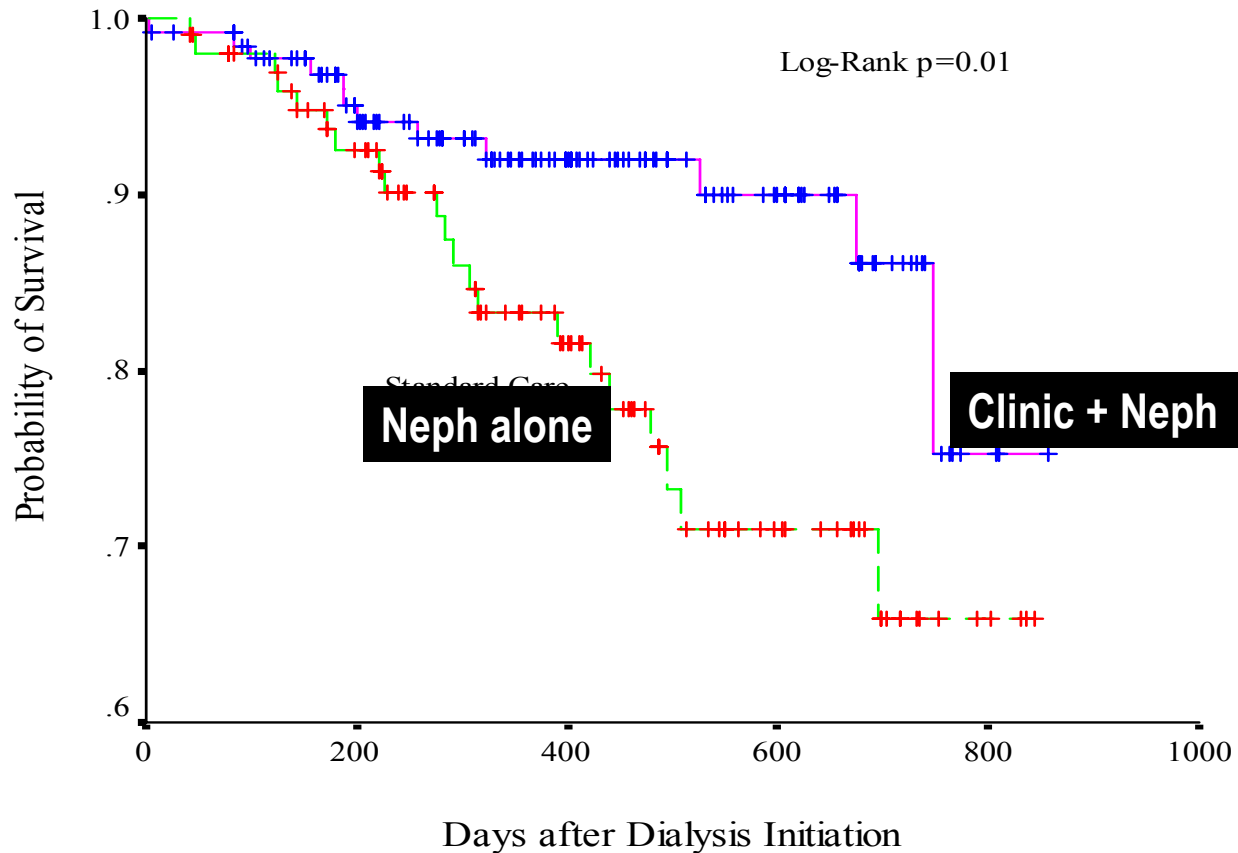
	<b>Traditional</b>	<b>Neph + MDC</b>
<b><i>N</i></b>	<b>156</b>	<b>132</b>
<b>Mean follow up</b>	<b>43m</b>	<b>40m</b>
<b>Age</b>	<b>64</b>	<b>60</b>
<b>Female</b>	<b>43%</b>	<b>35%</b>
<b>Diabetes</b>	<b>33%</b>	<b>34%</b>
<b>Kidney Disease</b>		
<b>Diabetes</b>	<b>20</b>	<b>25</b>
<b>Hypertension</b>	<b>21</b>	<b>19</b>
<b>GN/Autoimmune</b>	<b>23</b>	<b>26</b>

# Results

## Characteristics at dialysis start

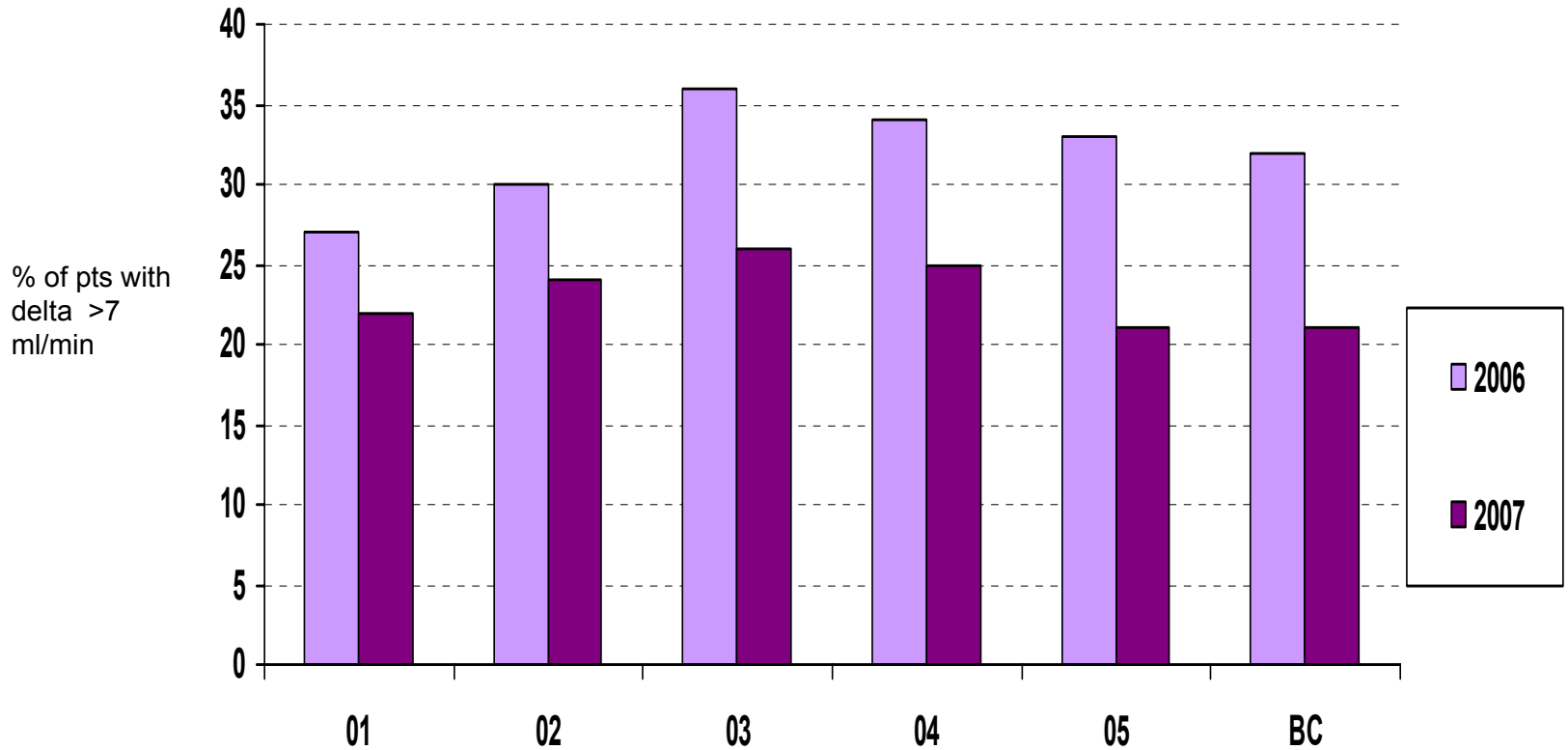
	<b>Traditional</b>	<b>Neph + MDC</b>	
<b><i>N</i></b>	<b>156</b>	<b>132</b>	
<b>Creatinine</b>	<b>707</b>	<b>650</b>	<b>.03</b>
<b>GFR</b>	<b>7.0</b>	<b>8.4</b>	<b>.001</b>
<b>Hgb</b>	<b>90</b>	<b>102</b>	<b>.0001</b>
<b>Alb</b>	<b>34.8</b>	<b>37</b>	<b>.002</b>
<b>Ca</b>	<b>2.16</b>	<b>2.29</b>	<b>.0001</b>
<b>PO4</b>	<b>1.73</b>	<b>1.73</b>	<b>.90</b>

# Survival advantage Clinic + Nephrologist vs Nephrologist alone



# Improved delay of eGFR progression over 12 months\*

Mdn BL GFR    31 (23-41)   28 (21-36)   26 (20-35)   29 (22-37)   30 (24-37)   29 (21-37)



\*eGFR decrease >7ml/min/year

# Provincial Framework

- **Local and regional differences in execution of CKD clinics**
- **Philosophy**
- **History**
- **Resources**
- **Context**
- **Opportunity to compare and contrast**

# Focus on Independent Dialysis

- **Variety of options:**
  - peritoneal dialysis;
  - home-based hemodialysis
  - self-care hemodialysis in hospital or community unit
- **Focus on independence vs. location**

Independent Dialysis:  
Is it an option for you?



Improved quality of life  
Fewer symptoms during and between dialysis  
Fewer medications  
More free time  
Less days in hospital



BC Renal Agency  
An agency of the Provincial Health Services Authority

# Patient Education DVD

- Featuring real-life patients talking about every aspect of the kidney care continuum
  - diagnosis and prior to dialysis care
  - dialysis options (facility-based and independent)
  - transplant
  - end of life issues

從患者到患者  
卑詩省腎臟護理須

ਬੀ.ਸੀ. ਵਿੱਚ ਗੁਰਦਿਆਂ ਦੀ ਦੇਖਭਾਲ  
ਮਰੀਜ਼ ਵਲੋਂ ਮਰੀਜ਼ ਦੀ ਮੋਦਦ

Pasyente sa Pasyente:  
Pangangalaga sa Sakit sa Bato sa BC

Health Authority Renal Programs: Fraser Health, Interior Health,  
Northern Health, Vancouver Island Health, Vancouver Coastal Health/  
Providence Health Care, BC Children's Provincial Renal Program

700-1380 Burrard Street, Vancouver, BC V6Z 2H3  
Phone: 604-875-7340 email: bcpra@bcpra.ca  
www.bcrenalagency.ca Produced 2007

Roaring  
mouse  
media

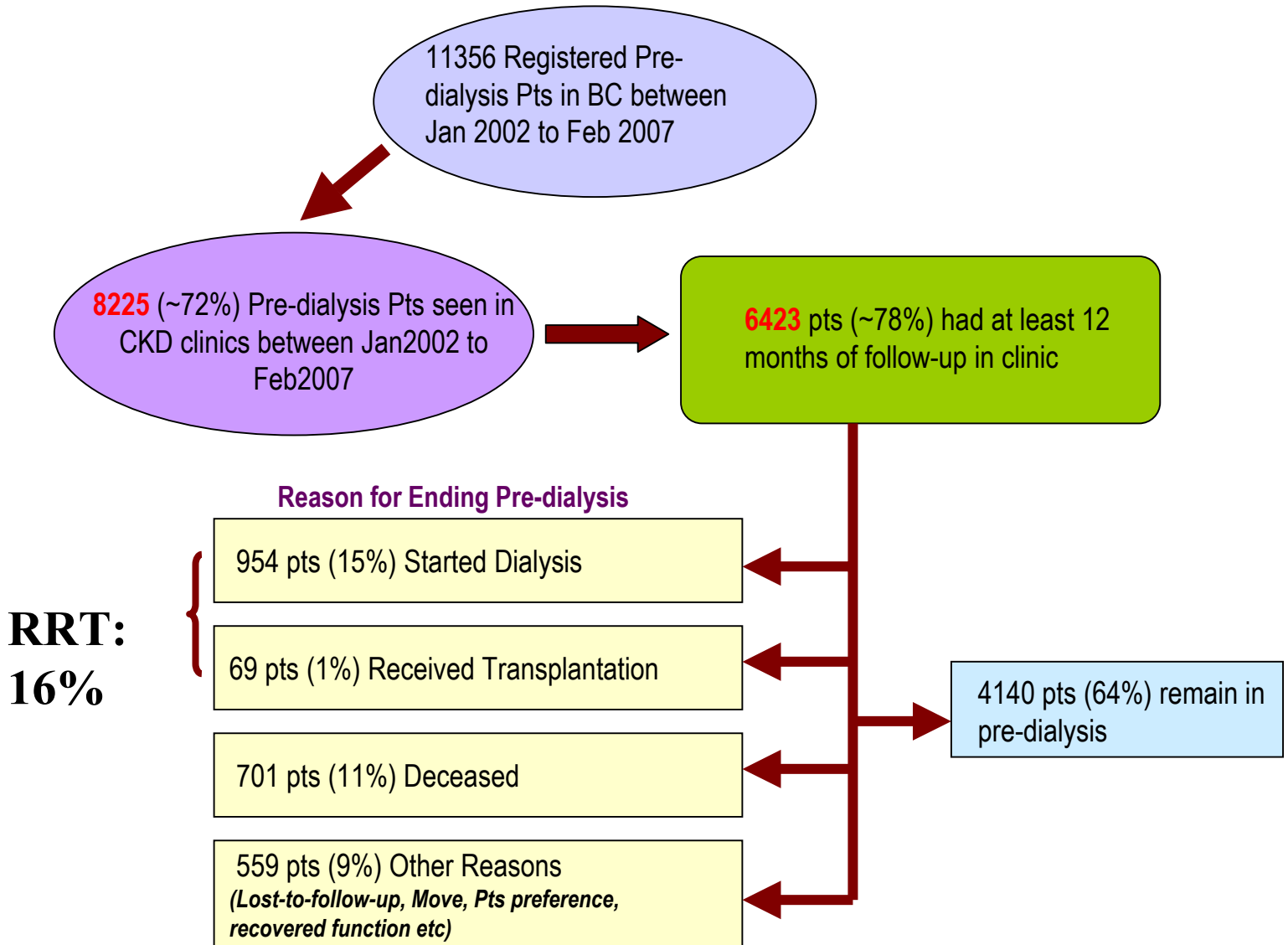
Patient to Patient  
Kidney Care In BC

Digital  
Education  
Package

Patient to Patient  
Kidney Care in BC

Cantonese 粵語 English 英語 Mandarin 國語 Punjabi ਪੰਜਾਬੀ Tagalog

# Provincial Perspectives: CKD



# Cohort Characteristics

	Total	Pre-dialysis Registration Year				
		2002	2003	2004	2005	2006/7
<b># Patients</b>	<b>6423</b>	757 (12%)	960 (15%)	1342 (21%)	1599 (25%)	1765 (27%)
<b>Mean Age</b>	<b>67</b>	65	66	66	68	69
<b>% Male</b>	<b>56%</b>	58%	56%	57%	54%	56%
<b>%Diabetes</b>	<b>24%</b>	30%	28%	25%	21%	21%
<b>Mean eGFR (ml/min)</b>	<b>33</b>	28	31	33	36	34
<b>% Pts by eGFR group:</b>						
<b>&gt;60 ml/min</b>	<b>5%</b>	2%	5%	5%	5%	4%
<b>45-60 ml/min</b>	<b>10%</b>	7%	8%	10%	12%	10%
<b>30-45 ml/min</b>	<b>34%</b>	28%	30%	31%	39%	34%
<b>15-30 ml/min</b>	<b>46%</b>	52%	48%	48%	41%	46%
<b>&lt;15 ml/min</b>	<b>5%</b>	11%	9%	6%	3%	5%

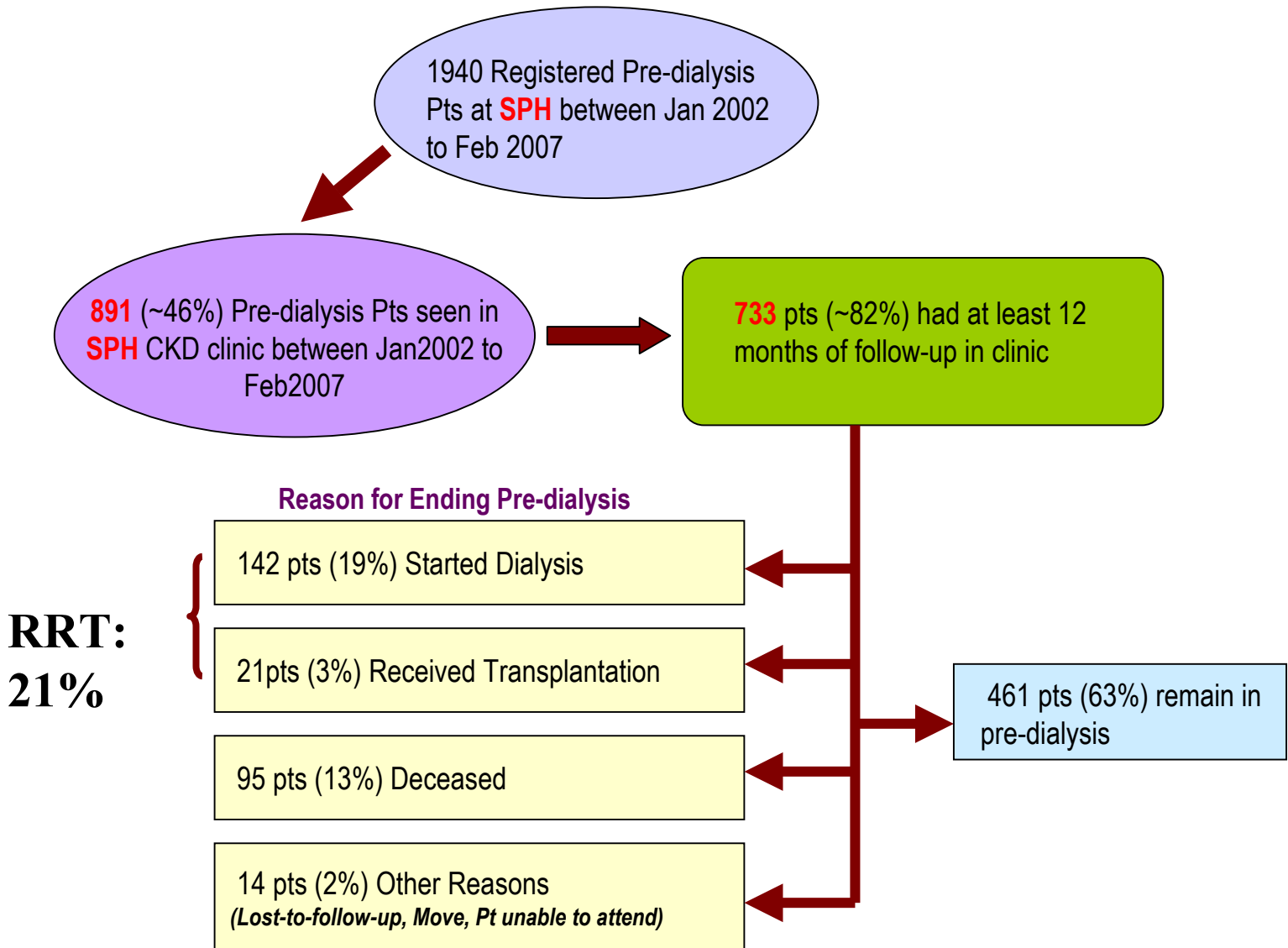
\* Age = Age at pre-dialysis registration

\* 2006/7 = contains full calendar year of 2006 + first 2 months of year 2007

# Key Indicators at 12 Months after CKD clinic care

	Pre-dialysis Registration Year					
	Total	2002	2003	2004	2005	2006/7
Mean Hemoglobin	124	124	124	125	124	126
Mean Calcium	2.31	2.29	2.29	2.31	2.32	2.32
Mean Phosphate	1.27	1.31	1.30	1.27	1.25	1.23
Median PTH	10.0	10.9	11.5	10.2	9.2	9.0

# SPH CKD Clinic Outcomes



# Cohort Characteristics

	Total	Pre-dialysis Registration Year				
		2002	2003	2004	2005	2006/7
<b># Patients</b>	<b>733</b>	131 (18%)	149 (20%)	163 (22%)	150 (21%)	140 (19%)
<b>Mean Age</b>	<b>64</b>	63	65	65	63	67
<b>% Male</b>	<b>61%</b>	61%	64%	61%	58%	62%
<b>%Diabetes</b>	<b>43%</b>	37%	46%	37%	51%	43%
<b>Mean eGFR (ml/min)</b>	<b>30</b>	29	31	29	32	31
<b>% Pts by eGFR group:</b>						
<b>&gt;60 ml/min</b>	<b>3%</b>	1%	5%	1%	3%	3%
<b>45-60 ml/min</b>	<b>8%</b>	10%	8%	8%	10%	6%
<b>30-45 ml/min</b>	<b>32%</b>	26%	34%	34%	31%	36%
<b>15-30 ml/min</b>	<b>50%</b>	52%	43%	51%	53%	49%
<b>&lt;15 ml/min</b>	<b>7%</b>	11%	10%	6%	3%	6%

\* Age = Age at pre-dialysis registration

\* 2006/7 = contains full calendar year of 2006 + first 2 months of year 2007

# Key Indicators at 12 Months

	Pre-dialysis Registration Year					
	Total	2002	2003	2004	2005	2006/7
<b>Mean Hemoglobin</b>	<b>123</b>	123	124	125	121	125
<b>Mean Calcium</b>	<b>2.27</b>	2.24	2.28	2.29	2.27	2.31
<b>Mean Phosphate</b>	<b>1.30</b>	1.30	1.33	1.30	1.31	1.25
<b>Median PTH</b>	<b>10.5</b>	11.5	12.0	10.6	9.9	8.0

# Cohort Characteristics of those who Initiated Dialysis

	Total	PD	HD
<b># Patients</b>	<b>140</b>	<b>53 (38%)</b>	<b>87 (62%)</b>
<b>Mean Age</b>	<b>63</b>	<b>59</b>	<b>64</b>
<b>% Male</b>	<b>58%</b>	<b>64%</b>	<b>55%</b>
<b>% Diabetes</b>	<b>51%</b>	<b>51%</b>	<b>51%</b>
<b>Median Months in CKD</b>	<b>26</b>	<b>24</b>	<b>26</b>
<i>Labs At 12 months...</i>			
<b>Mean Hemoglobin</b>	<b>118</b>	<b>117</b>	<b>118</b>
<b>Mean Calcium</b>	<b>2.20</b>	<b>2.21</b>	<b>2.20</b>
<b>Mean Phosphate</b>	<b>1.53</b>	<b>1.56</b>	<b>1.50</b>
<b>Median PTH</b>	<b>16.6</b>	<b>13.8</b>	<b>16.8</b>

2 pts were not included in the above:

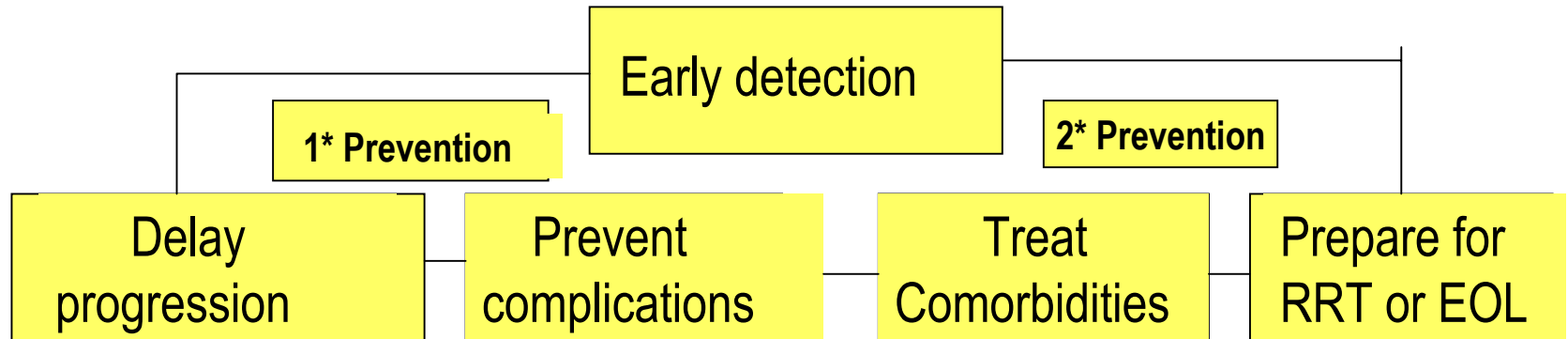
-1 pt started acute HD and recovered function shortly after

- 1 pt with no dialysis data

# What we know

- **Longitudinal care of identified patients appears to improve outcomes**
  - Prior to dialysis
  - On dialysis
- **Multidisciplinary team care is effective**
- **Costs of care prior to dialysis << dialysis costs**

# Care Goals and elements of CKD Programs



Education    Patient independence    Communication    Tools

Longitudinal follow up of complex condition by trained interdisciplinary team

# What we don't know

- Longitudinal care of all patients with CKD may or may not be cost effective
- Multidisciplinary team care is effective , with nephrology input
  - ? Non expert input
- Sustainability of Nephrologist based care delivery prior to dialysis
  - Differential remuneration issues ( vs dialysis)
  - Increasing numbers of patients >>> dialysis population

# Summary

- **Need for integrated care in complex patient groups**
- **Individual nephrologists / physicians unable to manage all aspects of CKD care**
- **Systematic approach to patients with CKD appears to be effective**
  - **In delaying progression**
  - **Maximizing independent dialysis uptake**
  - **Regional variations allow comparisons**
- **Evaluation and clinical research fundamental**

# Tale of Many Functions

- **Network system with responsibility, accountability and finances**
- **Involvement of physicians and information developed by and for clinicians**
- **Development of accountable practices and opportunities for innovation**