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Implementation of an Integrated Diabetes Management Program within a Cardiac Care Institution

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Objectives

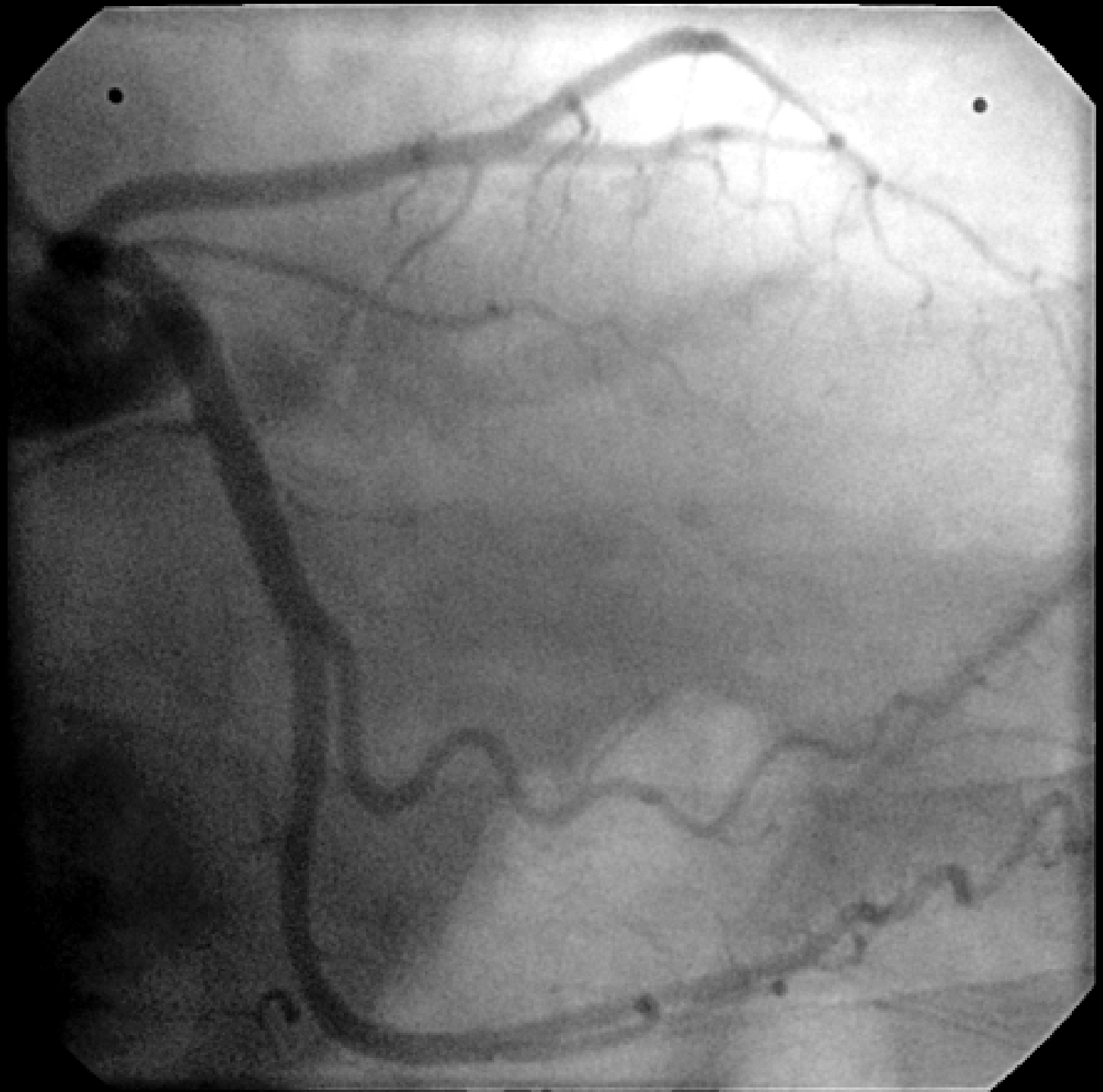
1. Understand the rationale for the development of such programs in tertiary care settings.

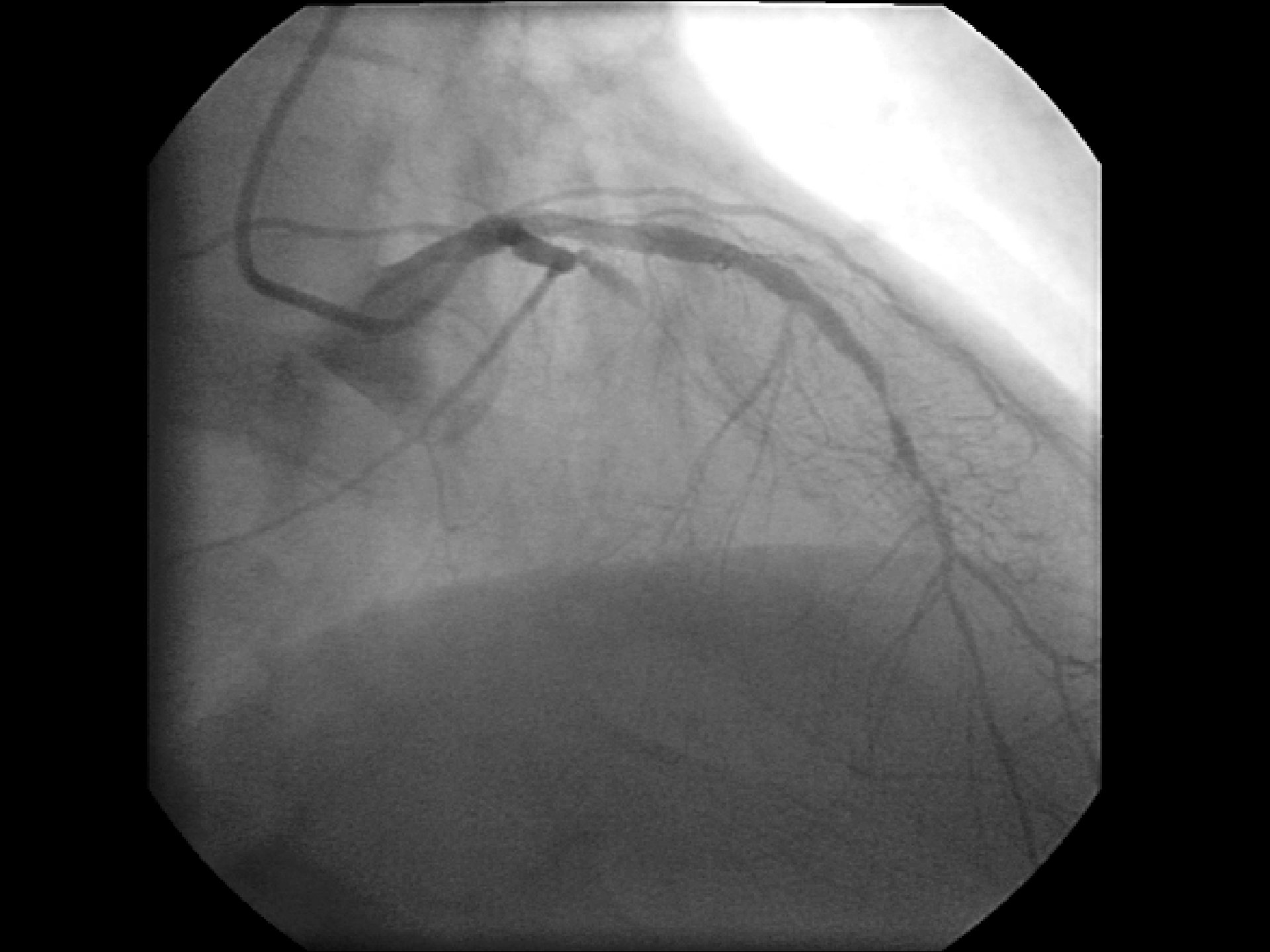
2. Appreciate how an entire team rallied to integrate diabetes into their practice with relatively little cost and partnered with existing community resources to improve patient outcomes.

3. Be inspired to make changes in your health care settings.

Cardiology Perspective in Managing Patients with Diabetes

- Cardiac Care
  - Revascularization
  - Congestive Heart Failure
  - Arrhythmia
- Diabetes
  - Importance recognized
  - Insufficient expertise, time and resources to manage it properly

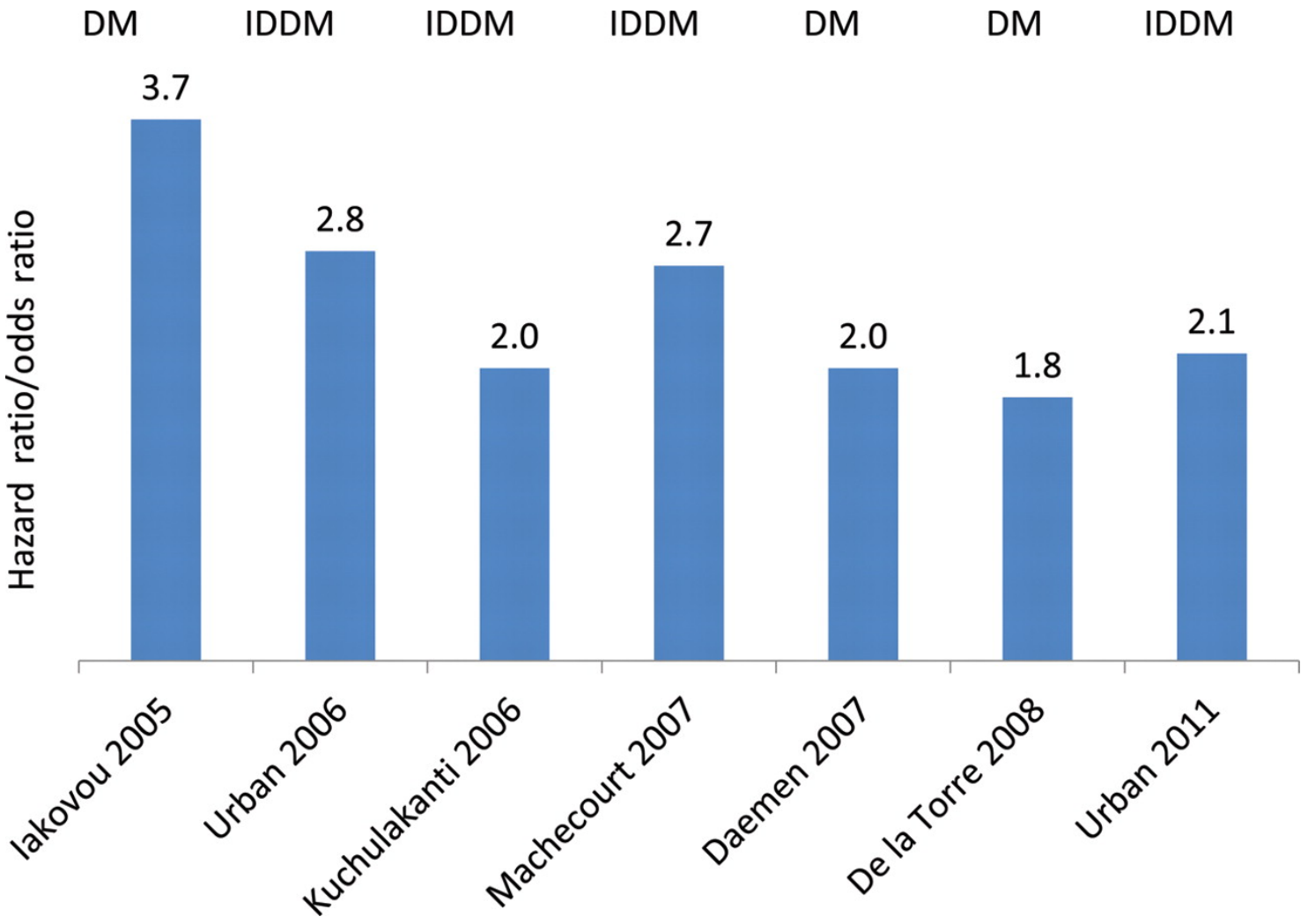




Revascularization

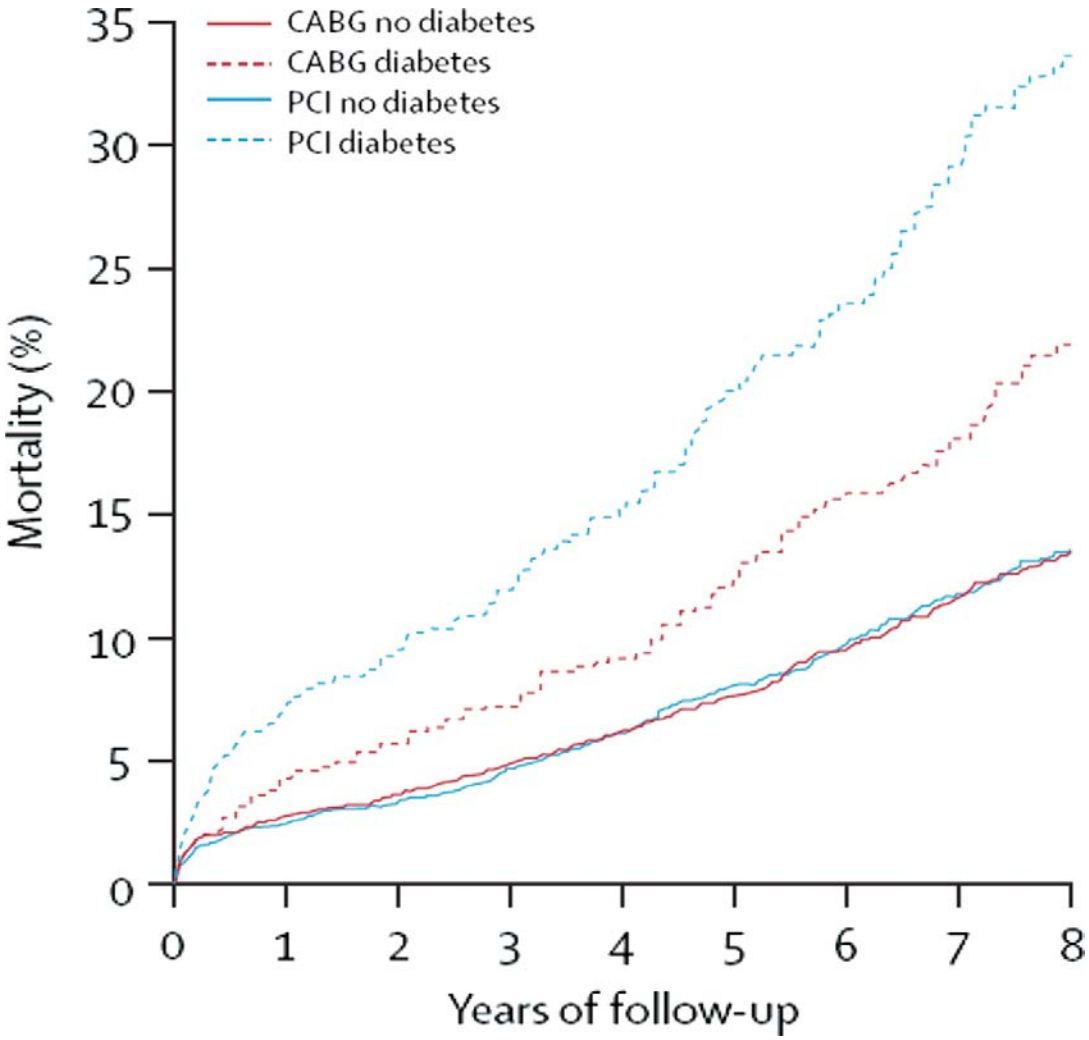
- Single most important mode of therapy
  - "Revascularize and then reassess"
  - Improve symptoms >> medications
  - Improve prognosis in important subgroups
- PCI
  - Less complete revascularization but lower morbidity
  - DES may be preferred over BMS but
    - Choice of antimitotic agent/stent may be important
    - Higher thrombosis rates
- Bypass surgery
  - More complete revascularizaton but higher morbidity
  - Lower rates of repeat revascularization than PCI for multivessel disease (BARI-2D, ARTS-II) ***but***
    - Higher 30-day post CABG mortality than non diabetics (OR 1.2)
    - Increased rates of graft occlusion at one year.
    - Radial grafts may not work as well as in non-diabetics
    - 2x increase in rates of sternal wound infection

Studies having detected diabetes mellitus or insulin-dependent diabetes mellitus as independent predictor of drug-eluting stent thrombosis.



Roffi M et al. Eur Heart J 2011;eurheartj.ehr305

Mortality in patients assigned to coronary artery bypass graft or percutaneous coronary intervention by diabetes status in an analysis of 10 randomized trials.



Roffi M et al. Eur Heart J 2011;eurheartj.ehr305

Congestive Heart Failure

- Management equally complex to diabetes
  - Combination = large burden of disease
- Diabetics especially prone to
  - Ischemic cardiomyopathy
  - Diastolic dysfunction
  - Ischemia presenting as SOB rather than chest pain
- Newer treatments of CHF
  - ICD and CRT
- Overlap: opportunity for combined specialty clinics?

Arrhythmia

- Ventricular Arrhythmias
  - ICD has made large difference in prevention and treatment of life threatening arrhythmias
- Supraventricular Arrhythmias
  - Ablation
    - now preferred mode of treatment for atrial flutter
    - option for difficult-to control atrial fibrillation
  - Atrial fibrillation
    - Increasing area of interest
    - Emerging as important cause of “cryptogenic” stroke

Background to Initiation of Pilot Study and Diabetes Care Program

- Diabetes is important cardiac risk factor and common in cardiac patients.
- Cardiac and diabetes care are complex.
- The treatment of diabetes in cardiac patients is often suboptimal.

GLUCOSE Pilot Study Methods

Setting:

- University of Ottawa Heart Institute
- Ottawa Hospital General Campus

Duration:

- First patient enrolled Feb 2005
- Last patient enrolled Aug 2006
- 1 year follow-up with visits at 3, 6 and 12 months.

Enrollment:

- 169 participants

GLUCOSE Study Design

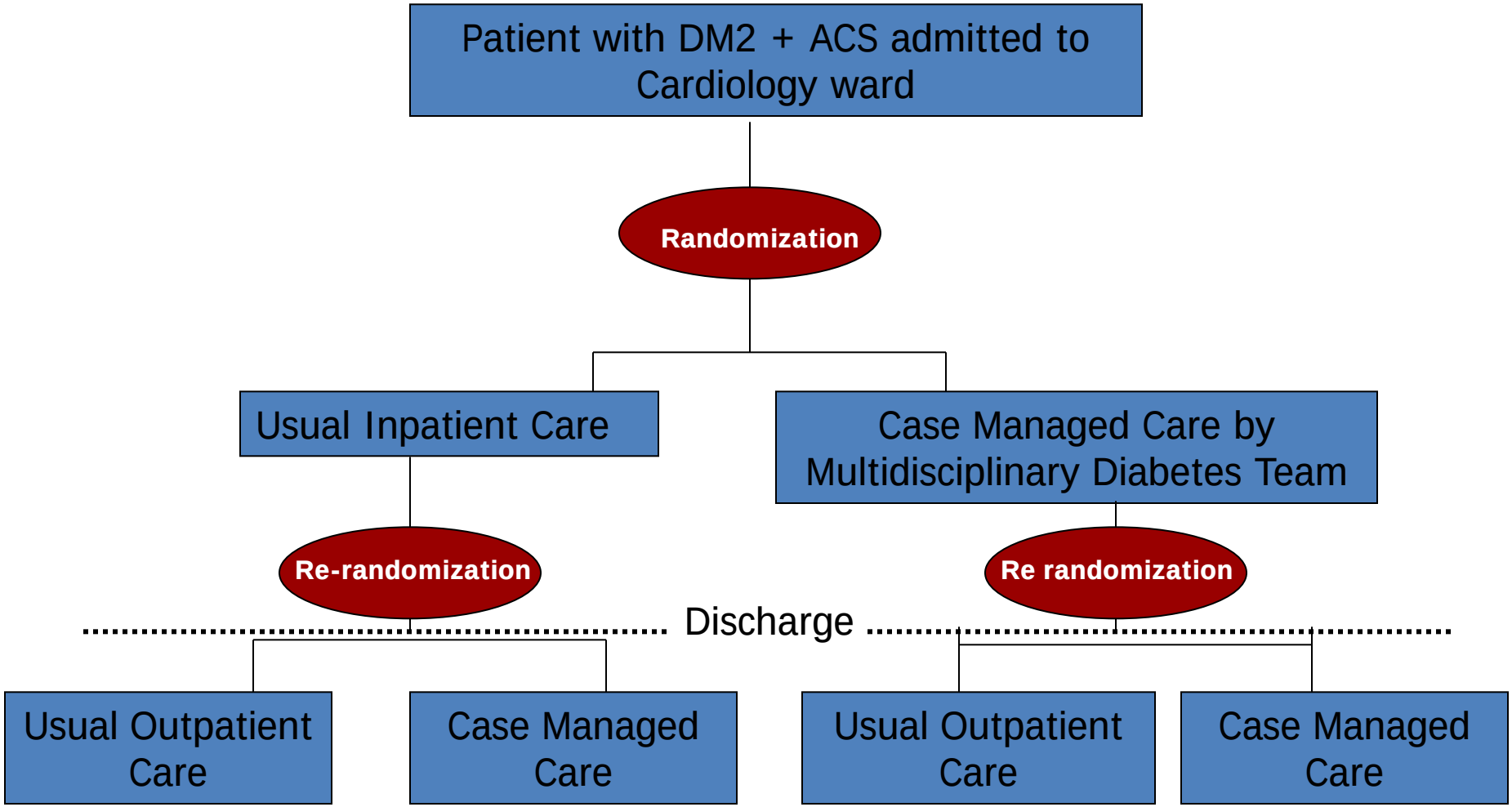


Table 1: Baseline Demographics	Groups			
	S-S	S-U	U-S	U-U
N	39	44	45	38
Age (years)	63.5	63.6	63.2	65.6
Ca	97.4	95.5	95.6	97.4
Fe	10.3	15.9	28.9	21.1
W	25.6	34.1	28.9	34.2
Prior Hypertension*	71.8	65.9	80	73.7
Known Dyslipidemia*	87.2	79.5	66.7	81.6
Currently Smoking	23.1	13.6	15.6	21.1
Prior PVD*	38.5	31.8	22.2	28.9
Prior Cerebrovascular disease*	20.5	20.5	22.2	21.1

This is a high risk group of patients

* Percent of group with characteristic

Table 3: Baseline Diabetes Status

	Groups			
	S-S	S-U	U-S	U-U
Prior Diabetes*	100	95.5	97.8	92.1
Du	11	11.4	12.6	10.7
Hx	25.6	9.1	24.4	23.7
Pr ucose*	2.6	9.1	13.3	0
Diabetic Retinopathy*	33.3	29.5	35.6	36.8
Blind*	2.6	0	2.2	5.3
Diabetic Leg Ulcer*	5.1	13.6	11.1	10.5
Hx Amputation*	2.6	4.5	0	5.3
On Dialysis*	0	0	2.2	0
Hx Organ Transplantation*	0	0	2.2	0

Almost all had known diabetes for over 10 years.

* Percent of group with characteristic

Table 2: Baseline Cardiac Diseases

	Groups			
	S-S	S-U	U-S	U-U
Family Hx CAD*	76.9	79.1	77.8	71.1
Hx of Prior CAD*	71.8	59.1	73.3	55.3
Du	12.9	9.4	6.7	7.7
6 r	5.1	15.9	6.7	7.9
In				
Unstable angina	23.1	22.7	13.3	28.9
NSTEMI*	38.5	34.1	24.4	39.5
NSTEMI with ST depression*	23.1	22.7	17.8	21.1
STEMI*	12.8	9.1	20	13.2
CHF*	5.1	6.8	13.3	2.6
Index Admission Revascularization				
Revascularized*	71.8	61.4	42.2	60.5
PCI*	48.7	40	35.6	42.1

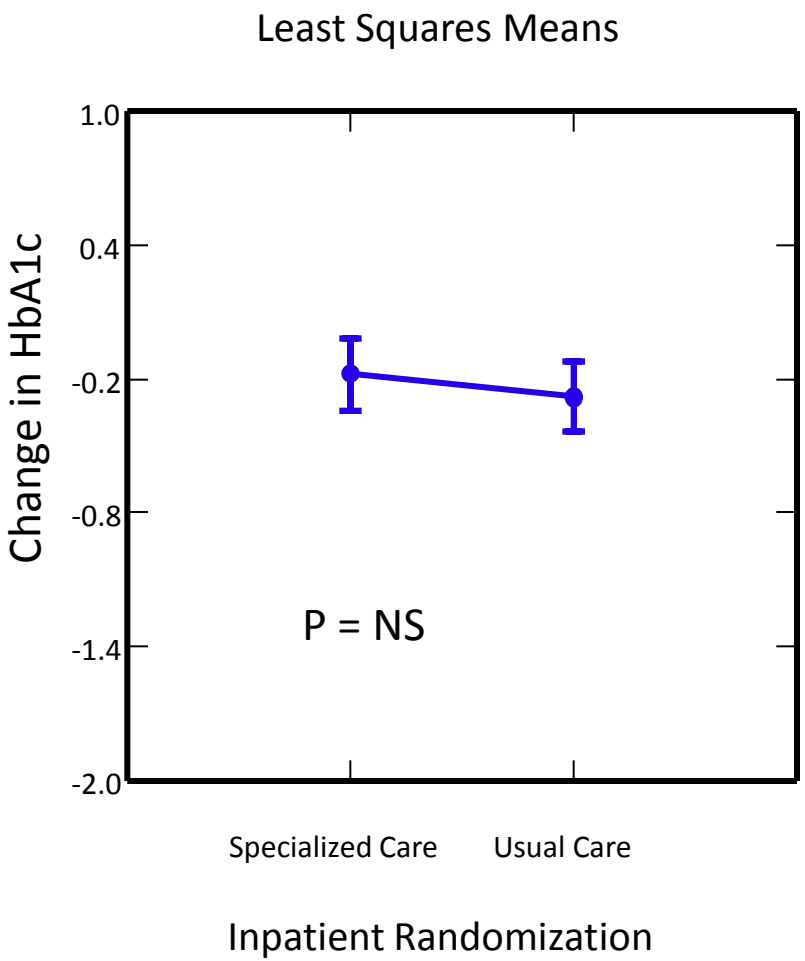
The majority had known CAD for many years.

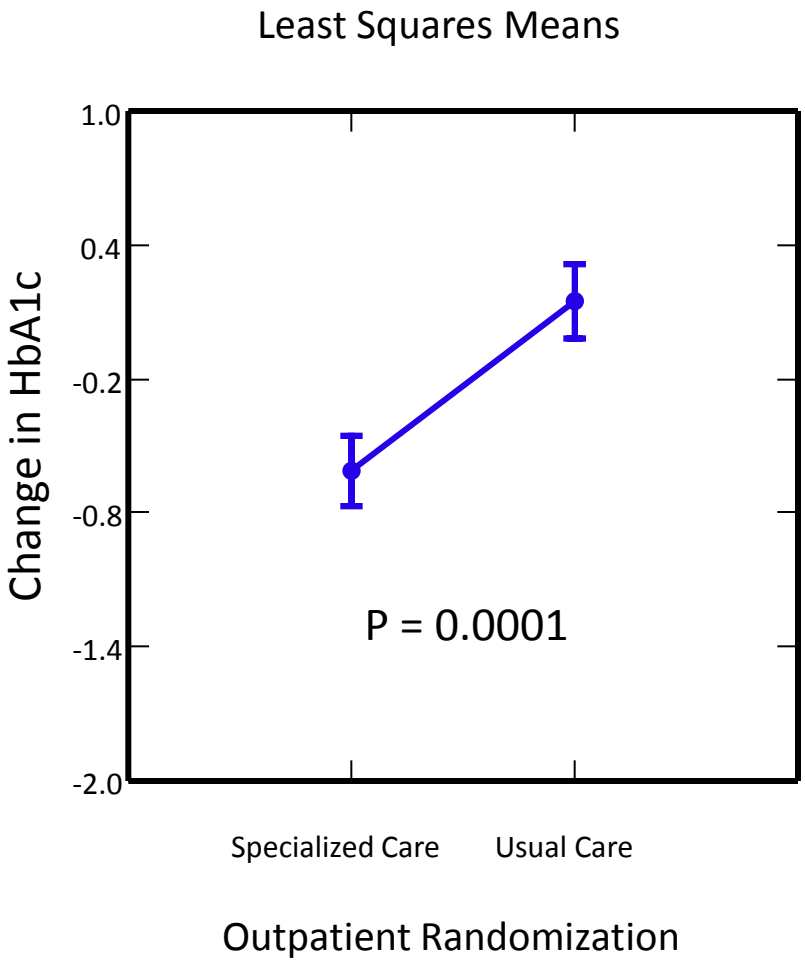
* Percent of group with characteristic

Table 4: Baseline Lab Values

	Groups			
	S-S	S-U	U-S	U-U
Fasting Cholesterol (mmol/L)	3.79	4.11	3.81	4.05
Creatinine (umol/L)	103	122	118	100
HBA1C (%)	7.39	7.53	7.59	7.33
HDL (mmol/L)	0.94	0.91	0.92	0.95
LDL (mmol/L)	2.04	2.23	2.01	2.13
Ratio	4.37	4.73	4.41	4.56
Triglycerides (mmol/L)	1.77	2.42	2.15	2.04
Urine Microalbumin (g/mol)	11.23	16.99	12.02	5.05

Change in HbA1C at 6 Months





Reduction in HbA1c

- All patients
- Subgroups
  - Baseline HbA1c < 10
  - Prior diabetes
  - Prior CAD

Number of Patients Reporting Hypoglycemia within 3 Months by Outpatient Randomization

	Specialized Care	Usual Care	Total
0	62	71	133
1	21	6	27
Total	83	77	160

Chi-Square Tests of Association

Test Statistic	Value	df	p-value
Pearson Chi-square	8.730	1.000	0.003

Six Month Clinical Outcomes

	Specialized Care	Usual Care	P-Value
Death	6.0%	12.2%	0.061
Death or MI	7.1%	15.9%	0.078
Death, MI or Admission	34.5%	42.7%	0.280
Death, MI, Admission or ER Visit	52.4%	67.1%	0.054

6 Month Outcomes

	Case Managed	Usual
Readmissions	38.1	45.1
Cardiac admissions	27.4	34.1
DM admissions	3.6	1.2
ER visits	57.1	79.3
Cardiac ER visits	22.6	35.4
DM ER visits	4.8	2.4
Stroke	0	4.9
TIA	0	1.2
MI	1.2	6.1
Revascularization	9.5	9.8
Hypoglycemia	36.9	17.1
DM eye changes	25.0	20.7

*number of events / 100 patients

No Significant Effect

- Creatinine at 3 or 6 months
- HDL at 3 or 6 months
- LDL at 3 or 6 months
- TC/HDL Ratio at 3 or 6 months
- Triglycerides at 3 or 6 months
- Microalbuminuria at 3 or 6 months
- Weight at 3 or 6 months

Waist circumference at 3 or 6 months

Systolic blood pressure at 3 or 6 months

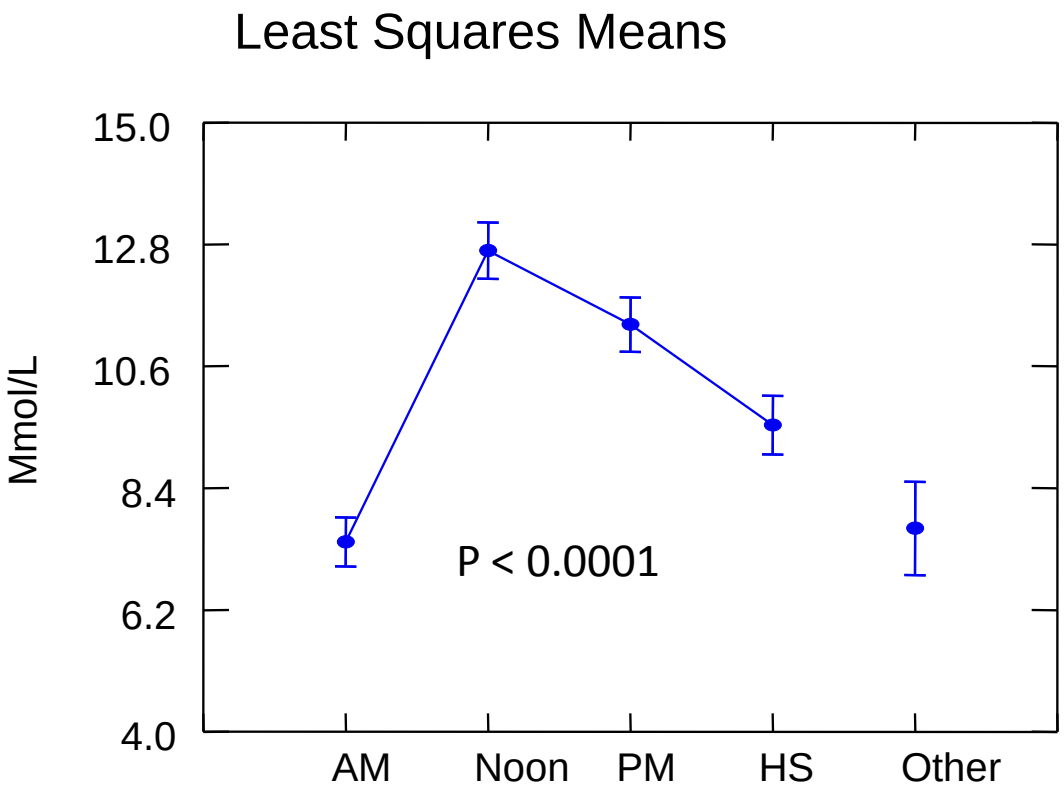
Diastolic blood pressure at 3 or 6 months

GLUCOSE Results Summary

- Study Population
  - Very high risk
  - Many have prior DM and CAD
- Inpatient Program
  - Very popular with patients
  - No effect on Capillary Blood Glucose
- Outpatient Program
  - Very effective in improving diabetes control at 6 months. (primary outcome)
  - No difference between study groups in other cardiac risk factors
  - Trends toward reduced outcomes in outpatient intervention group
- Conclusion
  - Significant care gap
  - Diabetes Care Program potentially beneficial
  - Outpatient component critical

Diurnal Trends in Capillary Blood Glucose

Multivariate Mixed Model Including all Measures in all Patients




MEILLEUR AVANT BEST BEFORE
Sealtest
LAIT ÉCRÉMÉ SANS GRAS
125 mL
Additionné de vitamines A et D
RED ROSE
KRAFT

Corroborative Data

DM Reporter Pilot Study

- Dictated and transcribed clinic letters
  - 3 years of consecutive clinic visits
  - > 30,000 patients
  - Over 80,000 records
- NLP to extract from free text
  - Diagnosis of Diabetes
  - Blood pressure control
  - Utilization of key drugs
  - LDL
  - Weight
  - HbA1c

UOHI Cardiology Outpatients 2007-2009
Baseline Characteristics

Parameter	Overall	No diabetes	Diabetes
Patients	30458	23438 (76.9%)	7020 (23.1%)
Number of visits	81932	59728	22204
Visits per patient	2.69	2.5	3.2 ***
Mean age	60.3	59.3	63.6 ***
% Female	38	39.3	33.7 ***
SBP	127.7	127.2	129.2 ***
DBP	73.4	73.6	72.8 ***

*** $P < 0.0001$

Drug Treatment in 30,458 UOHI Outpatients 2007 - 2009

Treatment	All Patients	No Diabetes	Diabetes
Antiplatelet (%)	51.5	47.2	66.2 ***
ACE (%)	35.4	30.9	50.4 ***
ARB (%)	11.6	9.5	18.8 ***
Either ACE or ARB (%)	44.7	38.8	64.2 ***
Both ACE and ARB (%)	2.3	1.6	5.0 ***
ACE Dose (% max)	43.7	42.5	46.3 ***
ARB Dose (% max)	53.4	51.3	56.9 ***
ACE + ARB Dose (% max)	47.9	45.9	52.2 ***
Statin (%)	42.8	37.6	60.1 ***

*** $P < 0.0001$

LDL and HbA1c in 30,458 Consecutive UOHI Outpatients 2007-2009

Parameter	All Patients	No Diabetes	Diabetes
LDL noted (%)	28.9	26.8	35.9 ***
Mean LDL when noted	2.53	2.65	2.23 ***
LDL $\leq$ 2.0 (%)	47.1	42.7	58.1 ***
LDL $\leq$ 1.8 (%)	30.1	26.1	39.8 ***
HbA1C noted (%)	3.8	1	13.3 ***

*** $P < 0.0001$

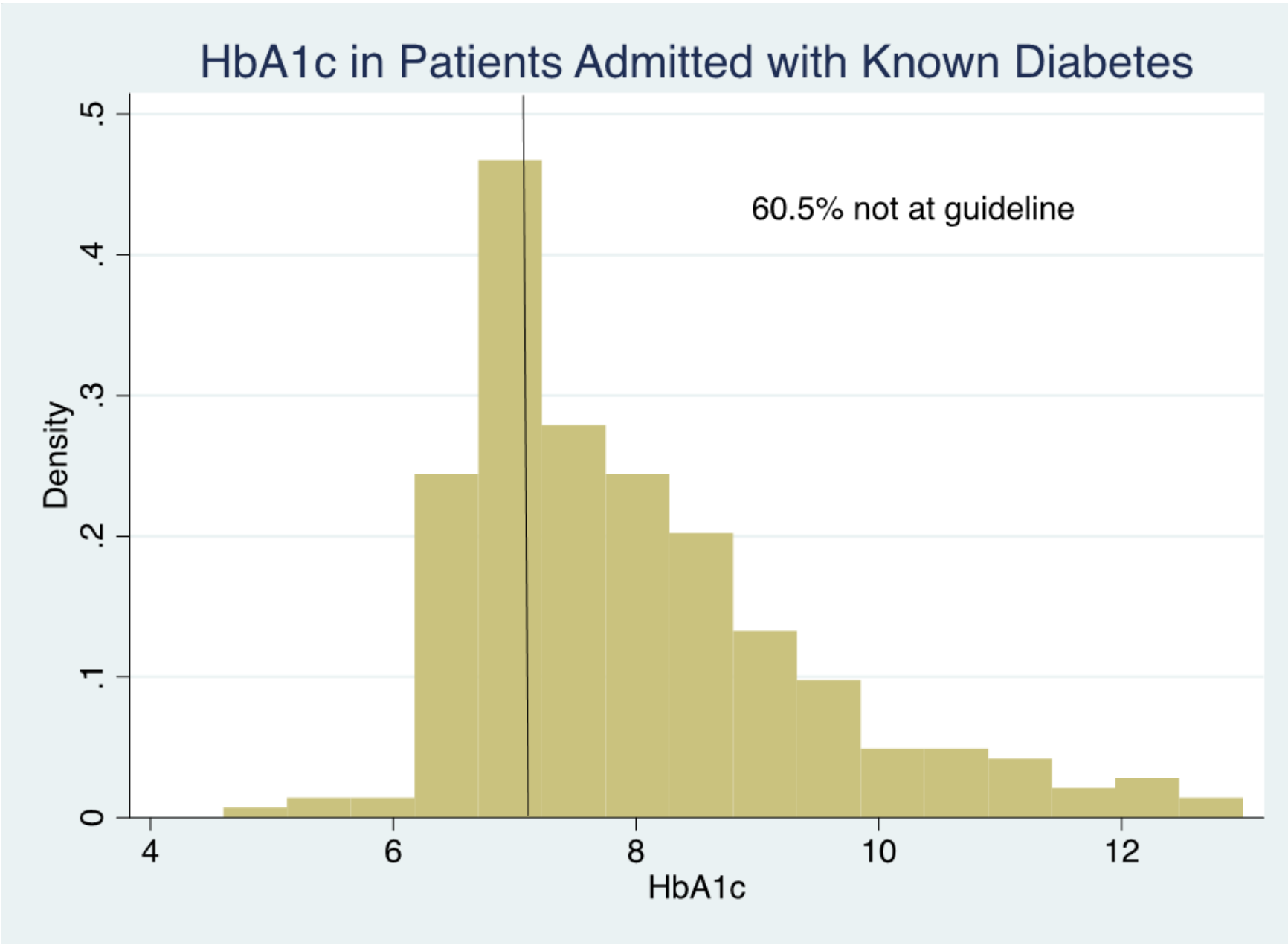
UOHI Outpatients with Diabetes 2007-2009: Adherence to Treatment Guidelines

Guideline	Adherence		Comments
	Men	Women	
Receiving ASA	70.8	57.1***	Other anti platelet agents included
Receiving ACE/ARB	66.9	59.0***	
Receiving Recommended Dosage of ACE/ARB	42.1	38.0**	Defined as > 45% of maximal antihypertensive dose % max. dose of ACE and ARB added
Receiving Statin	64.5	51.6***	
SBP $\leq$ 130	54.1	49.0***	
SBP $\leq$ 140	71.5	67.0***	
LDL $\leq$ 2.0	64.3	44.8***	Limited sample
LDL $\leq$ 1.8	45.6	27.7***	Limited sample

***p<0.0001 **p=0.001

Conclusion: Diabetes in Cardiac Patients

- Cardiology focuses on cardiac care
  - Revascularization
  - Heart Failure
  - Arrhythmia
- Diabetes is significantly under-treated
  - Both men and women, particularly latter
- Integrated specialty management programs could
  - Improve diabetes care
  - Improve mortality and morbidity
  - Reduce hospital utilization and health care costs


HbA1c in Patients Admitted with Known Diabetes
60.5% not at guideline
Density
0
.1
.2
.3
.4
.5
4
6
8
10
12
HbA1c

Diabetes Care Program For Cardiac Patients

- Stakeholders/key partners
  - UOHI Clinical Services
  - Division of Cardiology
  - Division of Endocrinology
- Key personnel and components
  - Diabetes nurse educator
  - Endocrinology
  - Data collection and analysis

Thank you

- Burning questions?
- Welcome Kim Twyman

University of Ottawa Heart Institute

Admissions from April 1, 2008 – March 31, 2012

Diagnosis	N	Admits	% Admits	Hospital Days	% Hospital Days	Average LOS	Maximum LOS	Cum. % Hospital Days
ACS	6331	7051	59.6	55287	49.0	7.6	174	49
CHF	779	1048	8.9	16773	14.9	15.6	210	63.9
Aortic valve disease	490	592	5.0	8588	7.6	14.8	168	71.5
Post cath	540	606	5.12	6204	5.5	10.3	142	77.0
Atrial fibrillation	380	486	4.11	3976	3.5	8.01	142	80.5
Bradycardia	340	383	3.24	3823	3.4	9.4	180	83.9
Tachycardia	214	277	2.3	2960	2.6	11.4	106	86.5
Endocarditis	77	87	0.7	2164	1.9	25.6	92	88.4
Cardiac Arrest	119	130	1.1	1916	1.7	14.8	86	90.1
ICD Related	160	208	1.7	1821	1.6	7.9	83	91.7
Syncope	177	200	1.7	1647	1.5	7.8	68	93.2
Mitral Valve Disease	93	111	0.9	1479	1.3	13.9	96	94.5

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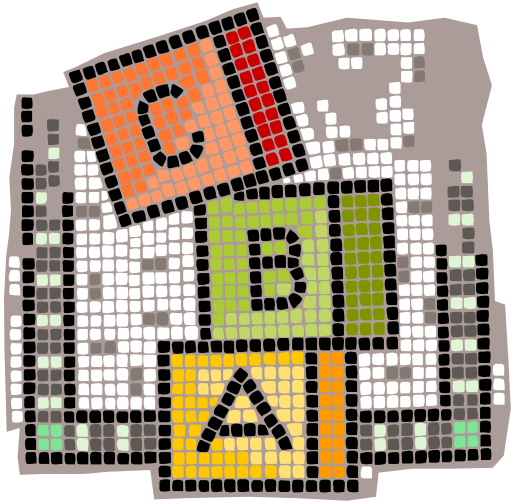
Program Implementation

Kim Twyman



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In-Patient Ownership of Diabetes Management

- Not unusual for health care providers to feel that managing diabetes is simply not their job
- ? Lack of confidence in being able to treat this disease
- ? Lack of knowledge in understanding the management of diabetes

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Benefits to Identification & Management

- **Unique opportunity to identify patients and offer best practices**
- **Decreased morbidity and mortality**
- **Improved health outcomes**
- **Reduced LOS and re-admissions for any cause**

Empower patients with diabetes to have significantly improved self management behaviours

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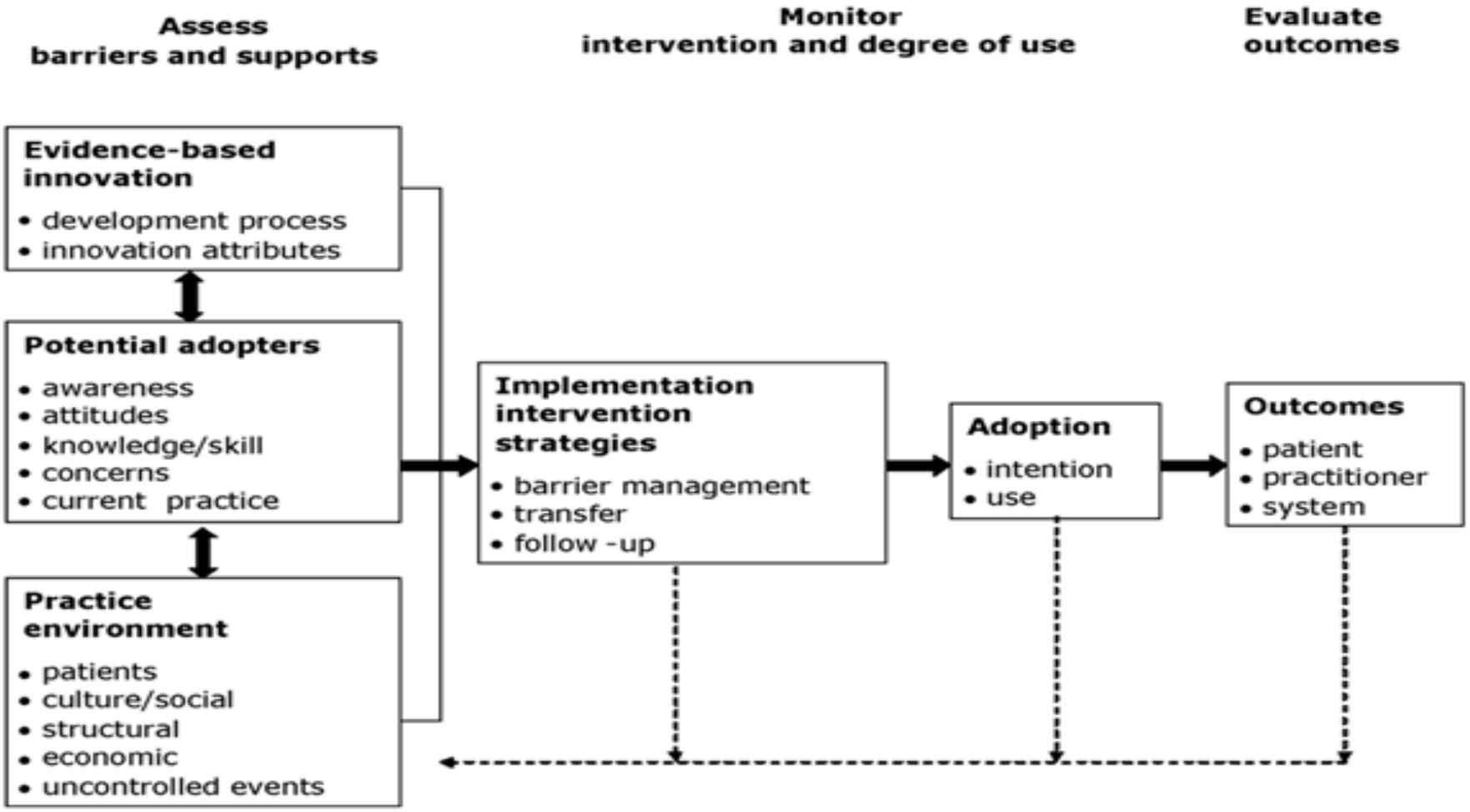
The Revised Ottawa Model of Research Use



Logan & Graham (1998) http://www.ncddr.org/kt/products/ktintro/

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The Beginning…

Initial work started, May 2011

- Prevalence Study completed
- Diabetes Leaders/Champions identified
- Lunch and Learns for staff nurses on how to use "Steps to Identifying and Managing Type 2 Diabetes at UOHI"
- Diabetes Nutrition classes
- Patient Education Binder on each unit

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Steps to Identifying and Managing Type 2 Diabetes at UOHI

1. Ensure HbA1c done on all in-patients (does NOT need to be fasting, need extra purple tube). Notify MD if result > 7%
2. Target glucose levels between 6 -10. Notify MD immediately if glucose < 4 or > 18. Notify MD on daily rounds if glucose > 10.
3. Diabetic diet
4. Diabetes Nutrition Class if: newly diagnosed with diabetes or HbA1c > 7%.
5. Consider asking MD for consult to Endocrinology if:

- Insulin pump (if new)
- Severe or frequent hypoglycemia (2 or more episodes of glucose < 3 or unresponsive to change in therapy)
- Poorly controlled glucose (admission HbA1c >10% or CBG > 14 despite changes in treatment)
- Patient is newly started on insulin (consult Diabetes Nurse Specialist as soon as possible)

6. Diabetes Follow up:
    - Ensure patient receives appropriate education for self management
    - Use CDA Diabetes Education materials(Diabetes binder)
    - Ensure patient receives contact information for Community Diabetes Program (see list in Diabetes Binder). Initiate contact with Community Diabetes program prior to discharge when possible.
    - Document all teaching/follow up provided

Adapted from TOH Stepwise Approach To Inpatient Diabetes

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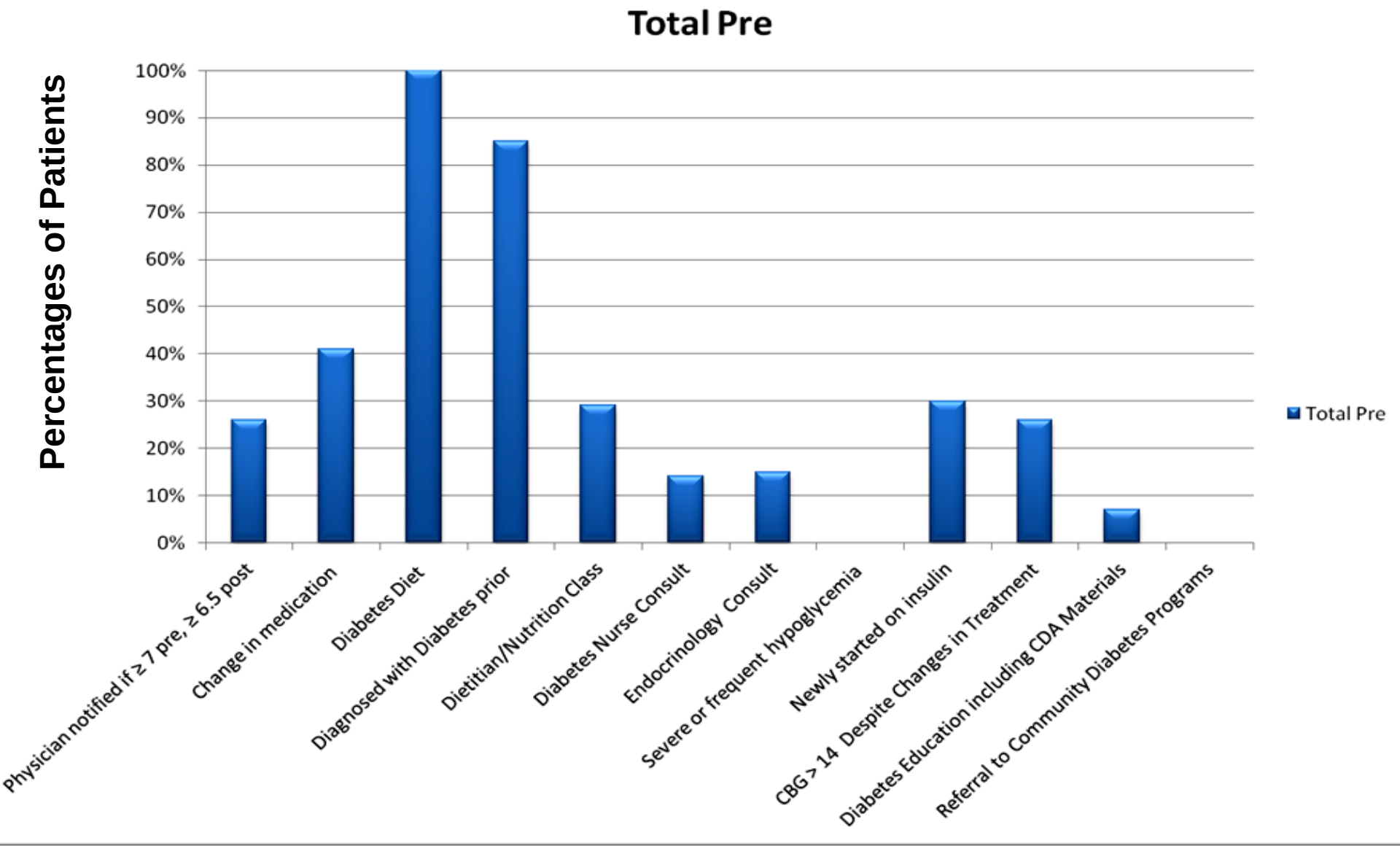
Pre-Implementation Point-prevalence measurement



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Diabetes Nurse Specialist

- Hired two years ago
- Ministry of Health grant initiative to incorporate diabetes into cardiac care
- Goal to increase knowledge and expertise of the cardiac staff nurse's understanding of diabetes and integrate to their usual care/practice to meet the needs of the patient as a whole

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Staff Development

- Informal education and survey with staff on units during consult work on needs
- Informal afternoon sessions on each unit related to the management of Hypoglycemia
- Medical/Surgical Resident Info Session
- Clinical Nursing Practice Committee; Diabetes working group
- Structured in service education with the Diabetes Champions

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Diabetes Champion Day Agenda

Agenda – Jan 11/12

0800hr	Welcome, Intro's and Thank you's
0830hr	Evaluation of Learning – Pre
0900hr	Diabetes 101
1030 hr	Nature Break
1045hr	CBG Meters
1100hr	Hypoglycemia
1115 hr	Insulin and Orals
1200hr	Lunch
1230hr	UOHI Medical Directives
1330hr	Lunch n Learn Sessions
1430hr	Evaluation of Learning- Post
1515hr….	Goal to get out of here!!!

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The Role of the Diabetes Champion

- ✓ Assisted in auditing the implementation process of the new policy and procedure
- ✓ Participated in another training with the DNS based on education needs and barriers defined by Diabetes Champion team
- ✓ Taught lunch-and-learns to educate the staff including nurses and ward-clerks regarding the new resources and explaining the importance of the new initiative

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The Role of the Diabetes Champion

✓ **Continually act as a go-to person for the floor and helped nurses be aware of their resources and the steps of the policy-procedures**

✓ **Our knowledge of diabetes was assessed before and after the specialized DNS day for evaluation purposes**

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DIABETES CHAMPION

Gael Anderson
Michelle Barone
Amy Charlebois
Lauren Kellar
Diane Kochanski
Melissa Lapointe
Kim Laskey
Louise Leger-Caldwell
Mary Jane Legassick
Julie McKechnie
Janet Nelson
Michelle Nelson
Katherine Park
Lorraine Poisson
Nazli Parast
Bonnie Quinlan
Lori Rogalsky
Nadine Roche
Julie Sawyer
Judith Sellick
Selma Sheikh
Diane Smaglinski
Sally Scott

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Lunch and Learn Sessions Jan 18, 24, 25, 2012

153 attendees

- Informal small group sessions lead by our Diabetes Champions
- Tool boxes were demonstrated
- Orientation to the revised Diabetes Education Binder
- Orientation to the UOHI Medical Directive and the Diabetes Management Tracking Tool

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Diabetes Education Tool Box

Each in-patient unit, the day unit and cardiac rehab have box to facilitate teaching of diabetes:

- **Glucose wands**
- **A1C pillow**
- **Insulin Resistance Globe**
- **Divided Food Plates**
- **Diabetes Patient Education Binder**
- **A1c Target Tear off sheet**
- **Logbooks**

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Diabetes Patient Education Binder

The original red binder was condensed to include

- **3 education handouts (“ What does A1C mean for you?”, CDA Type 2 diabetes: the basics and CDA Managing your blood glucose)**
- LHIN Diabetes Community Education Referral forms
- TOH Hypoglycemia handout (recent addition)
- List of Chiropodists across Champlain LHIN

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PHYSICIAN'S ORDERS
ORDONNANCES MÉDICALES
Cardiac Surgery and Cardiology
Chirurgie cardiaque et Cardiologie

Medication Allergies/Reactions	Substances or Food Allergies/Reactions
☐ none known-aucune connue	☐ none known-aucune connue

MEDICAL DIRECTIVE NO. NOV/HI-GEN-04 FOR DIABETES MANAGEMENT
DIRECTIVE MÉDICALE N^{0} NOV/HI-GEN-04 POUR LA GESTION DU DIABÈTE

DIABETES MANAGEMENT-GESTION DU DIABÈTE

Init	NON-MEDICATION-SANS MÉDICAMENTS

Laboratory blood tests:

- The registered nurse will ensure that a HbA1c test is completed on all in-patients
- The registered nurse will notify the physician on daily rounds if result is 6.5% or greater
- A Diabetes Management Tool document will be completed by the registered nurse on all patients who have a test result of 6.5% or greater
- If patient is known to have diabetes or HbA1c is equal to or greater than 6.5%, the registered nurse will start Capillary Blood Glucose testing four times daily. Results will be documented on the Diabetes Medical Administration Record and the patient's Logbook.

Nutrition:

Diabetic Diet and Diabetes Nutrition Class will be ordered for all patients diagnosed with diabetes by the registered nurse

Consultation:

The registered nurse will consult the Diabetes Nurse Specialist for the following:

- Type 1 diabetes
- Newly diagnosed with diabetes
- Newly started on insulin
- Severe or frequent hypoglycemia (2 or more episodes of glucose under 3 mmol/L or unresponsive to changes in therapy)
- HbA1c greater than 8% or Capillary Blood Glucose over 14 mmol/l despite changes in treatment
- Insulin pump

The registered nurse will ask the attending physician to consider a consult to Endocrinology for any of the above, as deemed necessary, on weekends and/or in the absence of the Diabetes Nurse Specialist as well as for the following:

- Diabetic Ketoacidosis
- Admission HbA1c greater than 10% or Capillary Blood Glucose over 14 mmol/L despite changes in treatment

Follow-up:

At discharge, the registered nurse will ask the patient to book a follow up appointment with the patient's Endocrinologist in 4 to 6 weeks or the next available appointment. If the patient is not being followed by an Endocrinologist, the registered nurse will call the UOHI Diabetes Clinic at extension 13530 to schedule an appointment.

Date (yyaa/mm/dj)	Time-Heure	Nurse initiating directive-Infirmière initiant la directive Name-Nom (print-en lettres moulées)	Signature

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PHYSICIAN'S ORDERS
ORDONNANCES MÉDICALES
Cardiac Surgery and Cardiology
Chirurgie cardiaque et Cardiologie

Medication Allergies/Reactions	Substances or Food Allergies/Reactions
☐ none known-aucune connue	☐ none known-aucune connue

MEDICAL DIRECTIVE NO. MAY/HI-GEN-04 FOR DIABETES MANAGEMENT
DIRECTIVE MÉDICALE N^{O} MAI/HI-GEN-04 POUR LA GESTION DU DIABÈTE

DIABETES MANAGEMENT-GESTION DU DIABÈTE

Init	NON-MEDICATION-SANS MÉDICAMENTS
	1. On all patients, check OACIS to determine if an HbA1c has been drawn in the last 60 days. If not, draw HbA1c and document on kardex. Results: _____
	2. If this is a new diagnosis of diabetes, notify the physician on daily rounds if result is greater than or equal to 0.065 (6.5 %). Date notified: _____
	3. If patient is known to have diabetes or HbA1c greater than or equal to 0.065 (6.5%), blood glucose testing by point of care testing (POCT) QID.
	4. Blood glucose testing by POCT will be documented on MAR and the Patient's Weekly Logbook at the bedside.
	5. Diabetes Diet.
	6. Diabetes Nutrition and Meter class for newly diagnosed diabetes or those interested in a refresher. (See calendar for Patient Education Classes). Date attended: _____
	7. Fax Consult (ext 14327) to the Diabetes Nurse Specialist for the following: • Type 1 diabetes • Newly started on insulin • Severe or frequent hypoglycemia (2 or more readings less than 3 mmol/L or unresponsive to changes in therapy) • HbA1c greater than or equal to 0.080 (8 %) or POCT greater than14 mmol/L despite changes in treatment • Insulin pump
	8. Discuss with attending physician an Endocrinology Consult for: • Diabetic Ketoacidosis • Admission HbA1c greater than or equal to 0.100 (10%) or POCT greater than 14 mmol/L despite changes in treatment
	9. Provide the following from the Diabetes Patient Education binder: • A1c result: circle on back of card "What does A1c mean for you?" • Canadian Diabetes Association Handout: "Type 2 Diabetes: the basics" • Canadian Diabetes Association Handout: "Managing your blood glucose"
	10. Discharge Planning: • Fax Community Diabetes Program referral (see Diabetes Patient Education binder) for diabetes education in their vicinity. Location: _____
	11. If the patient is not being followed by an Endocrinologist, call the UOHI Diabetes Clinic at ext. 13530 to schedule an appointment. Date and Time of Appointment provided: _____

Date (yyaa/mm/dj)	Time-Heure	Processed by-Traité par	Signature
Date (yyaa/mm/dj)	Initials(es)	Printed Name-Nom en lettres moulées	Signature

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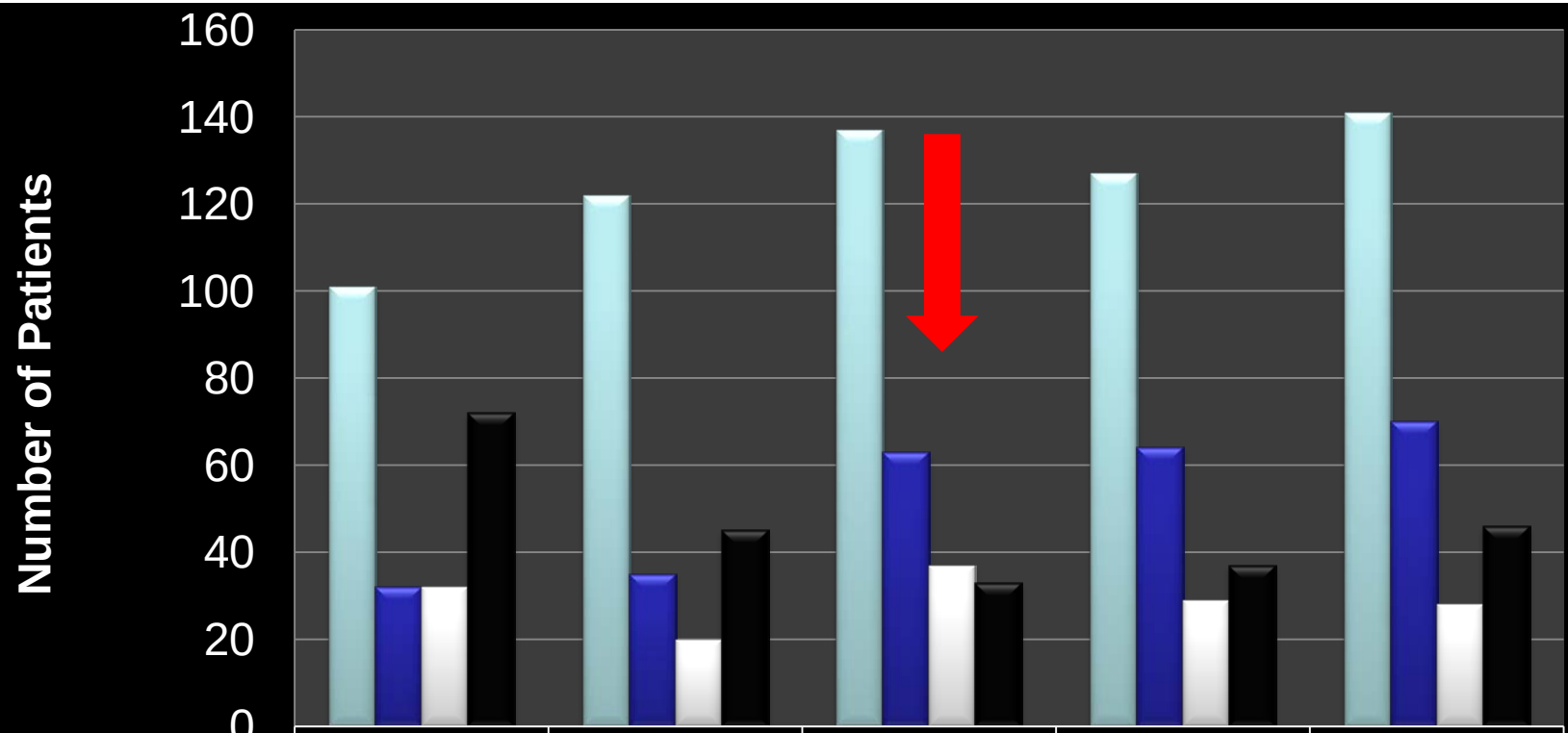
DNS Activities



	December	January	February	March	April
Total # of Patients with Diabetes	101	122	137	127	141
Total Number of Referrals	32	35	63	64	70
Consults	32	20	37	29	28
Phone Calls/Individual/Elective	72	45	33	37	46

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HgbA1c Volume

January - December 2012

Medical Directive initiated mid February

In Patient visits 5439

HgbA1c drawn 3903

71.7%

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Online Learning

Diabetes Education Day was videotaped and will be available online for staff

Clinical Services E Learning Portal

- **Modules being developed on diabetes medications, hypoglycemia and diabetes pathophysiology with resources and quiz**

Online Learning for Patients

Two presentations are available on diabetes medications for type 2 and insulin therapy.

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New Graduate Initiative

Nazli Parast: New Grad Initiative

- Resource person when a champion wasn't on duty
- Ensure the medical directive was added to the chart
- Instrumental in collecting and correlating data in regards to diabetes management UOHI

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Staff Feedback
"What did you like about this initiative the best"?

Improved Care for Patients living with Diabetes

- ✓Improved screening and earlier identification of diabetes
- ✓Making changes to diet while in hospital
- ✓ Clear guidelines on when to consult Endocrine and Diabetes Nurse Specialist
- ✓Improved teaching classes for patients- nutrition and meter class- many patients have verbalized how helpful these were
- ✓Supplying new patients with equipment
- ✓Availability of resources to give to patients

Staff Education and Engagement

- ✓Excellent tools that assist nurses on what to do when patients have borderline diabetes or is diabetic currently.
- ✓Widespread awareness of Diabetes management and screening…

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Staff Feedback
"What could have been improved"?

- ✓ Having the physicians more "on board" to communicate a diagnosis of diabetes in a timely fashion when a patient has an HbA1C >6.5%
- ✓ Staff nurses are becoming more limited with time for teaching another disease process and doing a good job teaching it.
- ✓ Need more resources to manage the patients post discharge before they are seen by the community diabetes program and to ensure they are seen for ongoing management.

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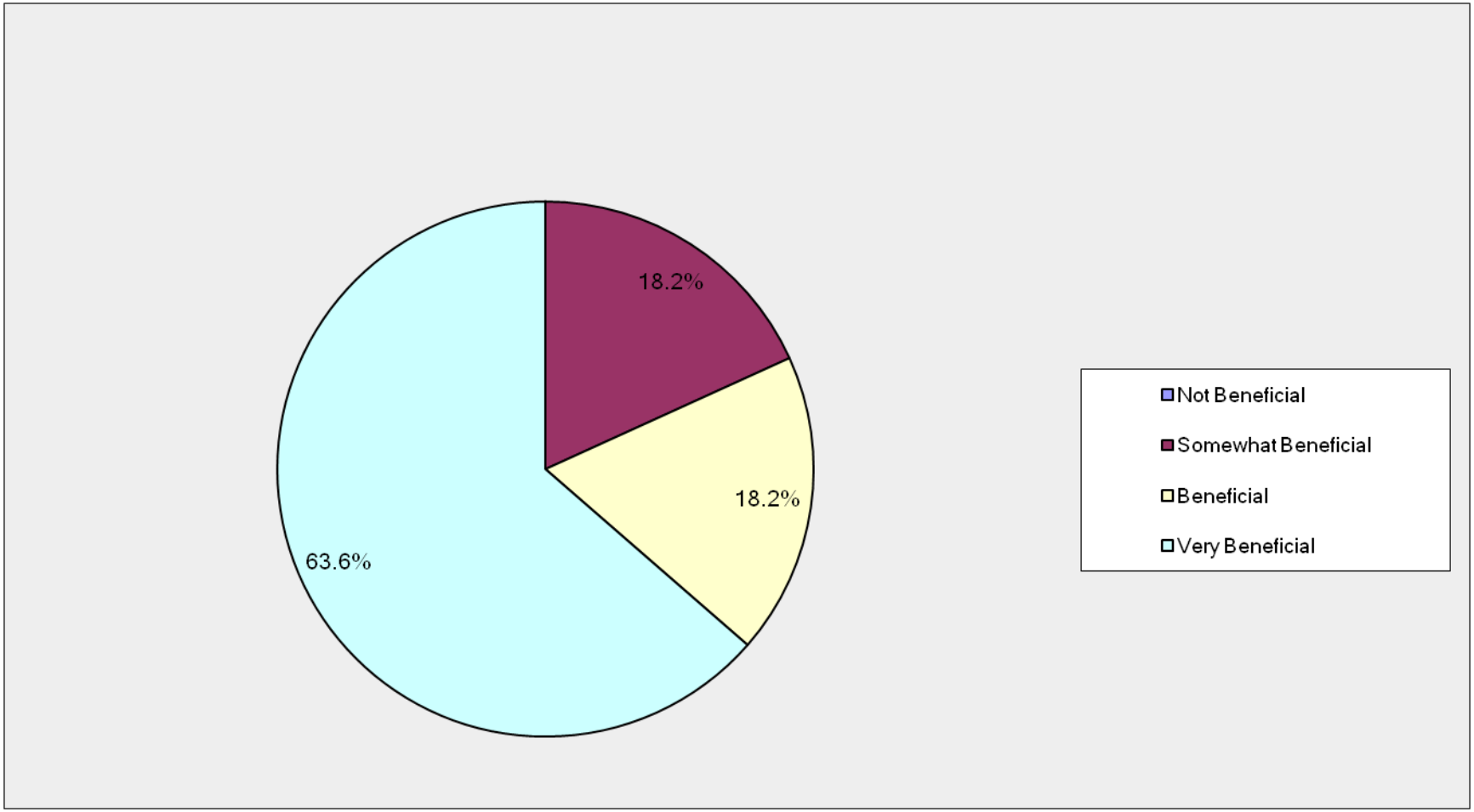
Improving Confidence of Front Line Staff in Dealing with Diabetes Patients



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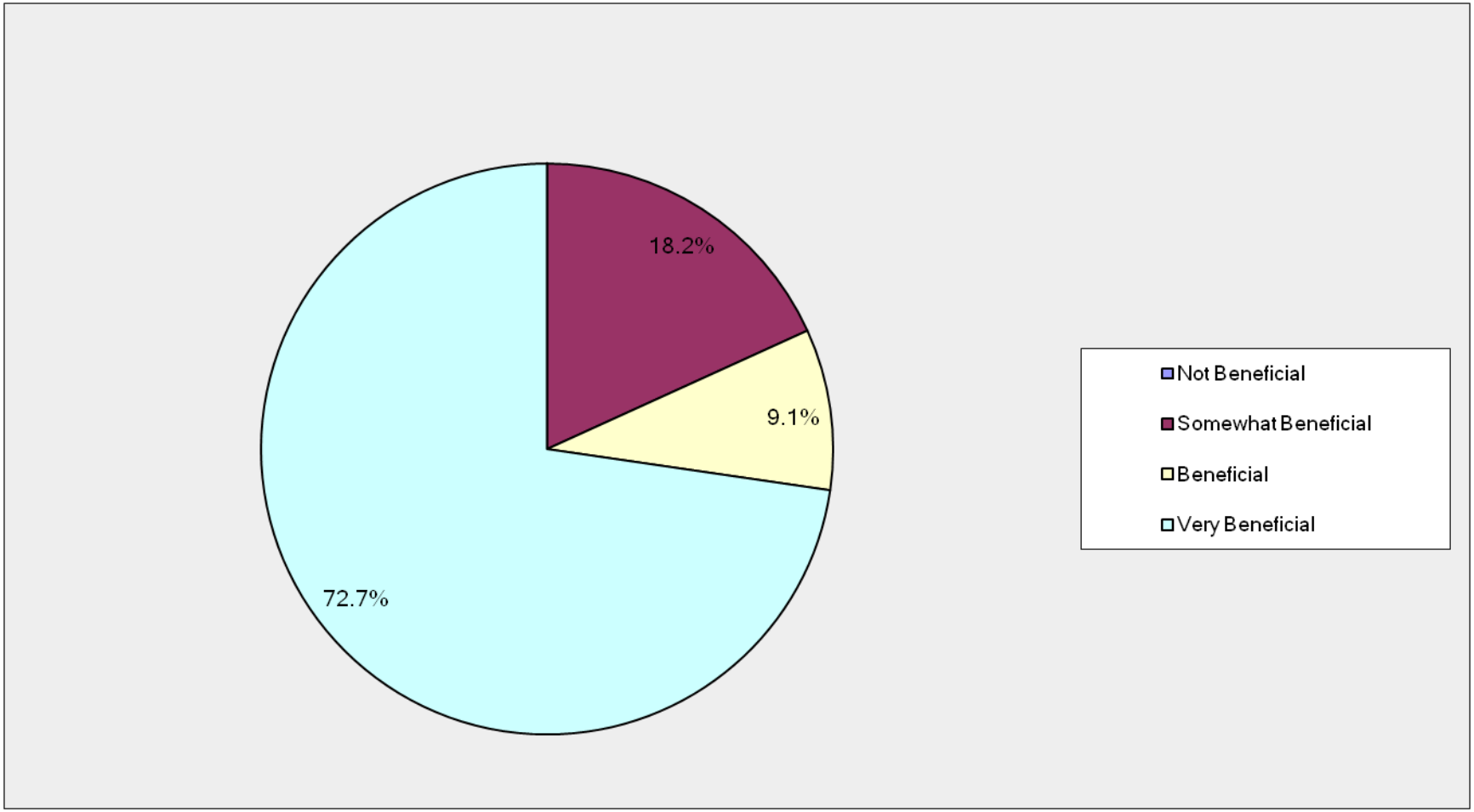
Improving Your Ability to Care for Patients with Diabetes



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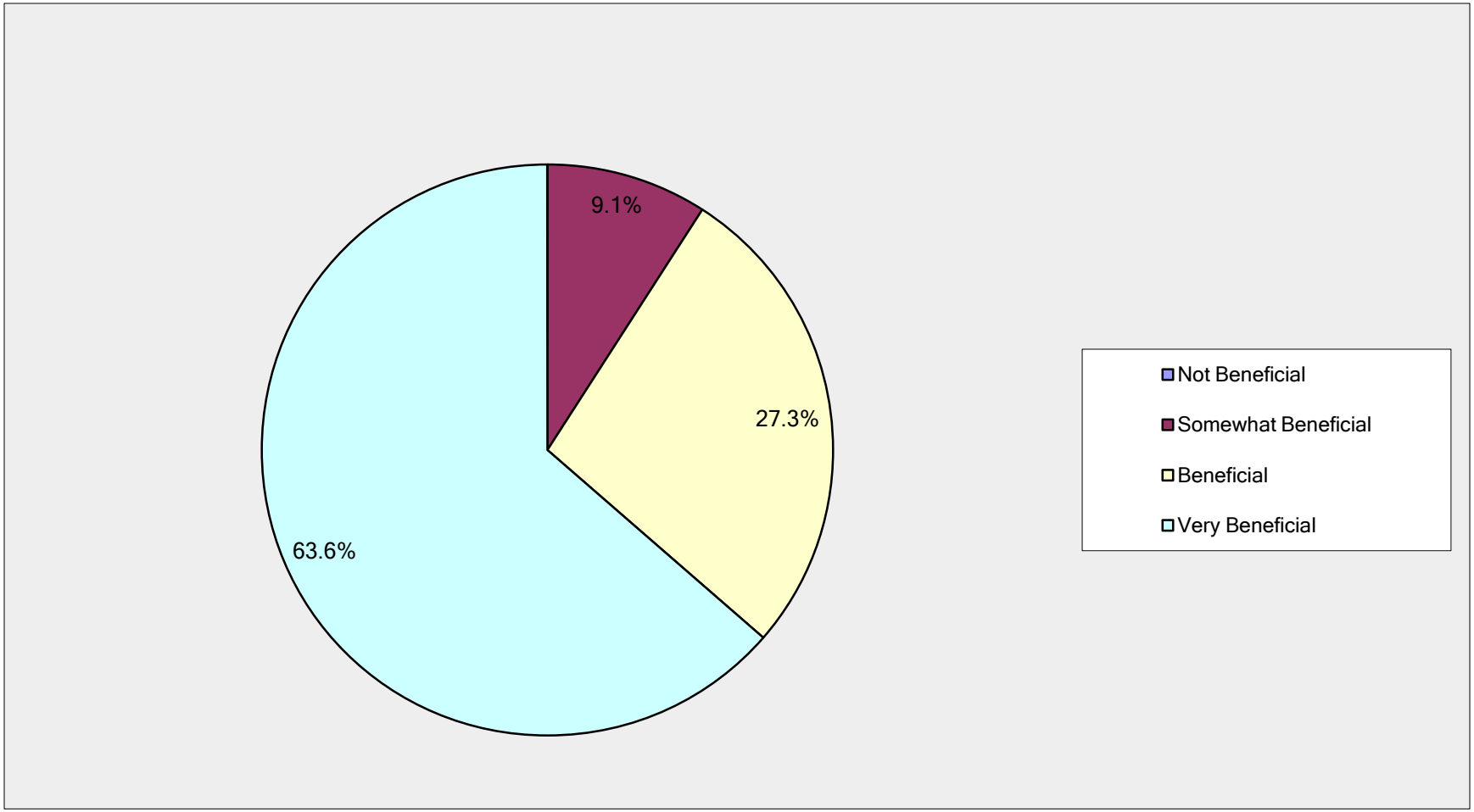
Providing Additional Knowledge for Diabetes



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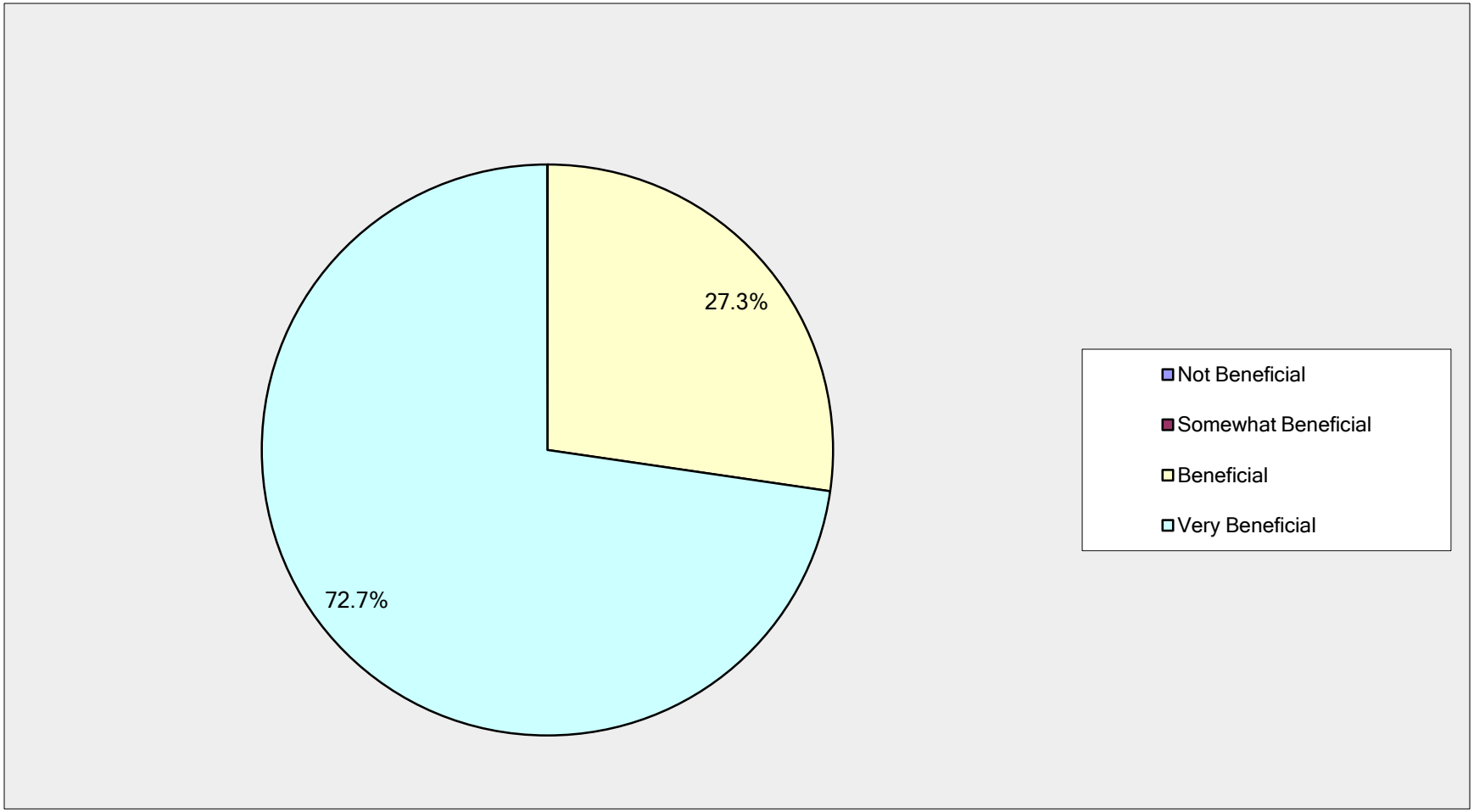
Providing Tools to Support Nursing Practice



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How has the role supported front line staff?

Champions:

- Able to provide information and more in-depth research
- Provide information with regards to meds being used for diabetes
- Support ++ new grads.
- Ensure staff are more aware of how to use the medical directive
- Provide knowledge so staff can teach better at the bedside
- Immediate accessibility for information and support
- Allows "front-line" staff to have a say in the policies and procedures being rolled out.
- Support their colleagues

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What benefits has this brought to the patients?

Patient Benefits:

- Provides efficient and organized care
- Patients receive up to date education
- Improved self management behaviors
- Improved glycemic control
- Increased knowledge and understanding of the correlation between diabetes and heart disease.
- Availability of community referral
- Continuity of care and increased resources
- Better quality and more thorough care

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Diabetes Integrated Management Pilot Study: Background and Results

Amel Arnaout MD FRCPC
Endocrinologist

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CVD in the Diabetic Patient

- CVD is 2 to 3 times more prevalent in diabetic than nondiabetic patients
- Higher occurrence of all manifestations of CVD: sudden death, acute MI, CHF, arrythmia, stroke
- "residual risk" after all other variables such as blood pressure and lipids are accounted for and treated remain higher in diabetic patients
- Glycemia on its own is a negative predictor of adverse cardiovascular outcomes

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Diabetes in the Cardiac Patient

- Up to half of patients presenting with Acute Coronary Syndrome have been reported to have diabetes
- Mutliple other cardiac cohorts so similar high prevalence
- Diabetes is a risk factor for poor outcome post cardiac interventions

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Glycemic Control in CVD: Is It Worthwhile

1. **Glycemic control & CVD: evidence**
   - Glycemic control alone may reduce CVD (UKPDS, DIGAMI)
   - Glycemic control combined with other risk factor modification reduces CVD in the chronic patient population (STENO-2)

2. **Occult/chronic CVD disease has different risks than overt/acute CVD disease and may differ with respect to effect of interventions (ACCORD)**

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Inpatient Diabetes Management

Prior to implementation of Diabetes Program:

- **Inconsistent identification of diabetes patients and blood glucose monitoring**
- **Endocrinology service consulted on inpatients at discretion of the admitting team.**
- **Diabetes nurse involved only in a minority of cases**
- **Follow up of patients in Endocrinology clinic only for the patients deemed likely need further treatment intensification**

Issues:

- Lack of consistent diabetes identification and treatment goals
- Limited shared diabetes nursing support across multiple hospital.
- Follow up challenges: patient travel to multiple campuses, congested diabetes clinics

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Results of Inpatient Program

- Audit of all patients admitted in the Cardiac Care Institution with an A1c of over 6.5% between Jan to June 2012
- Mean A1c was 7.8 - 8.9%
- Newly diagnosed diabetes comprised 21% of population enrolled.

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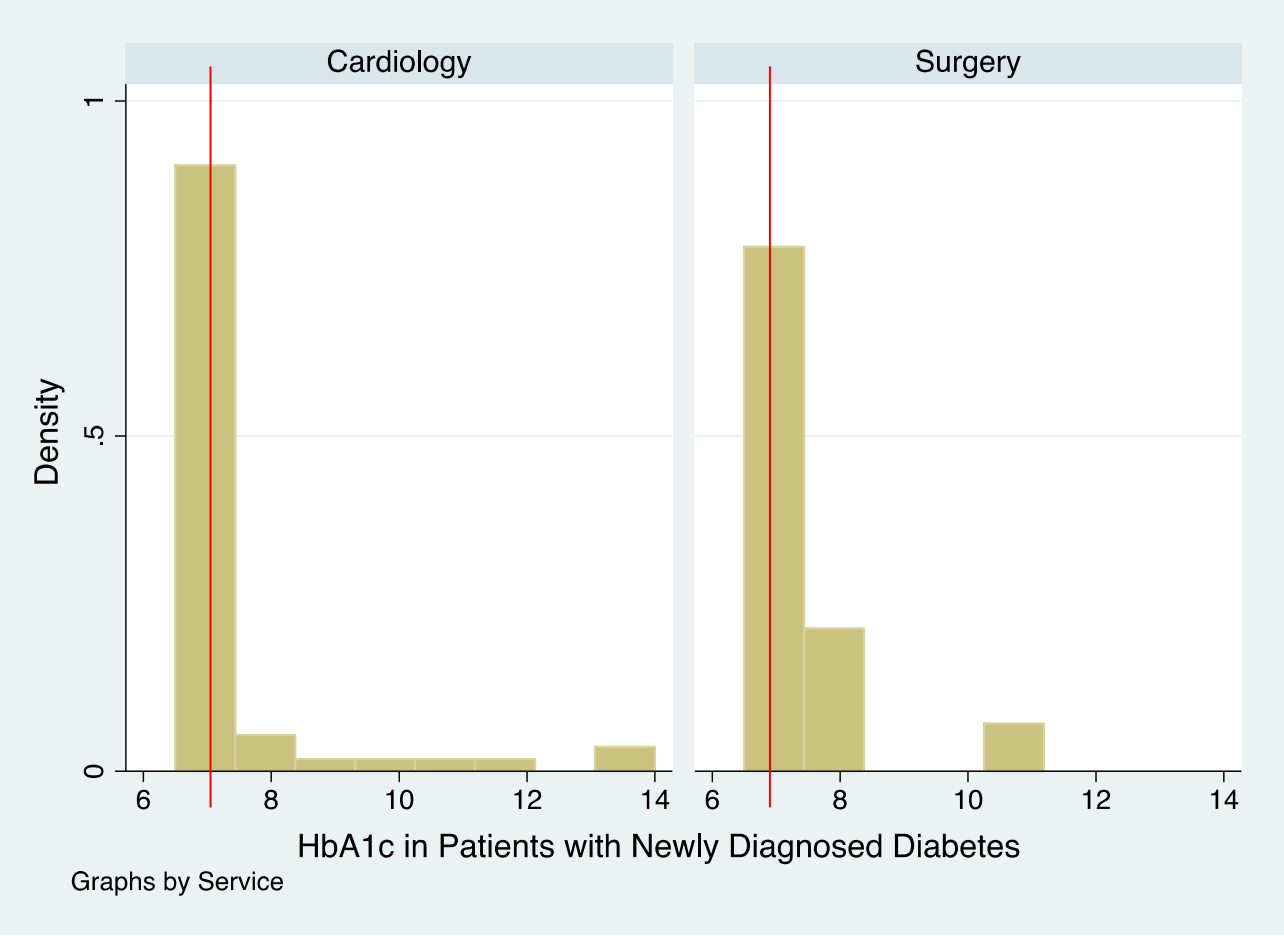
Newly diagnosed diabetes: A1c levels



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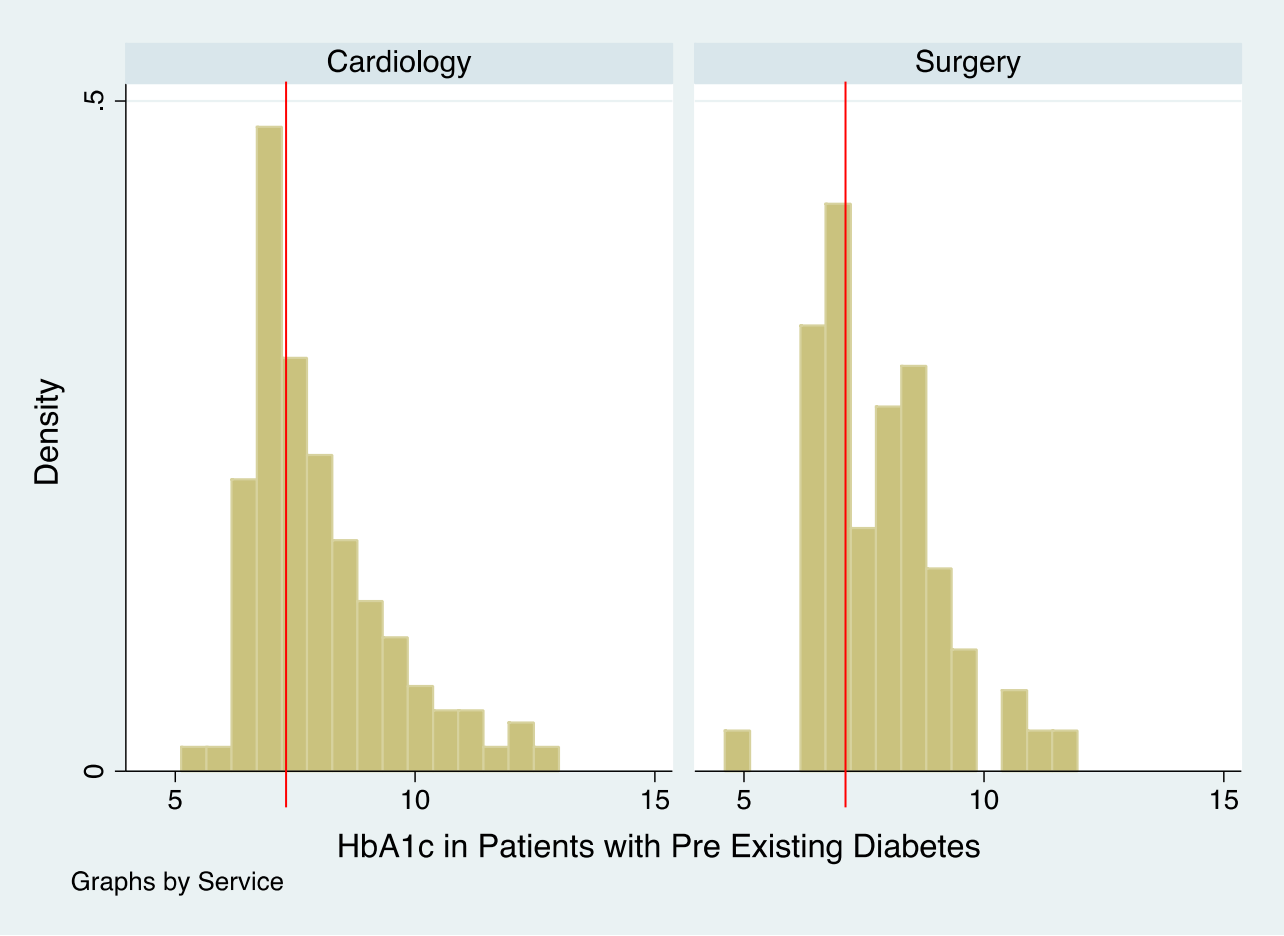
Pre-existing Diabetes: A1c levels



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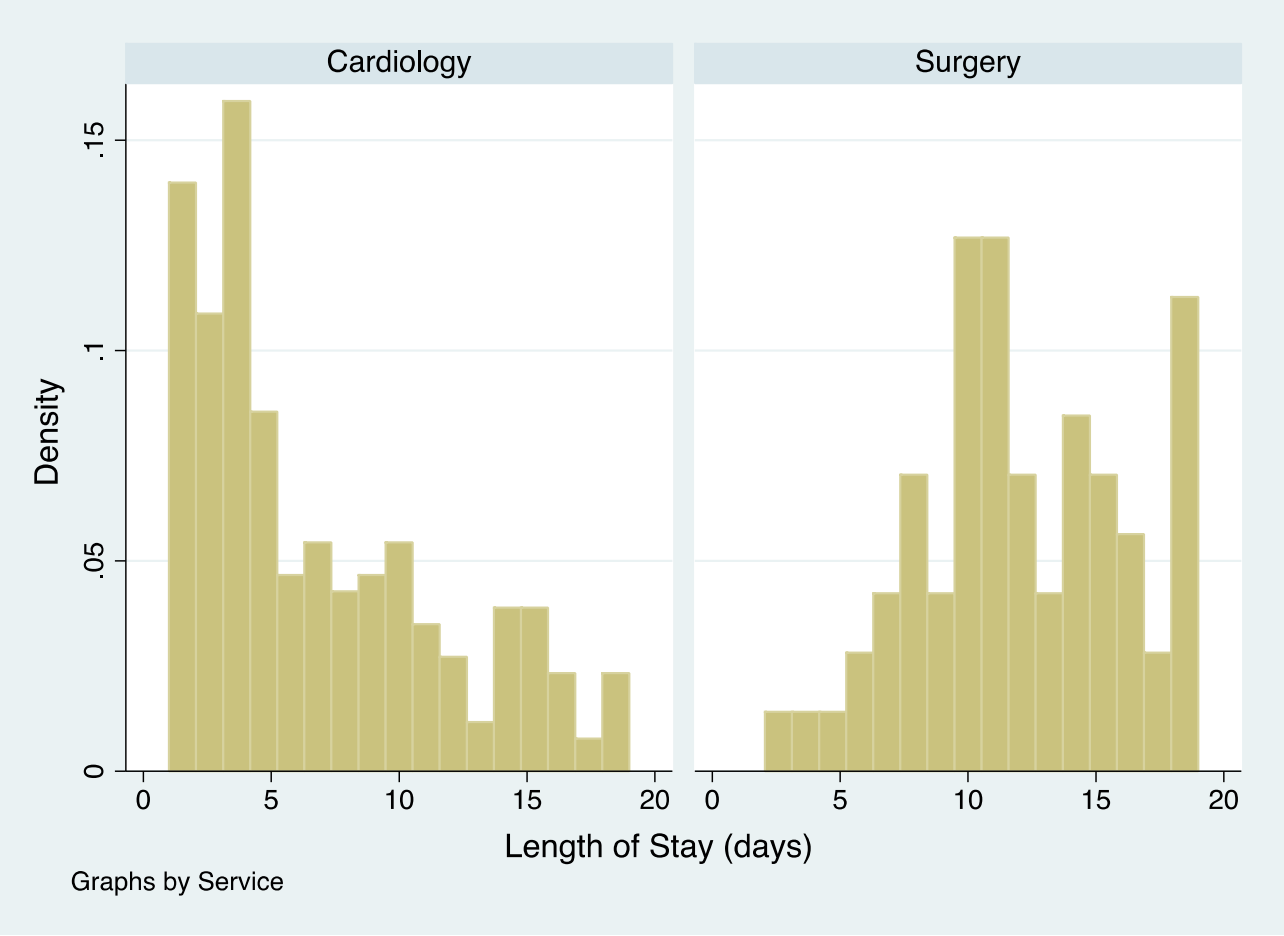
Length of Stay in Hospital



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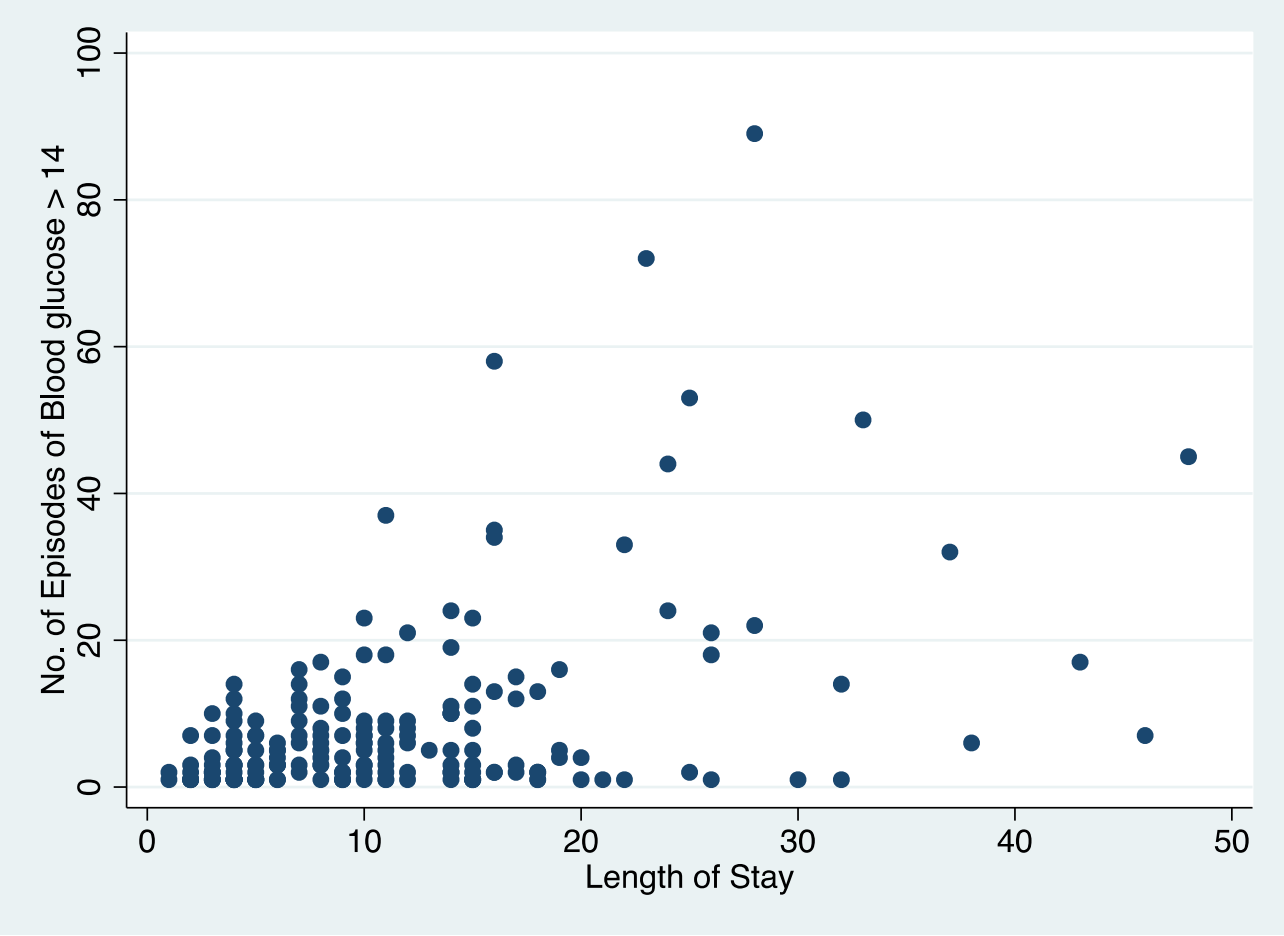
Correlation between episodes of hyperglycemia and longer LOS



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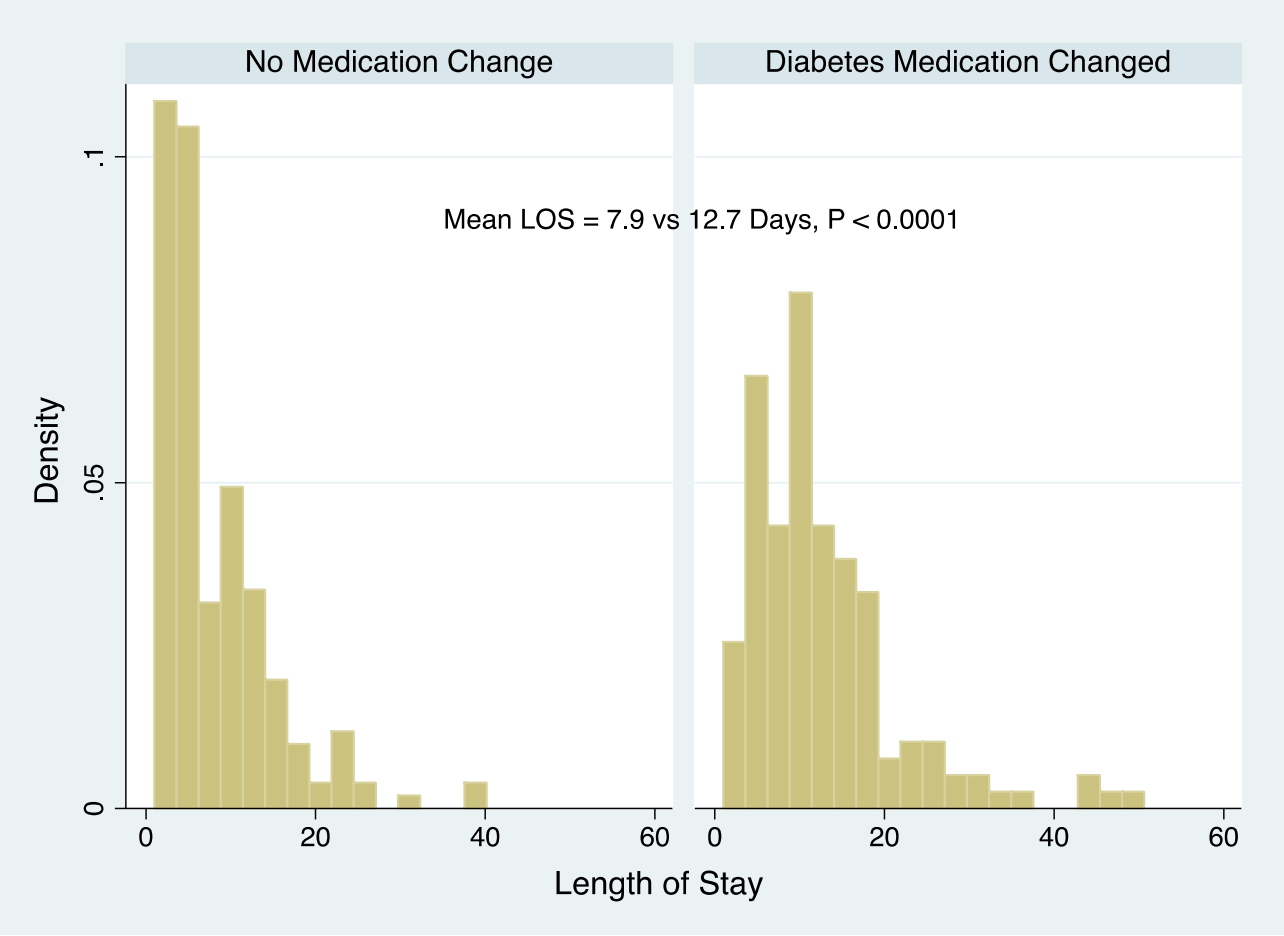
Diabetes Medication Change Correlates with longer LOS



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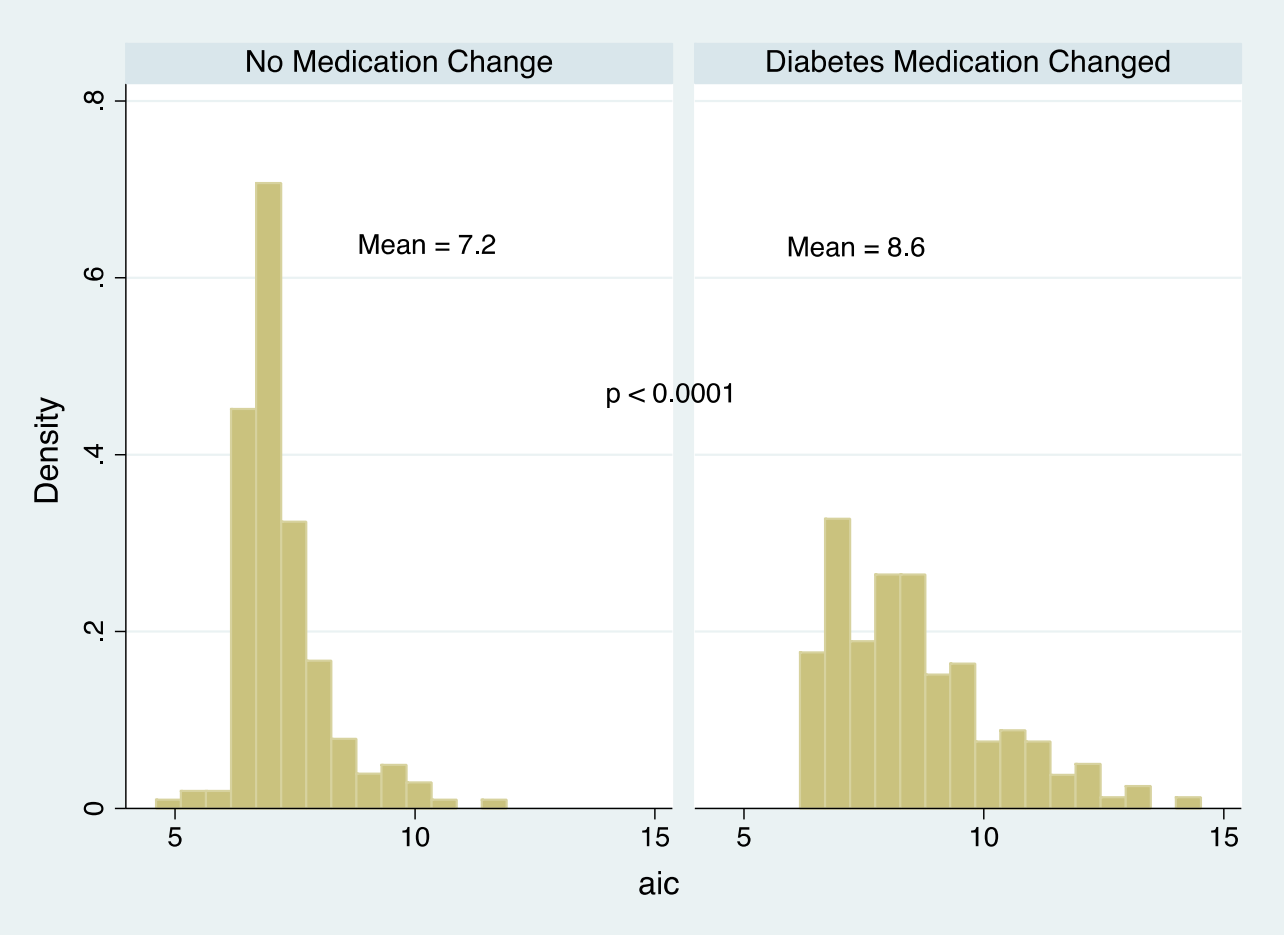
Diabetes Medication Change Correlates with A1c levels



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Length of Stay Summary

- Cardiac surgery patients stayed in hospital longer
- The longer the length of stay, the more episodes of hyperglycemia
- The longer the length of stay, the more likely a change was made to the diabetes medications
- Change in diabetes medications was highly correlated with a diabetes nurse or Endocrinology consult

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Hypoglycemia

- **Severe episodes (BS < 3.0mmol/L) were rare, less than 3% of patients**
- **Mild and severe hypoglycemia was associated with a changes in diabetes medications**
- **Interesting patients newly started on insulin in hospital did *not* have a higher occurrence of hypoglycemia**

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Consults

- Diabetes nurse was consulted in 40% of patients
- Endocrinology was consulted in 20% of patients
- Referral made to outpatient Cardiac Diabetes Clinic in 40%

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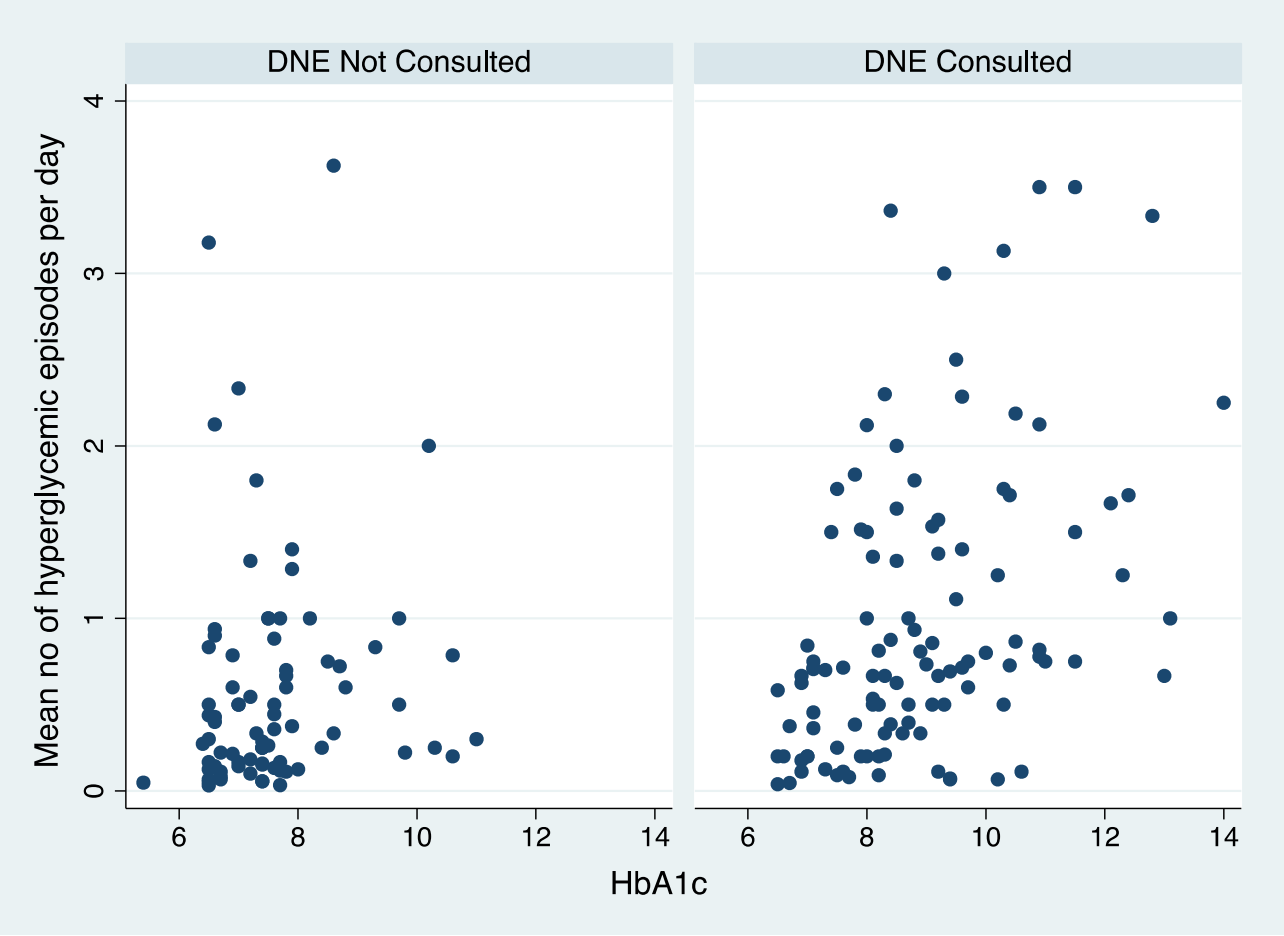
Diabetes Nurse Consult



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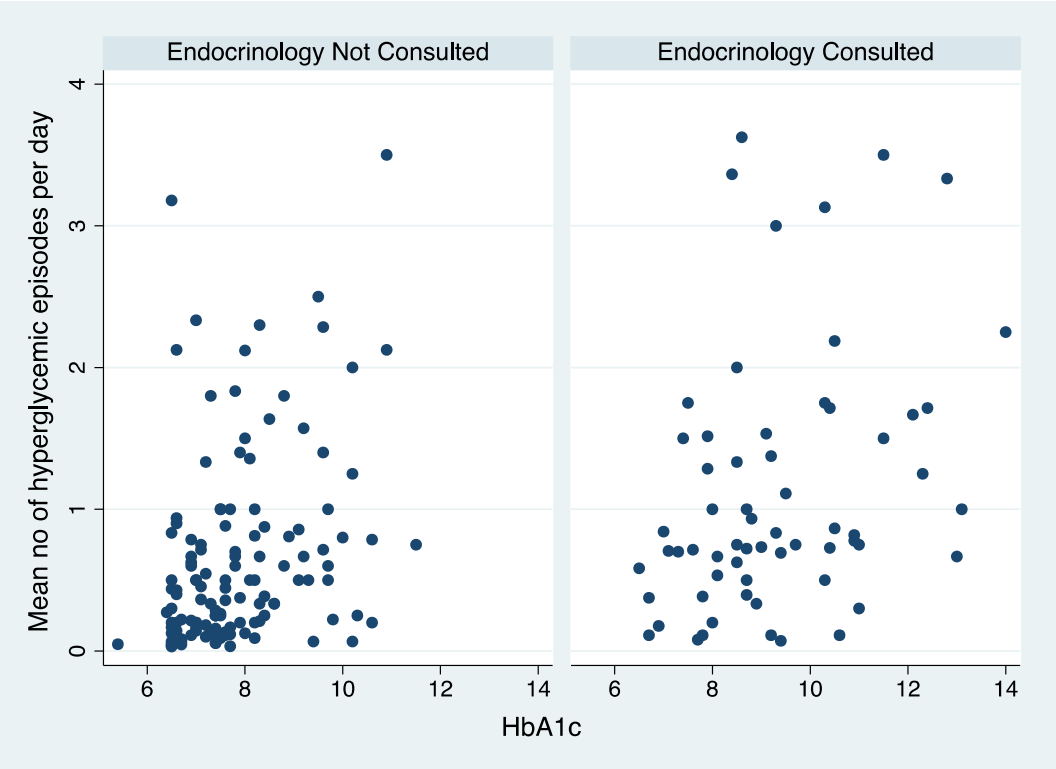
Endocrinology Consult



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Reasons Patients *NOT* referred to Clinic

Reason	Percentage (%)
Unspecified	68.2
Followed by Family Doctor	14.6
Refused	8.9
Already sees an Endocrinologist	8.3

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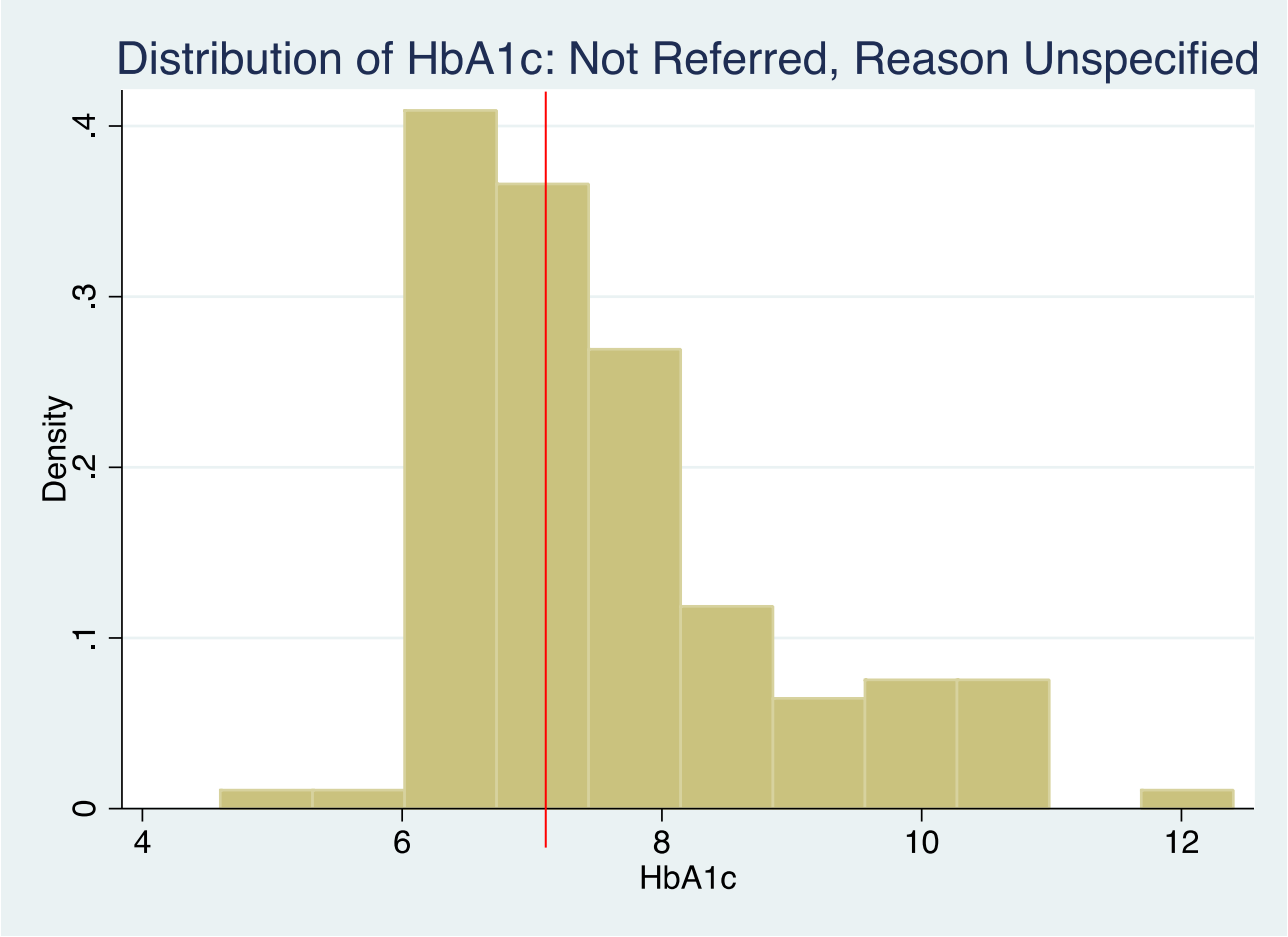
Patients *NOT* referred to Diabetes Clinic



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Why a Specialized Cardiology Diabetes Clinic

- High proportion of diabetes
- High risk patients with demonstrated vascular disease that can be worsened by inadequate glycemic control
- Early treatment of hyperglycemia can improve outcomes post ACS
- Evidence that a specialized outpatient clinic will improve glycemic control within a short period of time
- Patient convenience, continuity of care

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UOHI Diabetes Clinic

Patients referred:

- All inpatients seen by Endocrinology consult service or DNE, and not known to have an endocrinologist
- All newly diagnosed diabetes
- All others are offered an appointment as per medical directives

- **Initial Consult booked 2 – 6 weeks post discharge**
- **Follow up visit typically q3 months**
- **Patients discharged when deemed medically optimized and has accessed community resources for ongoing care.**
- **Goal is discharge at 1 year**

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Clinic assessments

Clinical parameters:

- Weight, Blood pressure, BMI
- Foot Screen

Diabetes Nurse Educator:

- Blood glucose assessment
- Insulin teaching
- Hypoglycemia teaching

Bloodwork and flowsheet as per guidelines: A1C, lipid profile, Cr/eGFR, UACR

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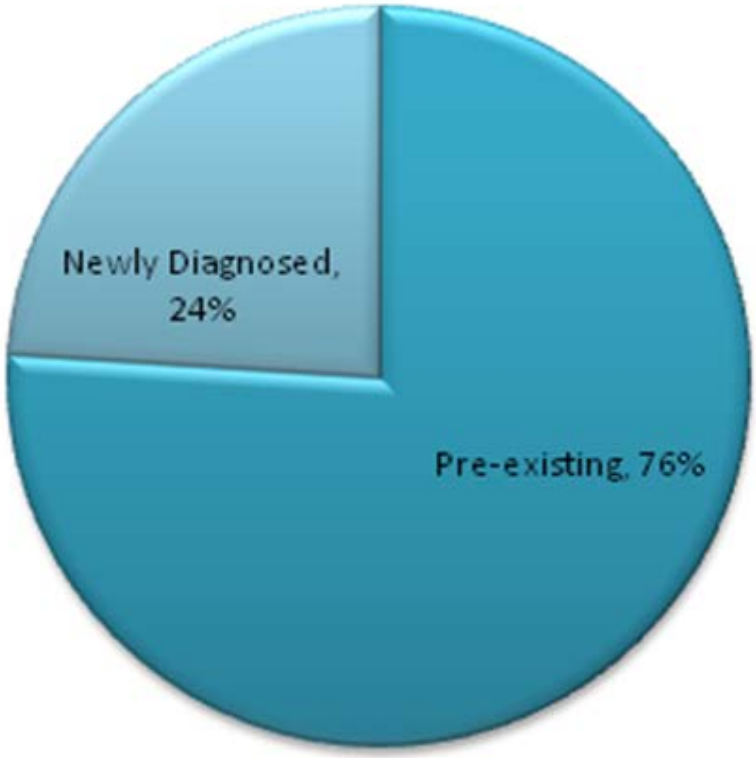
Outpatient Clinic Population: Newly diagnosed versus known diabetes



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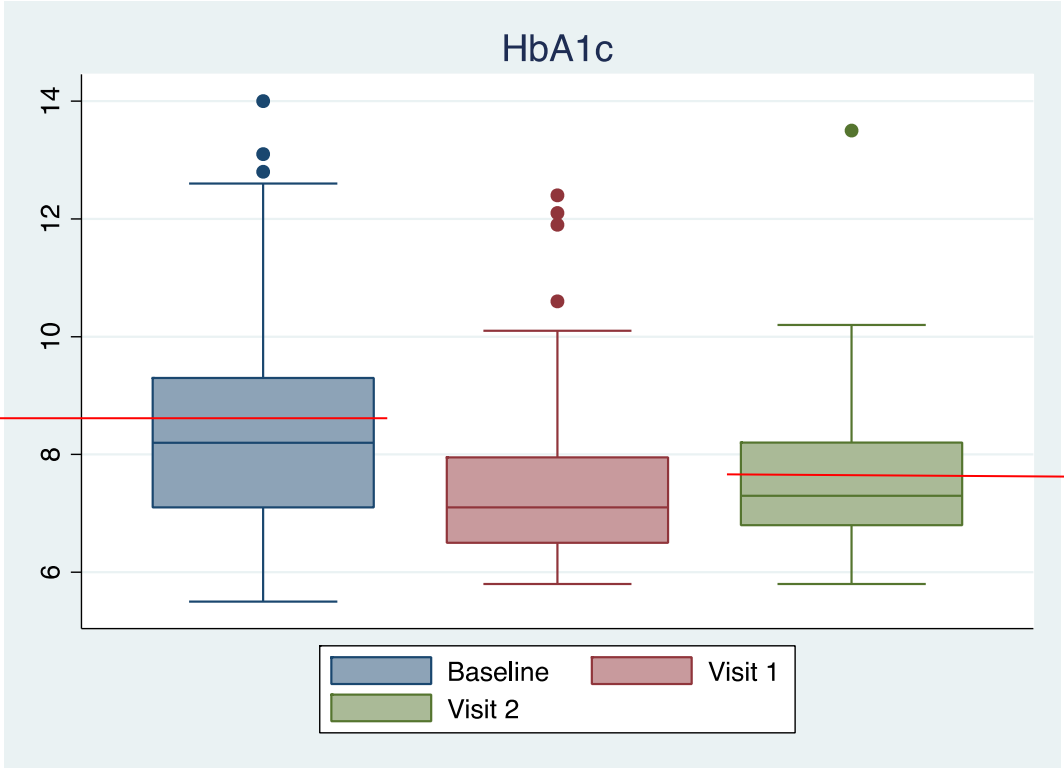
HbA1C levels by visit

Mean 9.0%



Mean 7.7%

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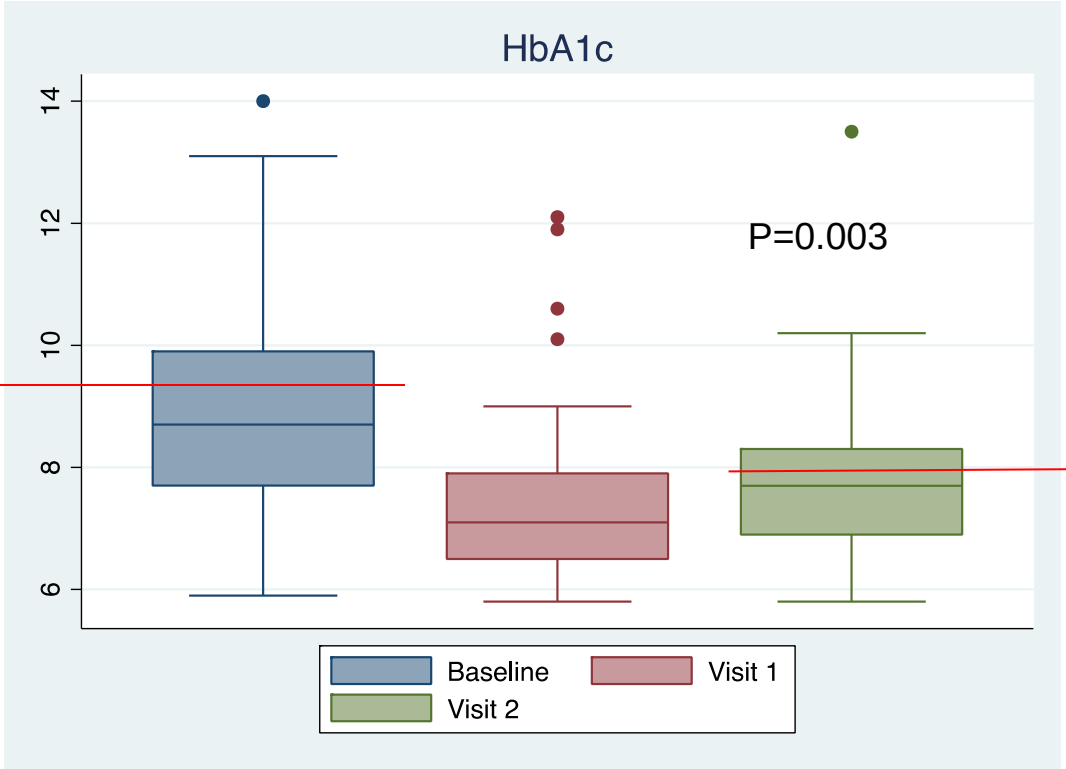
HbA1C change in patients completing all three clinic appointments

Mean 9.2%



Mean 7.78%

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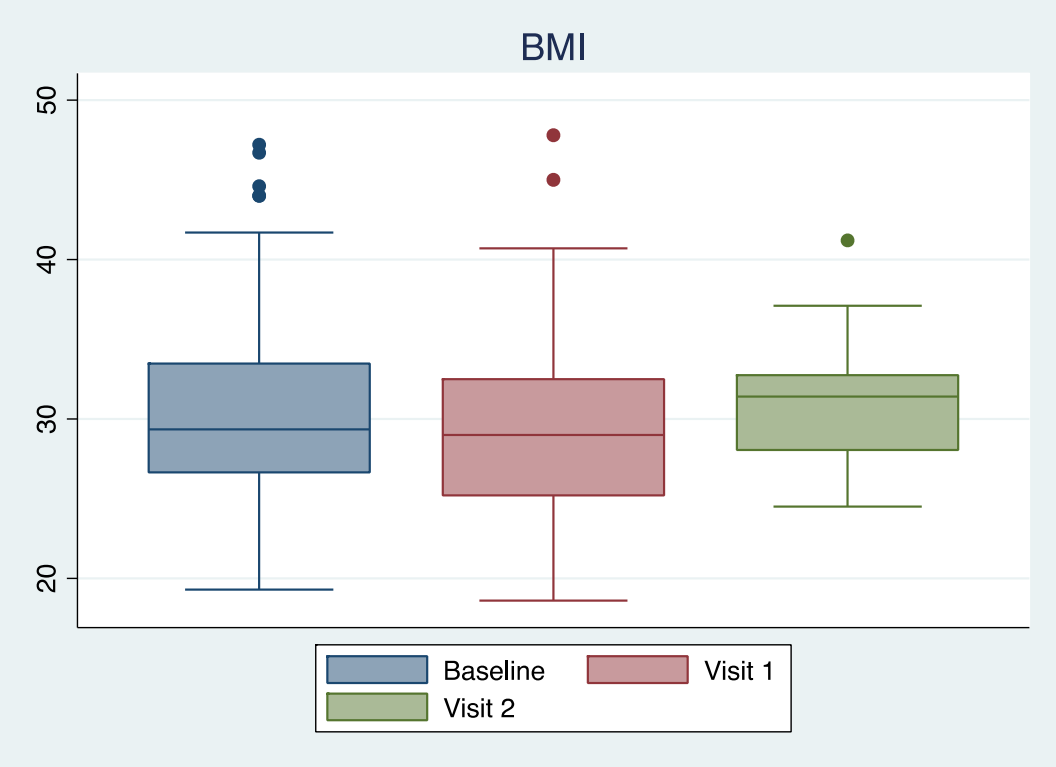
BMI by clinic visit, all patients



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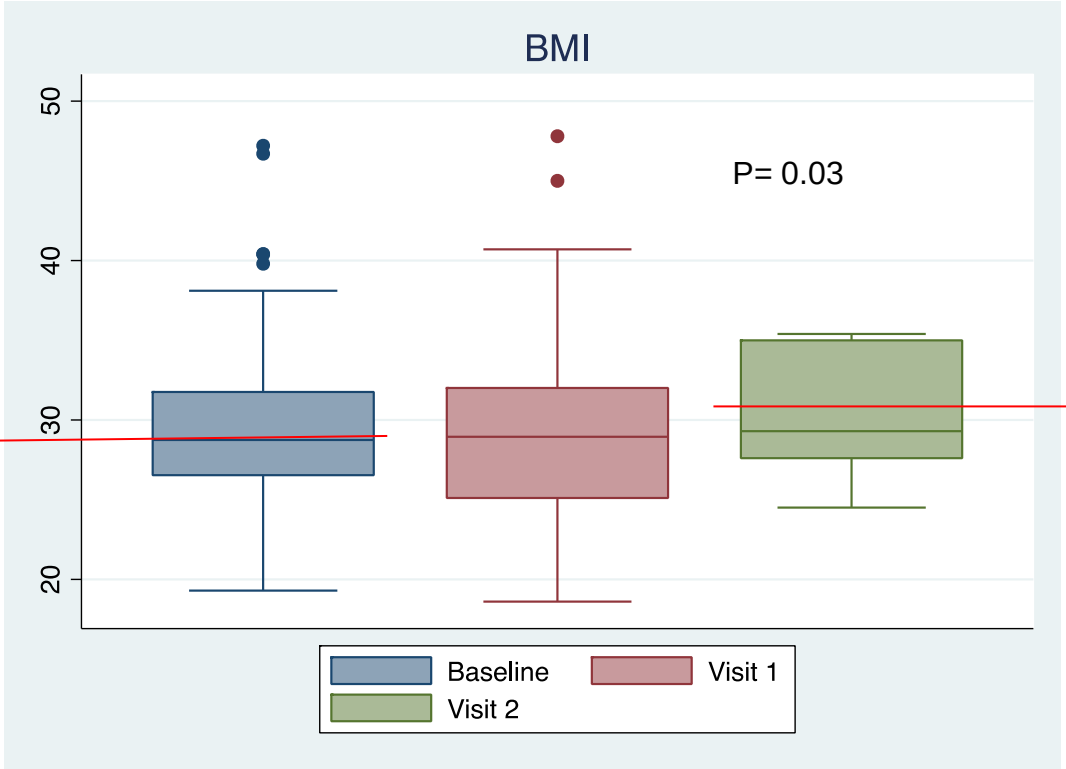
BMI difference in patients completing all three clinic appointments

Mean 28.5



Mean 30.2

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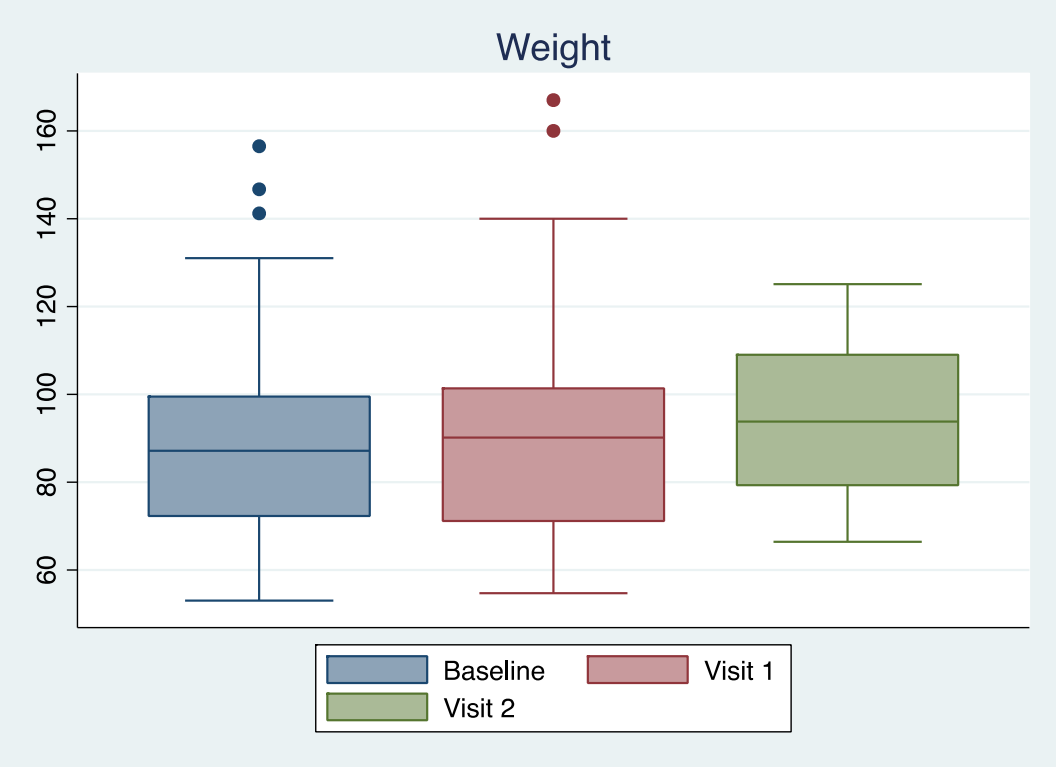
Weight changes in those completing 3 clinic appointments



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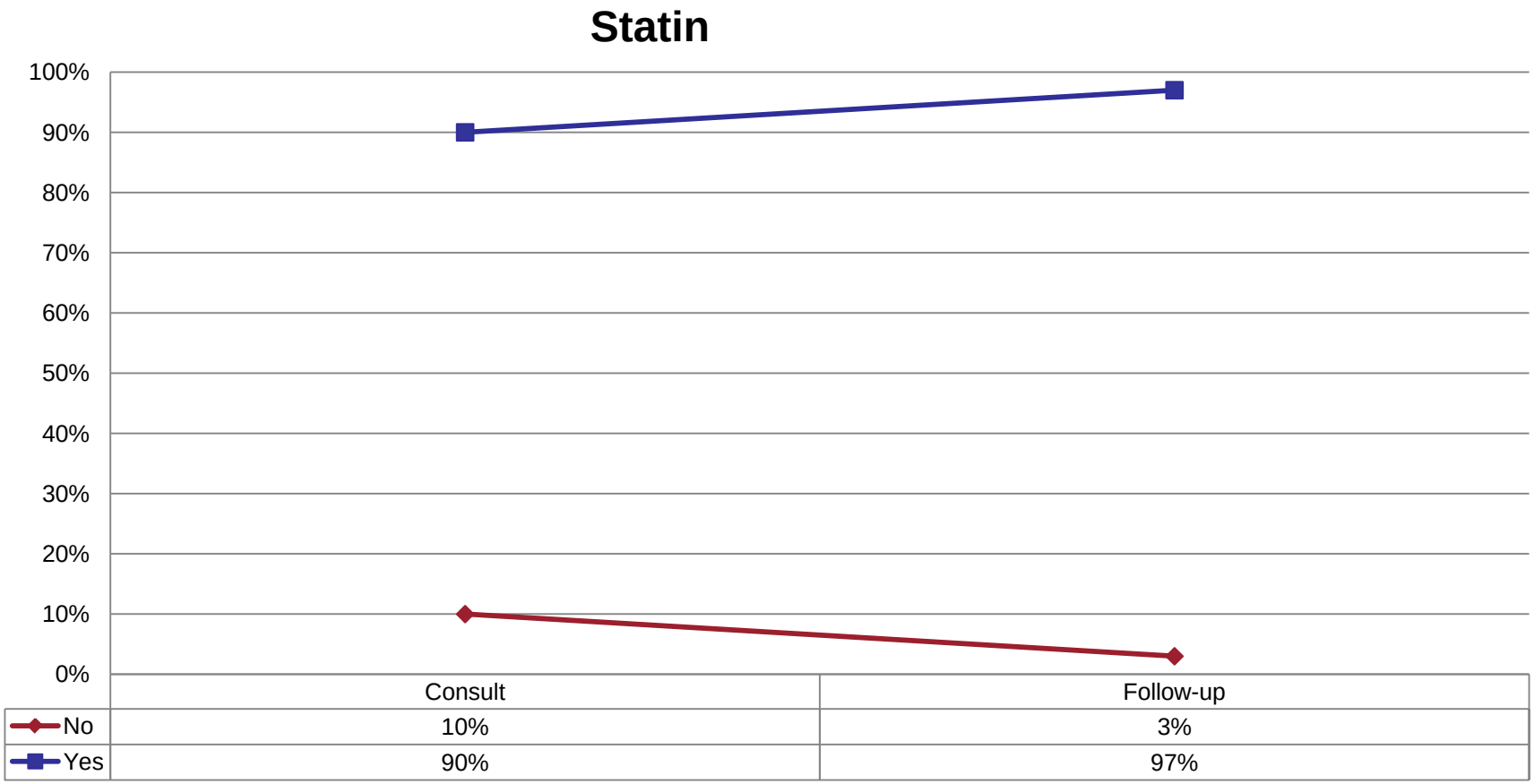
Statin Use at Baseline and first Followup



	Consult	Follow-up
No	10%	3%
Yes	90%	97%

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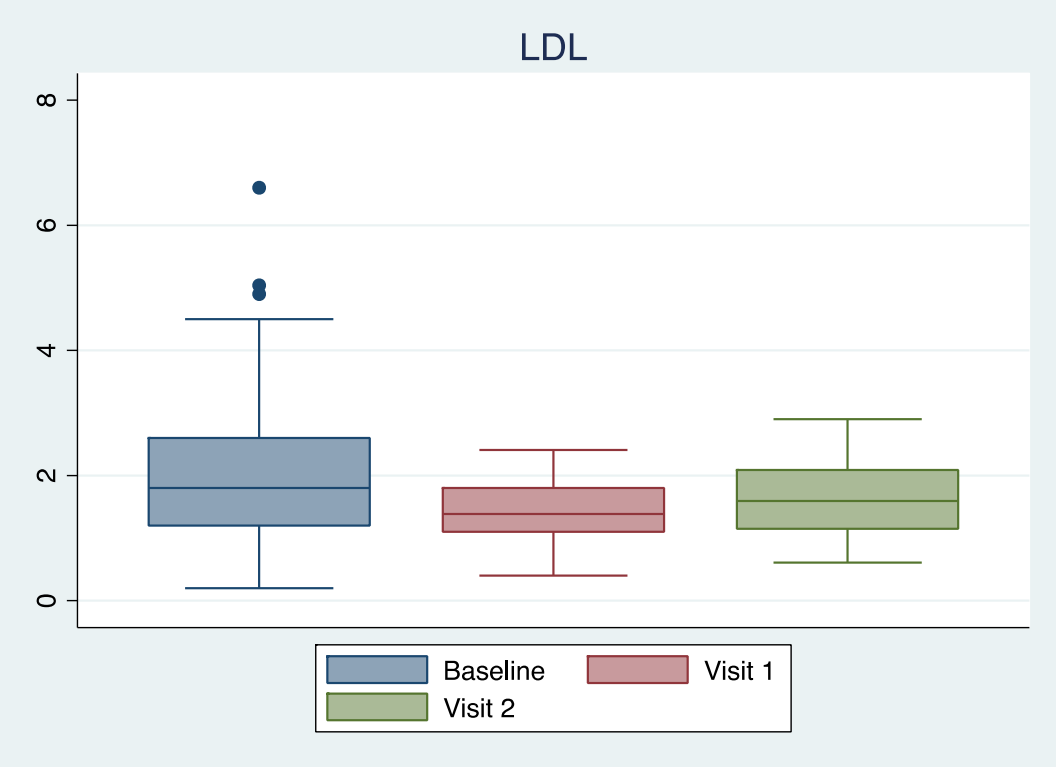
LDL levels by visit



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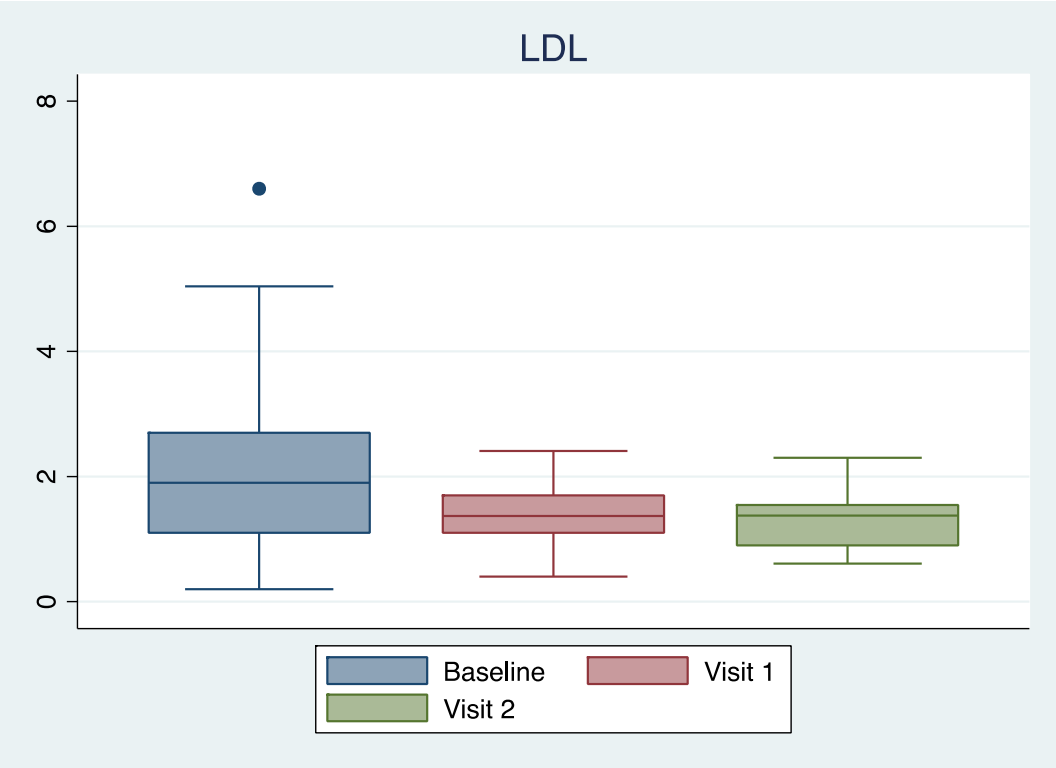
LDL changes in patients completing all three clinic appointments



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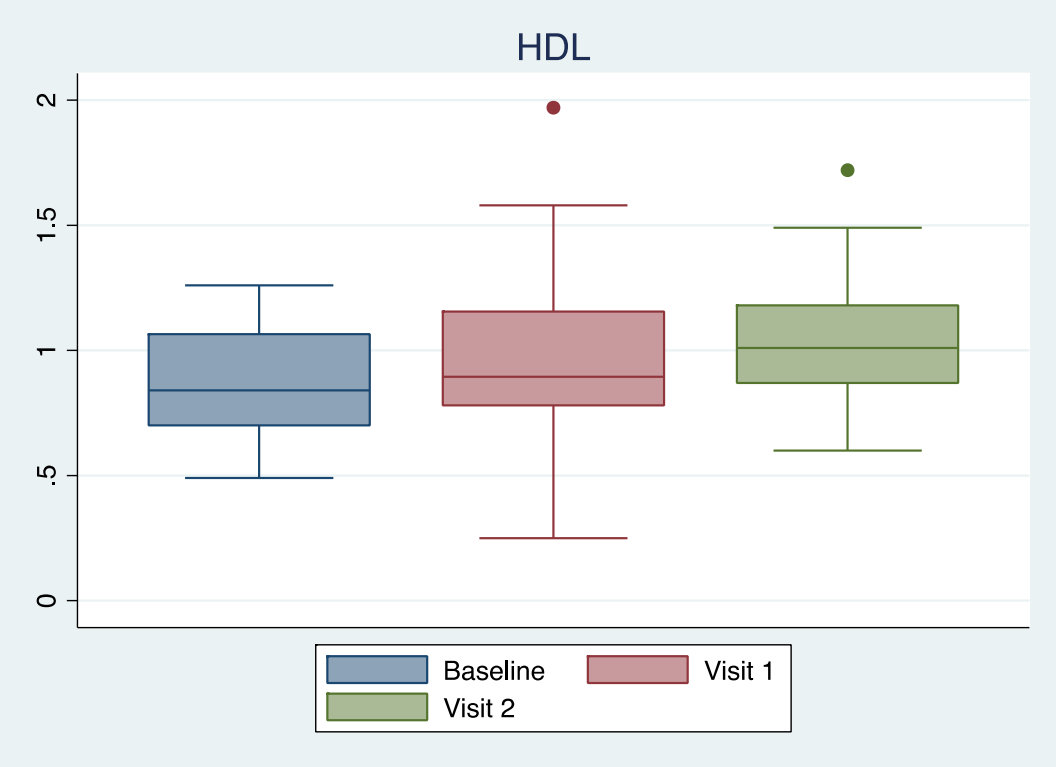
HDL change in patients completing all three clinic appointments



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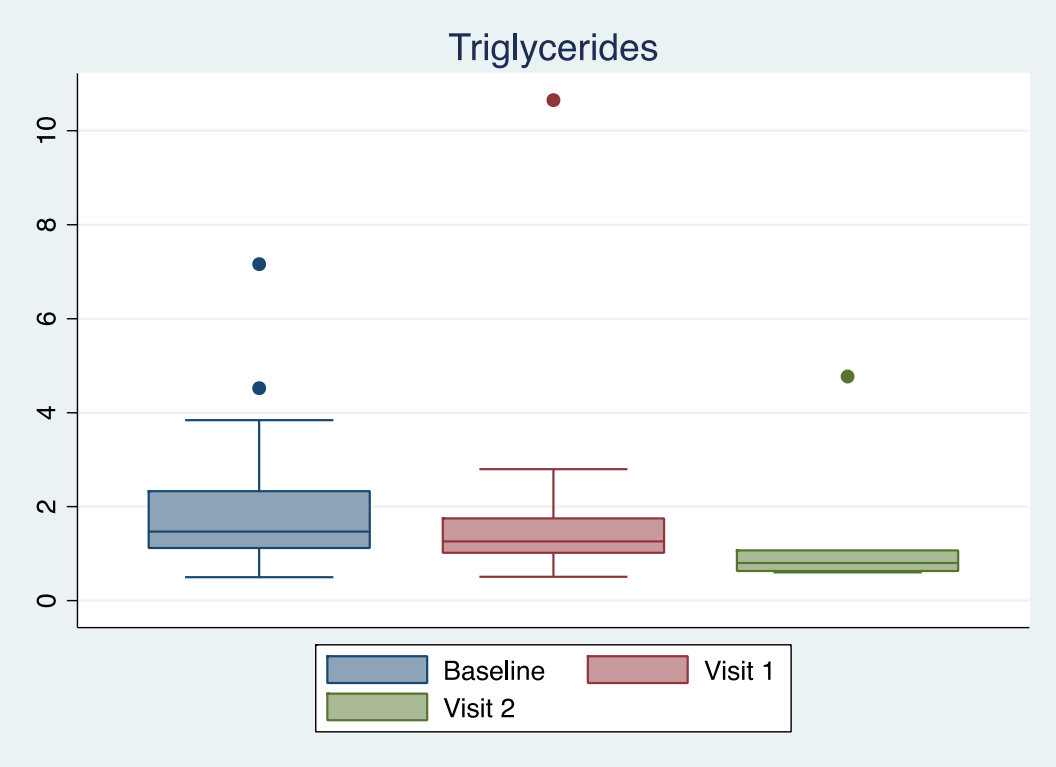
Triglyceride change in patients completing all 3 clinic appointments



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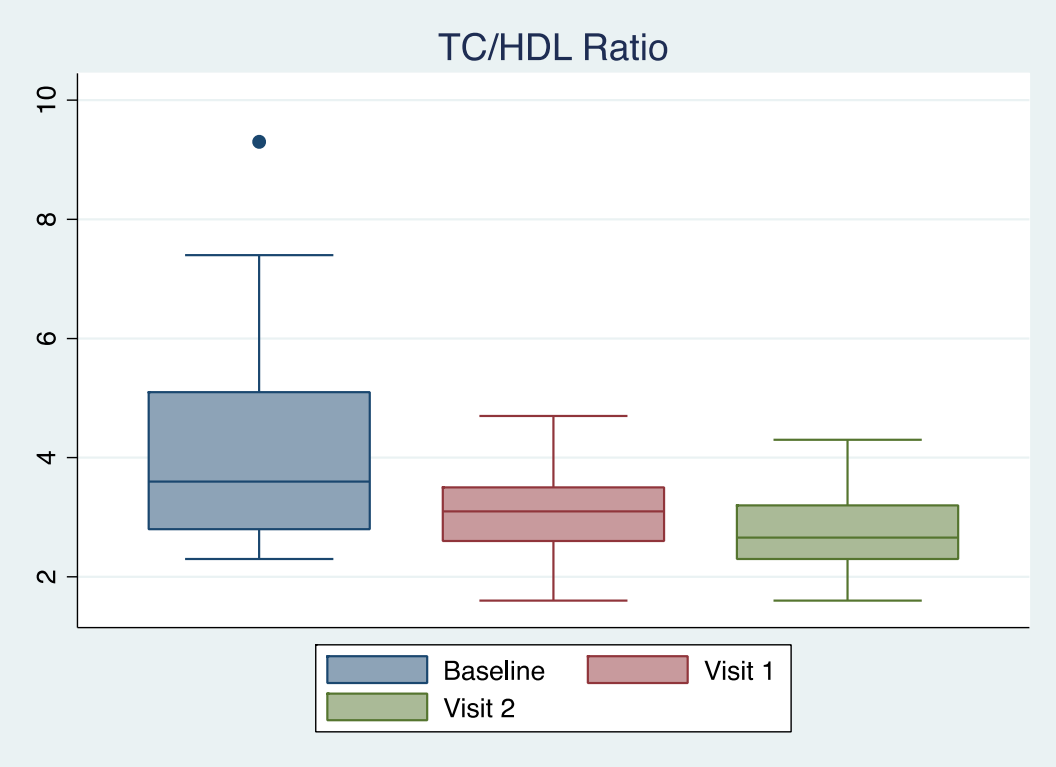
Total cholesterol/HDL ratio in patients completing all three clinic visits



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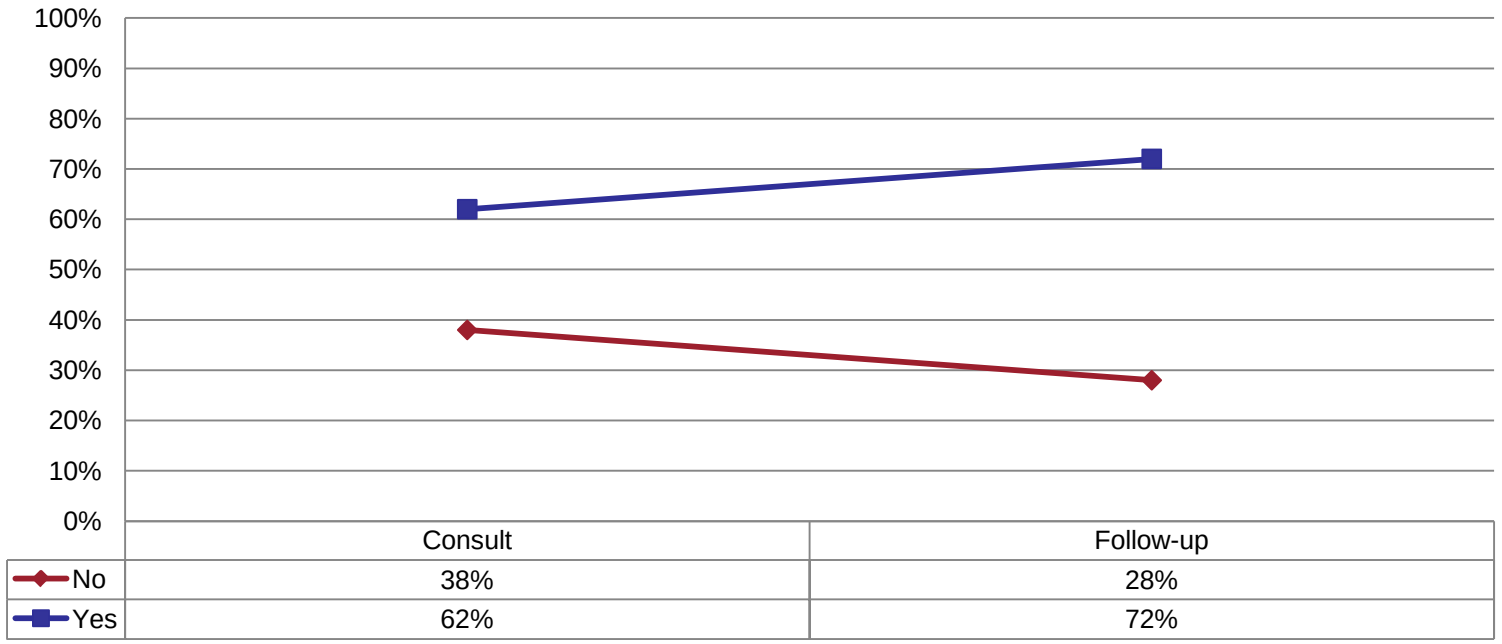
ACE/ARB Use at Baseline and first followup

ACE



	Consult	Follow-up
No	38%	28%
Yes	62%	72%

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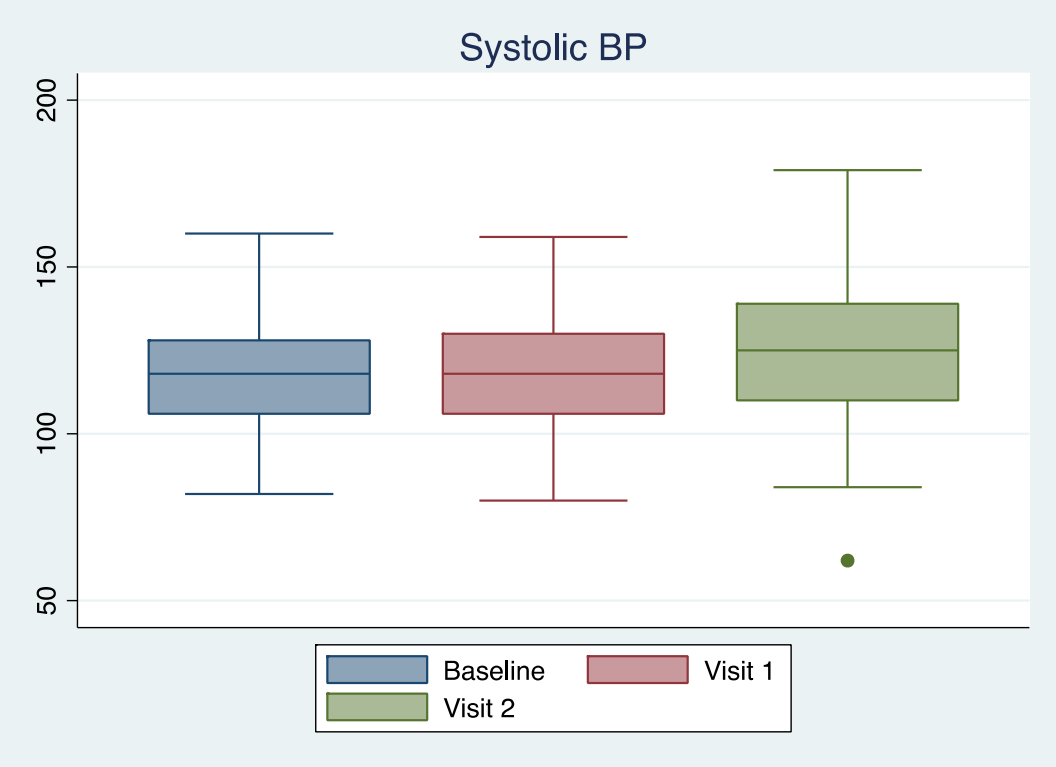
Systolic Blood Pressure by visit



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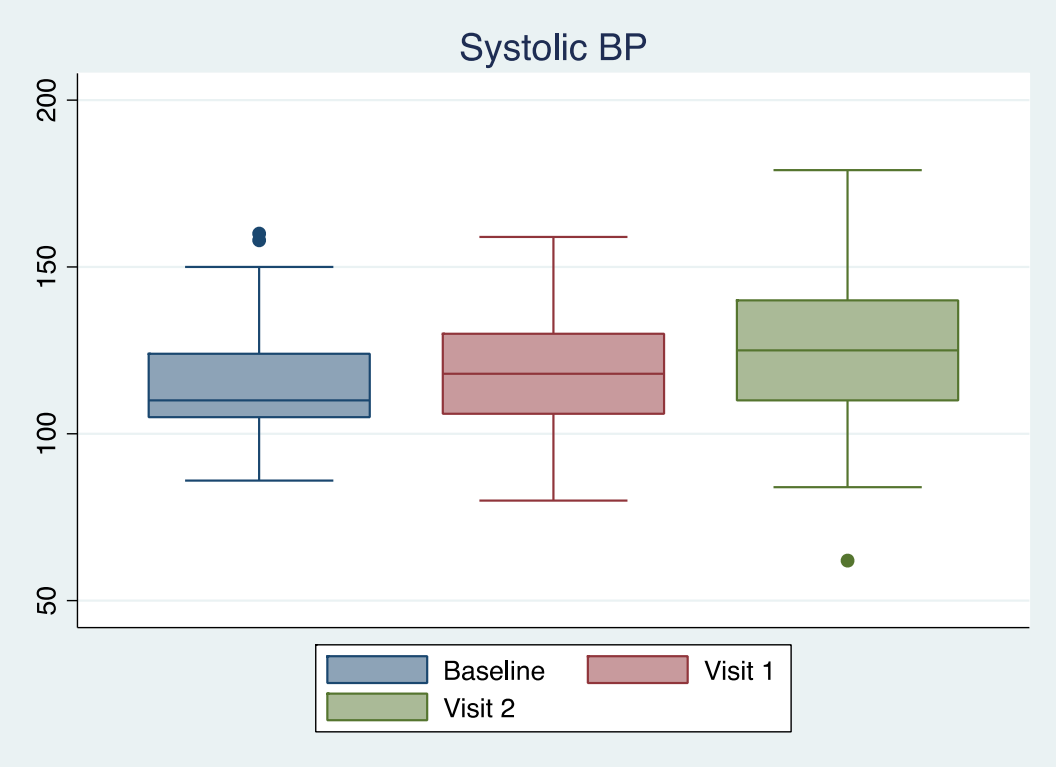
Systolic BP changes in patients completing all three clinic appointments



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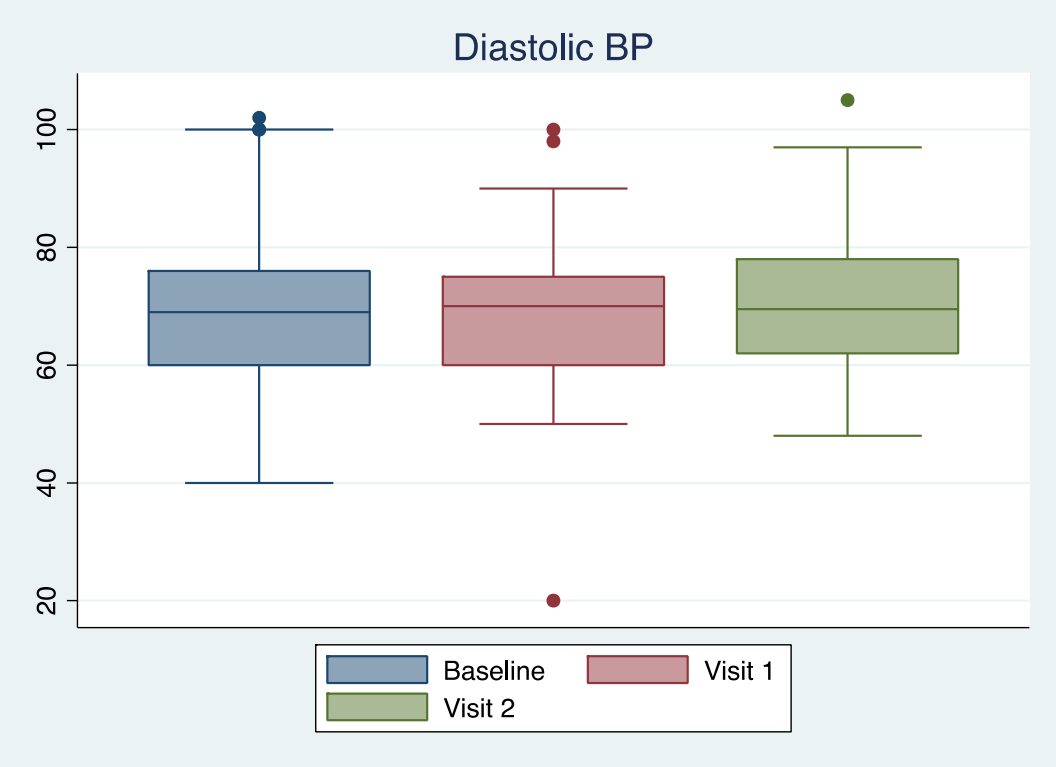
Diastolic BP by visit



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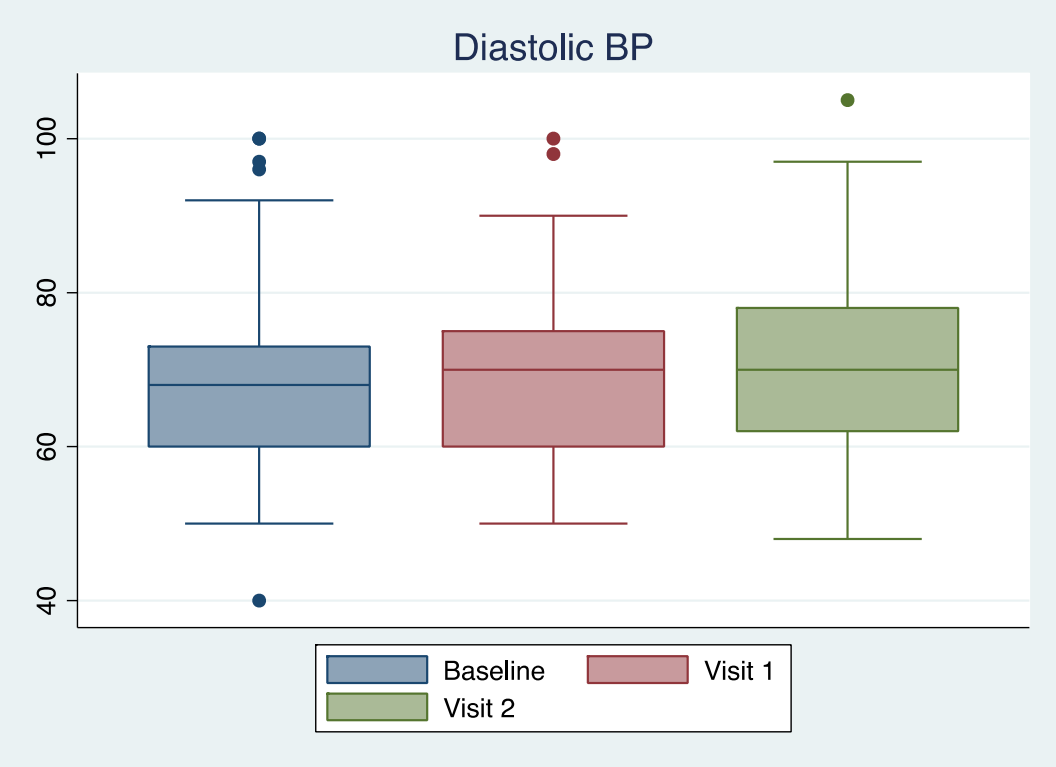
Diastolic Blood Pressure changes in patients completing all three clinic appointments



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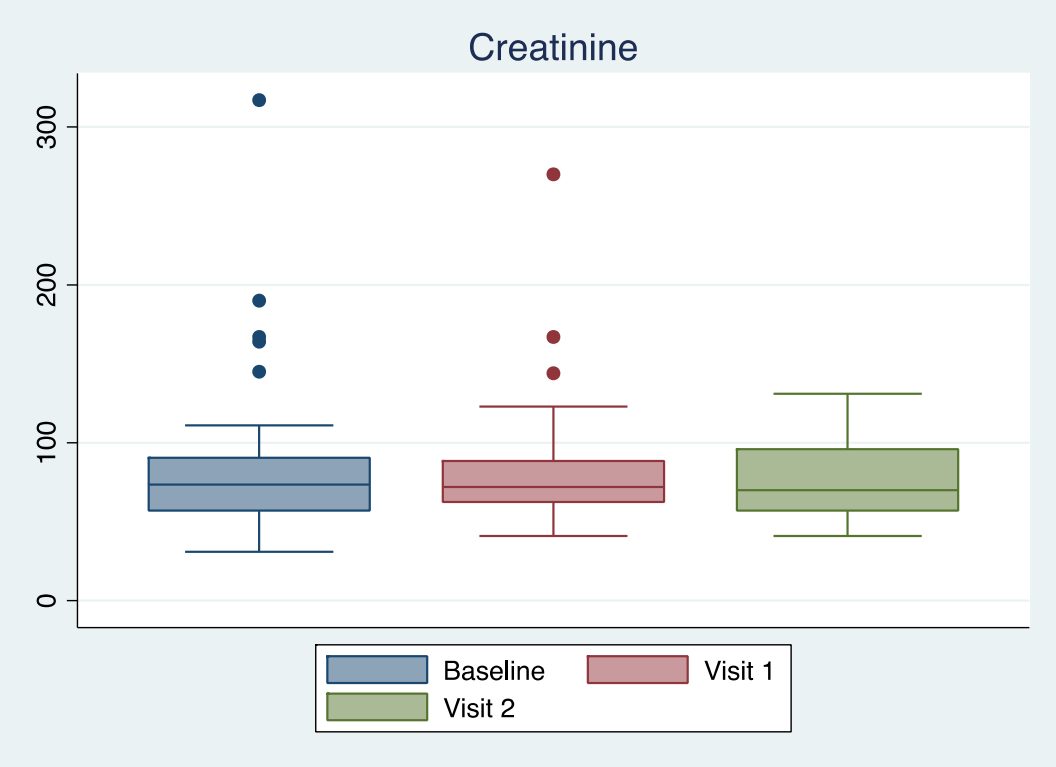
Creatinine levels in patients completing all three visits



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Insulin use by all visits

Visit	Insulin (%)		Oral hypoglycemics (%)	
	Yes	No	Yes	No
Baseline	29.9	70.1	74.0	26.0
1	44.8	55.2	79.7	20.3
2	59.4	40.6	69.7	30.3
Total	**40.9**	**59.1**	**75.4**	**24.6**

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Insulin use in patients completing all three clinic appointments

Visit	Insulin (%)		Oral hypoglycemics (%)	
	Yes	No	Yes	No
Baseline	35.3	64.7	70.6	29.4
1	64.7	35.3	88.2	11.8
2	64.7	35.3	76.5	23.5
Total	**54.9**	**45.1**	**78.4**	**21.6**

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LESSONS LEARNED AND PANEL DISCUSSION

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Lessons learned

- Importance of having a core group of dedicated team members
- Full integration means identifying patients *before* they arrive at the hospital – preop and pretransplant patients
- You can only make an impact in the people you apply the intervention to – still a significant missed opportunity in outpatient care

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Moving Forward

Build on the positives:

- Continue to improve staff awareness
- Smooth transition from inpatient to outpatient
- Greater utilization of community resource for education

Challenges:

- Appropriate use of resources: Endocrinology inpatient consult service, Diabetes Nurse Educator, outpatient clinic

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Lessons Learned

Strengths

- ✓ All patients with Diabetes are being ***systematically*** identified and offered treatment based on Best Practice Guidelines
- ✓ Increased knowledge and enthusiasm of staff related to the care and management of their patients with DM
- ✓ Increased use of existing community resources
- ✓ Better outcomes for our patients

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Lessons learned

Challenges

✓Shorter stay patients

✓"One more piece of paper!"

✓Program maintenance

Lesson 1: The Importance of Teamwork

Team Members

- Division of Cardiology
  - Lloyd Duchesne, Lyall Higginson
- UOHI Clinical Services
  - Kim Twyman, Heather Sherrard, Bonnie Quinlan
- Division of Endocrinology
  - Amel Aranout, Janine Malcolm, Erin Keely, Alexander Sorisky

Lesson 2: The Need to Embrace New Technology and Ideas

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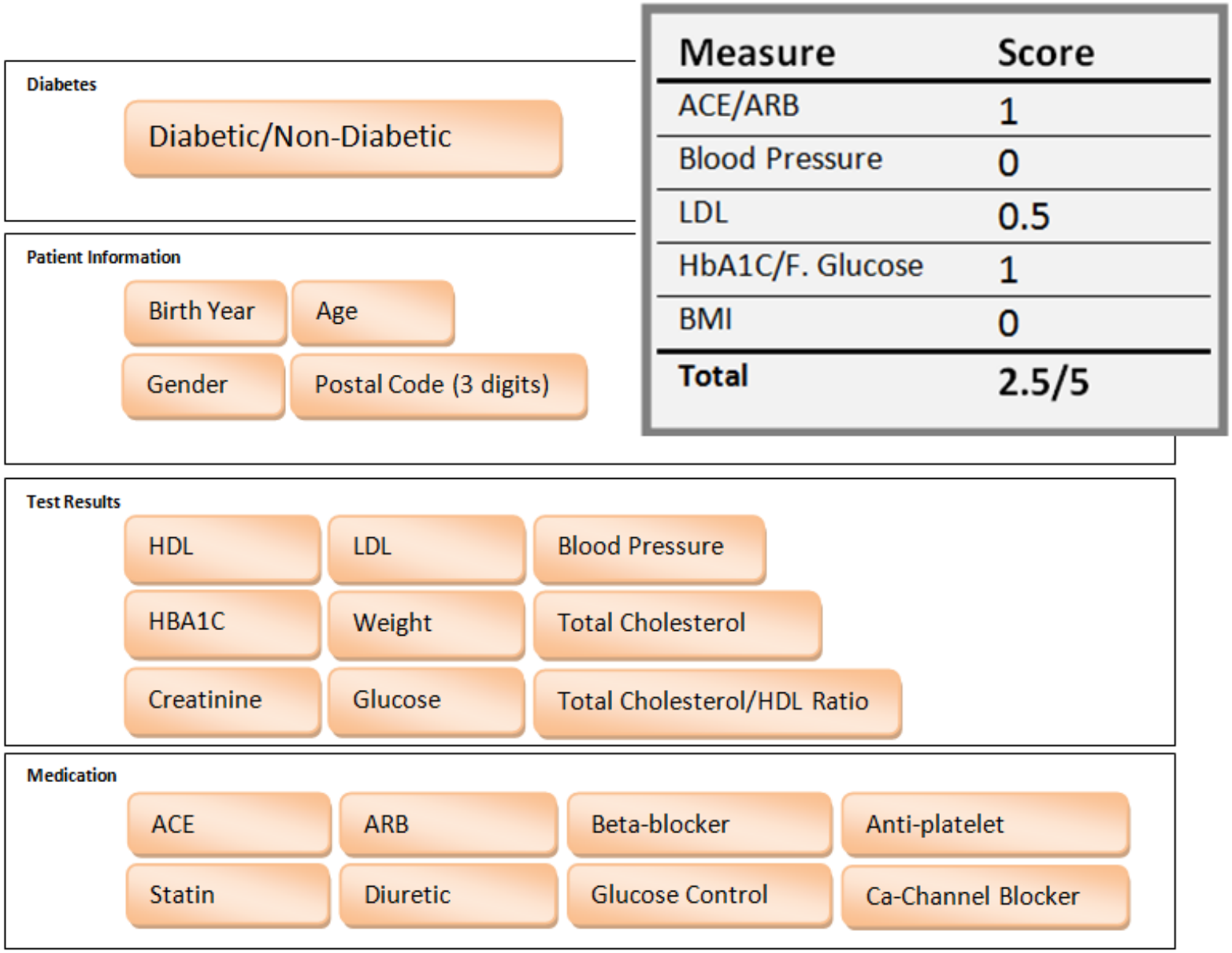
AUTOMATICALLY TRACKING DIABETES USING INFORMATION IN PHYSICIANS' NOTES

Ramanjot Singh Bhatia
Susan McClinton
Richard F Davies
University of Ottawa Heart Institute

Working with Unstructured Data: A Challenging Problem

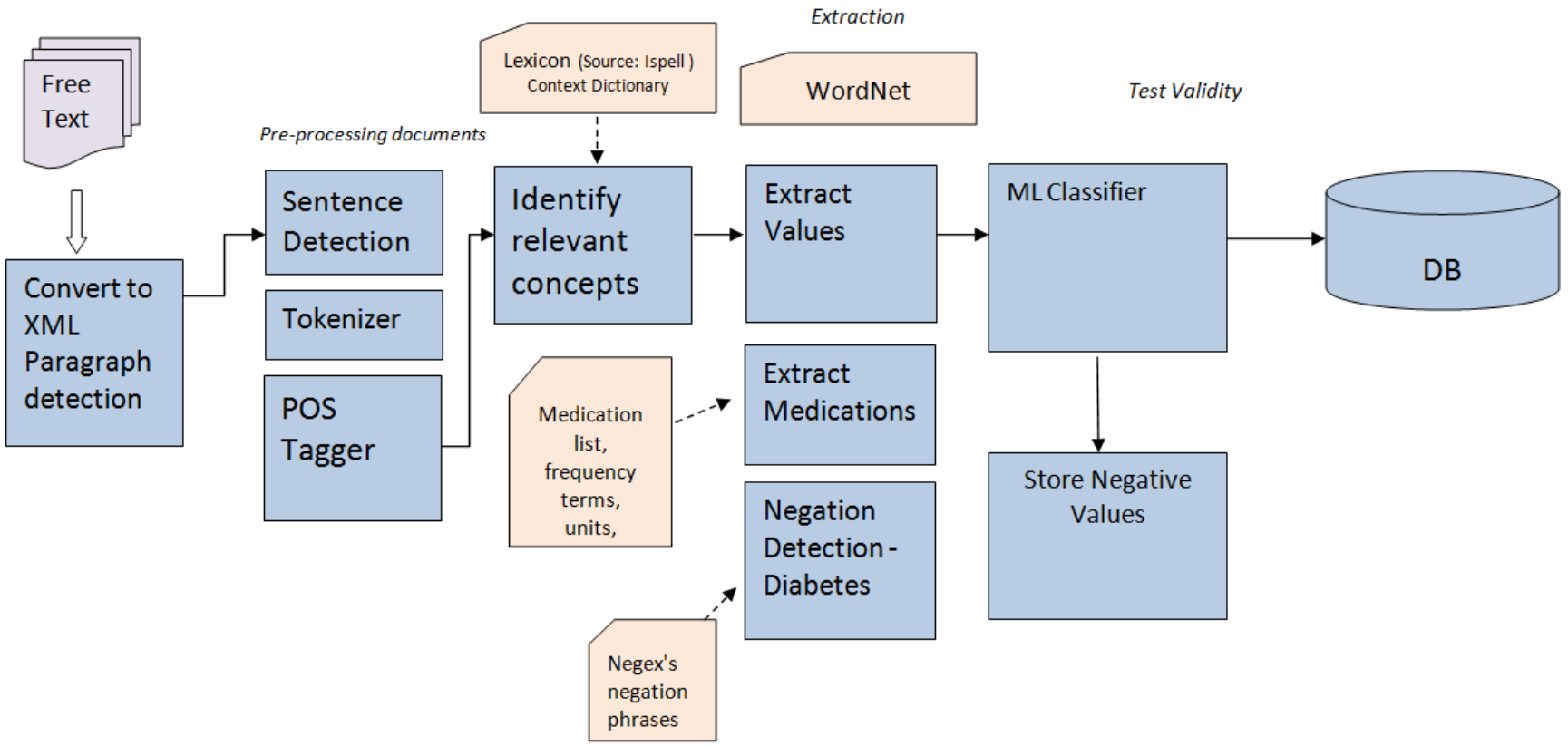
- Natural Language is complex and difficult for machines to comprehend.
  - Information is modified by presence of negation, temporal information and even family history.
  - Same words can have different meanings e.g. discharge from hospital vs. discharge from wound
- Examples
  - This past summer she worked as a counselor at diabetic camp
  - His locomotion is principally limited by diabetic foot ulcer.
  - His wife is diabetic with coronary disease.
  - The blood pressure is usually in the high 150's. It is 120/80 now.
  - He admitted to me that about the time of the press release of Atenolol not being a good medication, he actually stopped his own Atenolol.
  - In April 2005 her weight was 187.
  - His target LDL cholesterol at a minimum should be below 2.5
  - His LDL cholesterol dropped from 4.2 on November 21, 2003 to 2.8 with the addition of Ezetrol.
  - Blood pressure is 140/80 in his right arm.
  - At home his blood pressure was 140/80

Diabetes Report Card - Elements



Measure	Score
ACE/ARB	1
Blood Pressure	0
LDL	0.5
HbA1C/F. Glucose	1
BMI	0
Total	**2.5/5**

System Process pipeline



Diabetes Detection

Modified NegEx

- Modified to run on only the sentence which contains the mention of diabetes.

Experiencer Agreement Detection

- Machine learning classifier
  - Pronoun agreement
  - Presence of relationship cue, using WordNet
  - Token Distances
  - 2 token wide window round the relationship cue token

Numerical Value Extraction

Values modified by locational attributes

- On examination blood pressure in the right arm was 130/60 and in the left arm was 135/65.
- At home his blood pressure was 140/80

Values modified by temporal attributes

- His glucose was 4.8 this morning.
- He recalls the last time his blood pressure was measured it was in the area of 140-145/85. His blood pressure today was 135/80.
- In April 2005 her weight was 187.

Target Values

- His target LDL cholesterol at a minimum should be below 2.5.
- She has not been able to get her weight down to her target weight of 72 kg.

Other Values

- Blood pressure was initially 140/70 and fell to 130/60 with resting
- He lost 30 lbs over six months by diet and exercise.

Medications

Name, Dose, and frequency

- Extract 260 medications in 8 categories

List vs. detail sentence

- Classifier based on
  - Numerical tokens
  - Medication units token count
  - Unknown tokens
  - Number of lines
  - Number of verbs
  - Total number of tokens in the sentence

Results

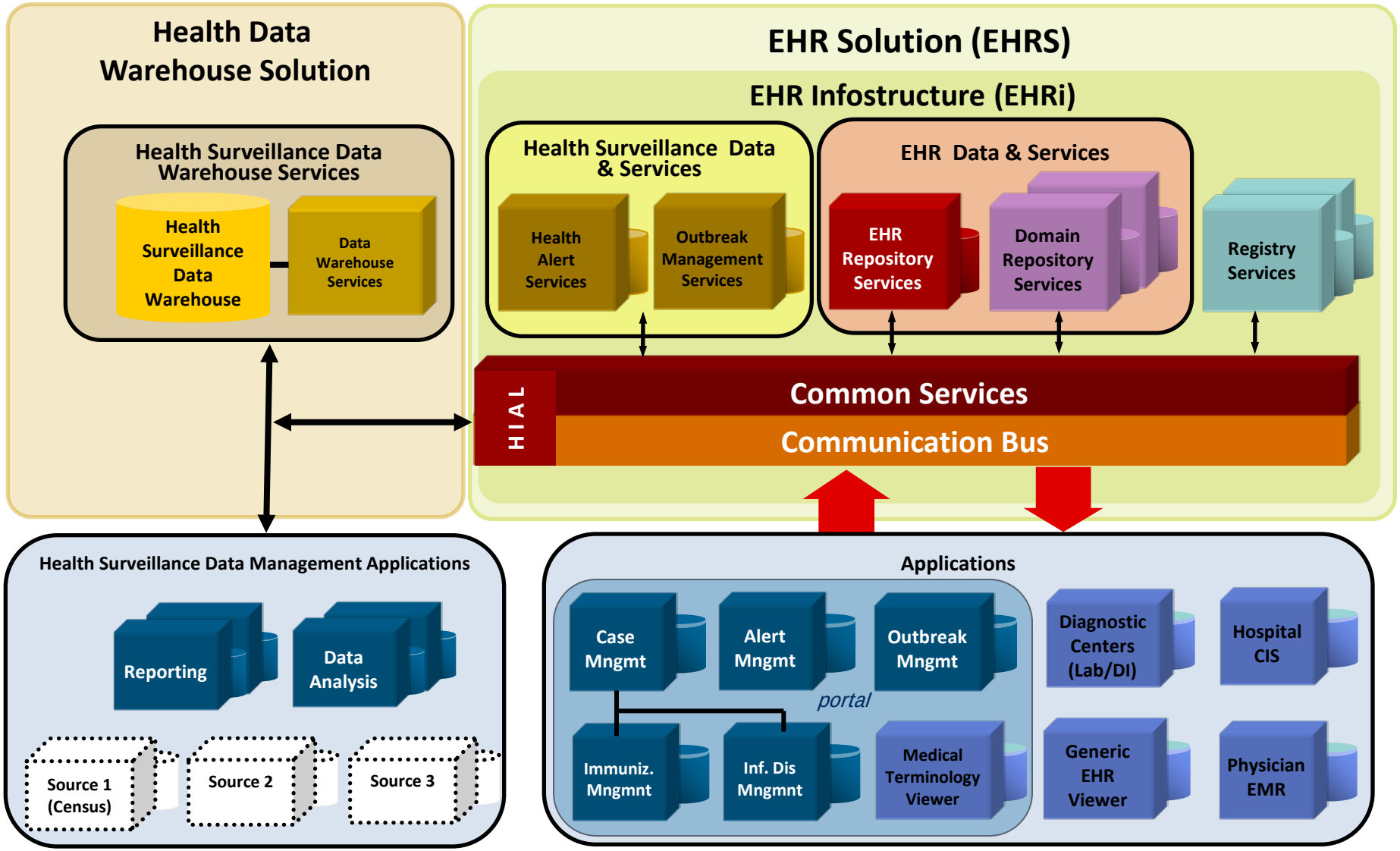
Diabetes Detection	
Sensitivity	98.30%
Positive Predictive Accuracy	95.08%
Numerical Values (9 Lab Value)	
Sensitivity	80.0-98.3%
Positive Predictive Accuracy	88.8-100%
All Medications (290 medications)	

	Value	Precision	Recall	F-measure
1	Blood Pressure	98.2	96.9	97.8
2	LDL	96.4	94.2	95.3
3	HDL	100	98.3	99.1
4	Creatinine	97.2	92.1	94.5
5	Weight	95.6	92.9	94.2
6	TC	93.1	98.1	95.5
7	Glucose	90.7	85.7	87.7
8	F Glucose	88.8	80.0	84.2
9	HbA1C	90.9	86.9	88.8

Data Availability

Attribute	Availability in clinic letters
Age	99%
Gender	99%
Postal Code	92%
Blood pressure	85%
Medications	69%
Weight	27%
LDL	29%
HDL	22%
Total Cholesterol	21%
Fasting Glucose	2.9%
Random Glucose	7.6%
HbA1c	3.8%
Creatinine	11%

Integrating Health Surveillance Below the HIAL



Lesson 3: The need to move to a collaborative disease management model for complex chronic diseases

Disease Management vs. Referral

Disease Management

- Active case finding and inclusion in program “by default”.
- Best suited for long-term management of chronic diseases.
- Outcomes are long term.
- Measurement, assessment of process and evaluation of outcomes are key components.

Referral based

- Patient excluded by default and included only if referred.
- Best for short term emergency care.
- Outcomes are short term.

Integrated Subspecialty Disease Management Programs: Potential Advantages

- Reduced cost
  - Transfer of inpatient to outpatient care.
  - Avoidance of readmissions.
  - Integration with primary care.
- Improved outcomes.
  - Better implementation of prevention strategies.
  - Explicit identification and targeting of high risk subgroups.