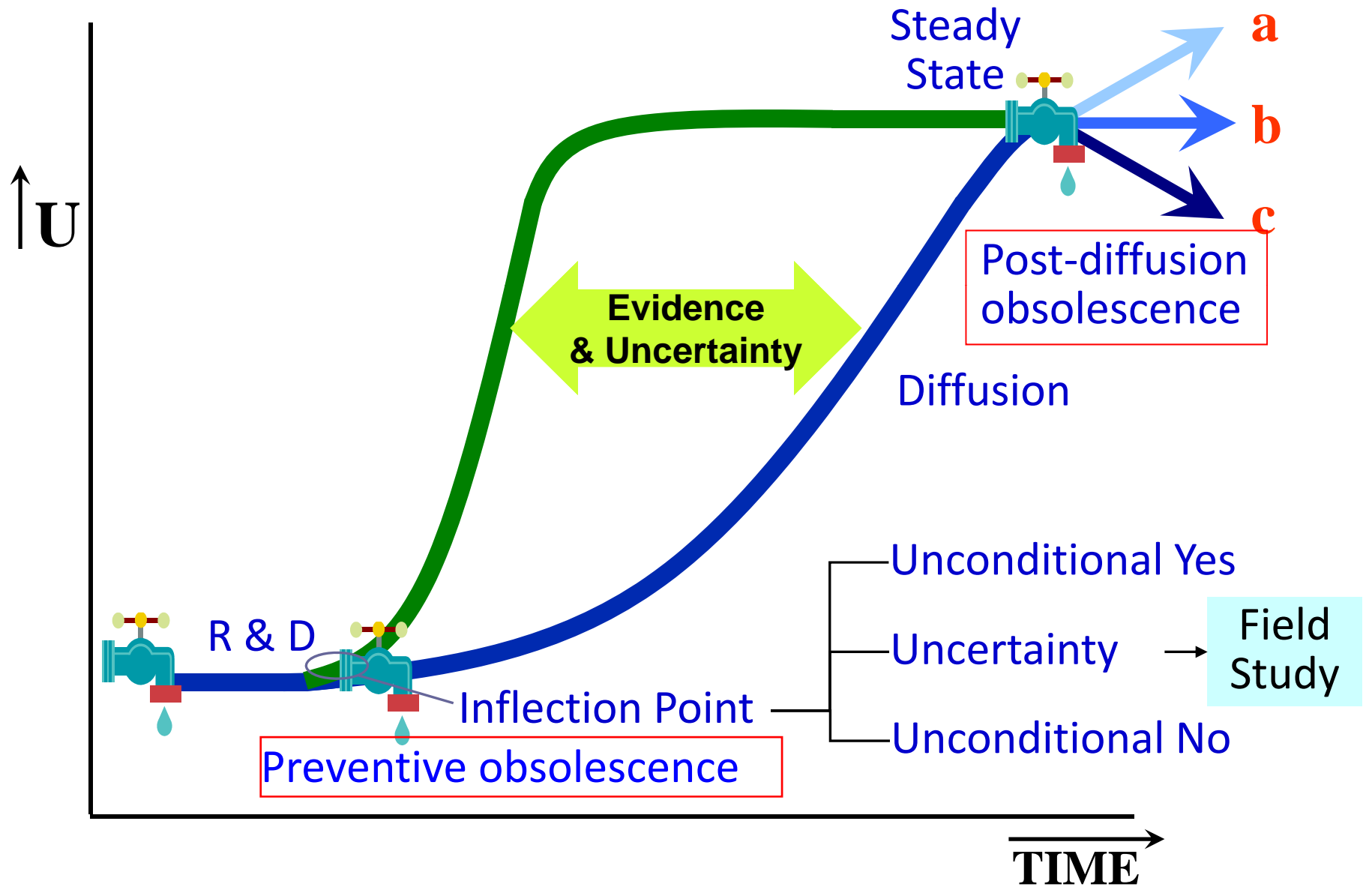


Disinvestment Strategies Based on Evidence Guided Adoption and Obsolescence of Technologies: The Ontario Experience

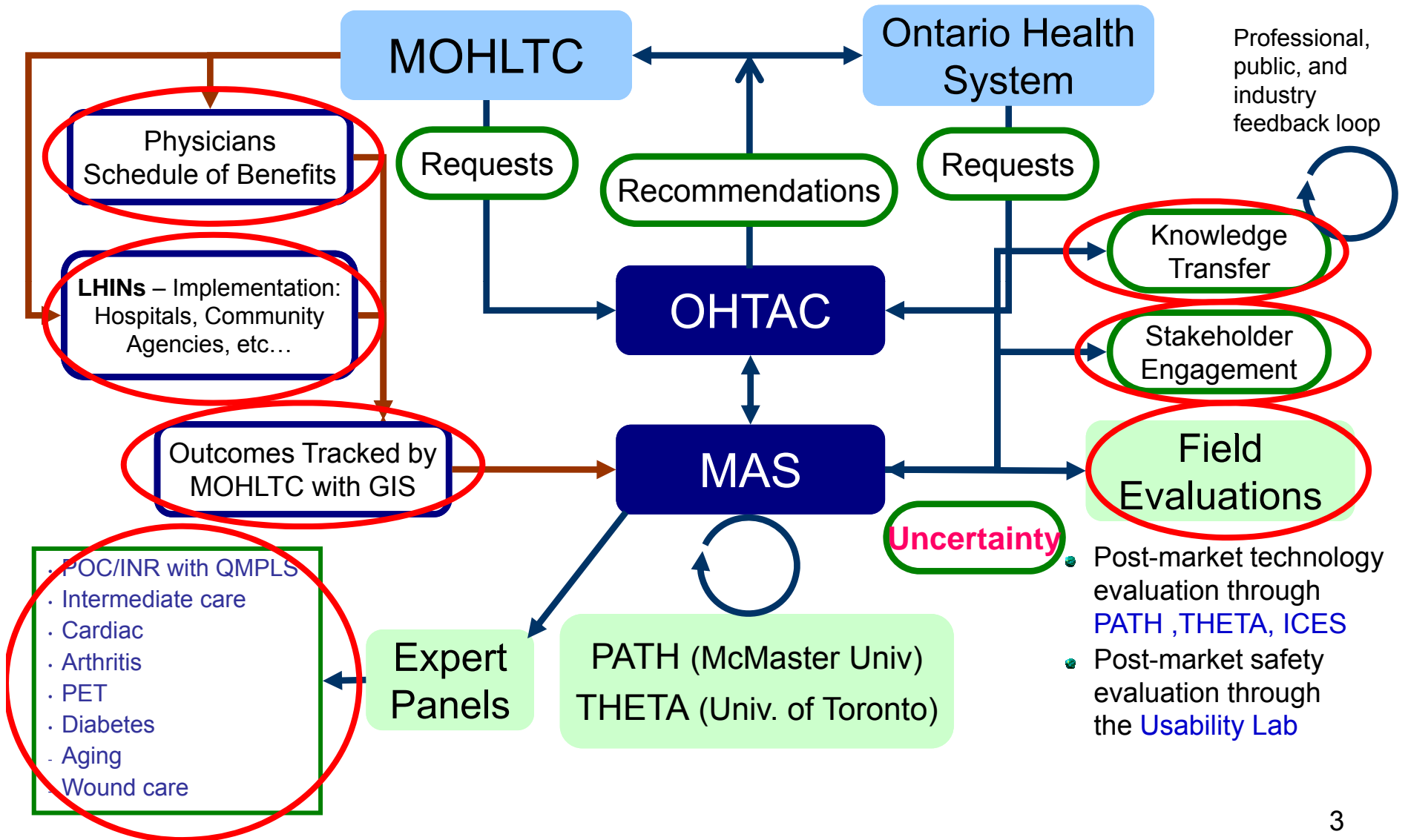
2011CEO Forum
Montreal

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Head, Medical Advisory Secretariat
Ontario Ministry of Health and Long-Term Care
Professor of Medicine, University of Toronto

Life-Cycle Diffusion Curve



MAS/OHTAC Associated Structures & Linkages



Ontario's Evidence-Based Analyses (EBA) to Manage Technology Adoption and Obsolescence

- Single health technology EBA
- Mega-analysis EBA of technologies around disease conditions. Prioritized by effectiveness and cost-effectiveness
- Field evaluation EBA to assess performance of health technologies in real world conditions

Designed to better inform policy and funded by MOHLTC to address uncertainty in evidence prior to committing to long-term funding . Engages key clinical opinion leaders

Single Technology Analysis: Preventive Obsolescence Comparative Effectiveness by MAS, PATH & THETA (85% Conversion to Policy)

2010 (to July 2010)

- 64-Slice Computed Tomographic Angiography for the Diagnosis of Intermediate Risk Coronary Artery Disease
- Cancer Screening With Digital Mammography for Women at Average Risk for Breast Cancer, Magnetic Resonance Imaging (MRI) for Women at High Risk: An Evidence-Based Analysis
- Cardiac Magnetic Resonance Imaging for the Diagnosis of Coronary Artery Disease
- Clinical Utility of Vitamin D Testing
- Endovascular Laser Treatment for Varicose Veins
- Extracorporeal Lung Support Technologies - Bridge to Recovery and Bridge to Lung Transplantation in Adult Patients
- Magnetic Resonance Imaging for the Assessment of Myocardial Viability
- Non-Invasive Cardiac Imaging Technologies for the Assessment of Myocardial Viability
- Non-invasive Cardiac Imaging Technologies for the Diagnosis of Coronary Artery Disease
- Population-Based Strategies for Smoking Cessation
- Positron Emission Tomography (PET) for the Assessment of Myocardial Viability
- Single Photon Emission Computed Tomography for the Diagnosis of Coronary Artery Disease
- Solid Organ Transplantation for End Stage Organ Failure in persons with HIV
- Stress Echocardiography for the Diagnosis of Coronary Artery Disease
- Stress Echocardiography with Contrast for the Diagnosis of Coronary Artery Disease
- Use of Contrast Agents with Echocardiography in Patients with Suboptimal Echocardiography

2009

- Airway Clearance Devices for Cystic Fibrosis
- Diabetes Strategy Evidence Platform
- Fenestrated Endovascular Grafts for the Repair of Juxtarenal Aortic Aneurysms
- Intraocular Lenses for the Treatment of Age-Related Cataracts
- Intrastromal Corneal Ring Implants for Corneal Thinning Disorders
- Optical Coherence Tomo. for Age-Related Macular Degeneration & Diabetic Macular Edema
- Oral Appliances for Obstructive Sleep Apnea
- Phakic Intraocular Lenses for the Treatment of Low to High Refractive Errors
- Point-of-Care International Normalized Ratio (INR) Monitoring Devices for Patients on Long-term Oral Anticoagulation Therapy
- Prevention and Management of Chronic Pressure Ulcers
- Screening Methods for Early Detection of Colorectal Cancers and Polyps
- Specialized Multidisciplinary Community-Based Care (SMCC) Series
- Ultraviolet Phototherapy Management of Moderate-to-Severe Psoriasis

2008

- Aging in the Community
- Aging in the Community: Summary of Evidence-Based Analyses
- Behavioural Interventions for Urinary Incontinence in Community-Dwelling Seniors
- Caregiver- and Patient-Directed Interventions for Dementia
- Limbal Stem Cell Transplantation
- Prevention of Falls and Fall-Related Injuries in Community-Dwelling Seniors
- Social Isolation in Community-Dwelling Seniors
- The Falls/Fractures Economic Model in Ontario Residents Aged 65 Years and Over (FEMOR)

2007

- Anal Dysplasia Screening
- Low-Density Lipoprotein Apheresis
- Multidetector Computed Tomography for Coronary Artery Disease Screening in Asym. Pop
- Scintimammography as an Adjunctive Breast Imaging Technology
- Screening Mammography for Women Aged 40 to 49 Years at Average Risk for Breast Cancer

2006

- Ablation for Atrial Fibrillation
- Advanced Electrophysiologic Mapping Systems
- Artificial Disc Replacement for Lumbar and Cervical Degenerative Disc Disease
- Coil Embolization for Intracranial Aneurysms
- Energy Delivery Systems for Treatment of Benign Prostatic Hyperplasia
- Enhanced External Counterpulsation (EECP)
- Extracorporeal Photopheresis (ECP)
- Functional Brain Imaging

- Gastric Electrical Stimulation
- Hydrophilic Catheters
- In Vitro Fertilization and Multiple Pregnancies
- Intravascular Ultrasound to Guide Percutaneous Coronary Interventions
- Metal-on-Metal Total Hip Resurfacing Arthroplasty
- Midurethral Slings for Women with Stress Urinary Incontinence
- Nanotechnology
- Negative Pressure Wound Therapy
- Optimum Methadone Compliance Testing
- Polysomnography in Patients with Obstructive Sleep Apnea
- Portable Bladder Ultrasound
- Routine Eye Exams
- Ultrasound Screening for Abdominal Aortic Aneurysm
- Utilization of DXA Bone Mineral Densitometry in Ontario

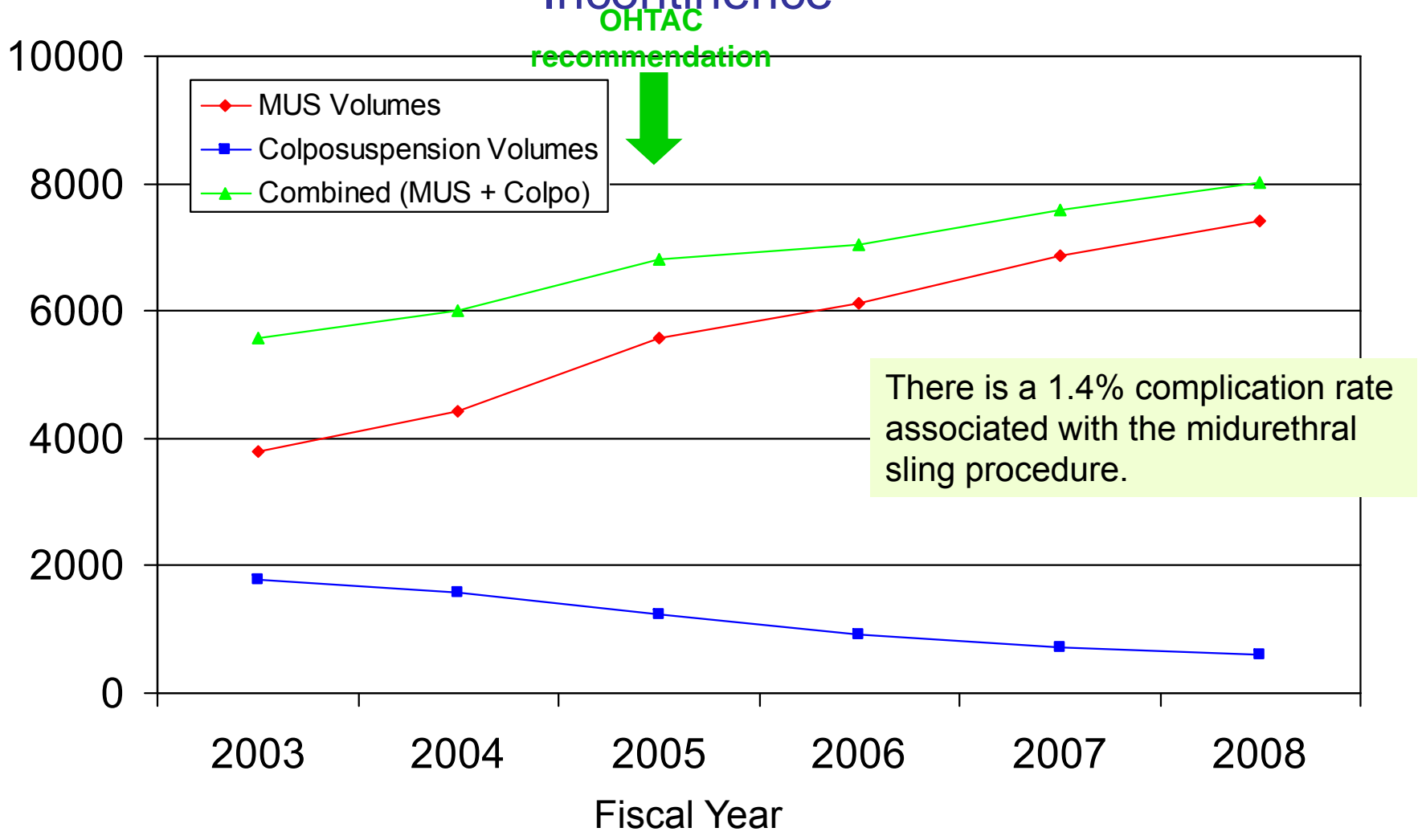
2005

- Bariatric Surgery
- Deep Brain Stimulation in Parkinson's Disease and Other Movement Disorders
- Sacral Nerve Stimulation For Urinary Urge Incontinence, Urgency-Frequency, Urinary Retention, and Fecal Incontinence
- Spinal Cord Stimulation for Neuropathic Pain
- Multi-Detector Computed Tomography Angiography for Coronary Artery Disease
- Osteogenic Protein-1 for Long Bone Nonunion
- Intrathecal Baclofen Pump for Spasticity
- Physiotherapy Rehabilitation After Total Knee or Hip Replacement
- Total Knee Replacement
- Intra-Articular Viscosupplementation With Hylan G-F 20 To Treat Osteoarthritis of the Knee
- Hyperbaric Oxygen Therapy for Non-Healing Ulcers in Diabetes Mellitus
- Arthroscopic Lavage and Debridement
- Biventricular Pacing (Cardiac Resynchronization Therapy)
- Implantable Cardioverter Defibrillators (ICD)
- Technologies for Osteoarthritis of the Knee
- Positron Emission Tomography for the Assessment of Myocardial Viability
- Air Cleaning Technologies
- Endovascular Repair of Descending Thoracic Aortic Aneurysm
- Automated External Defibrillators

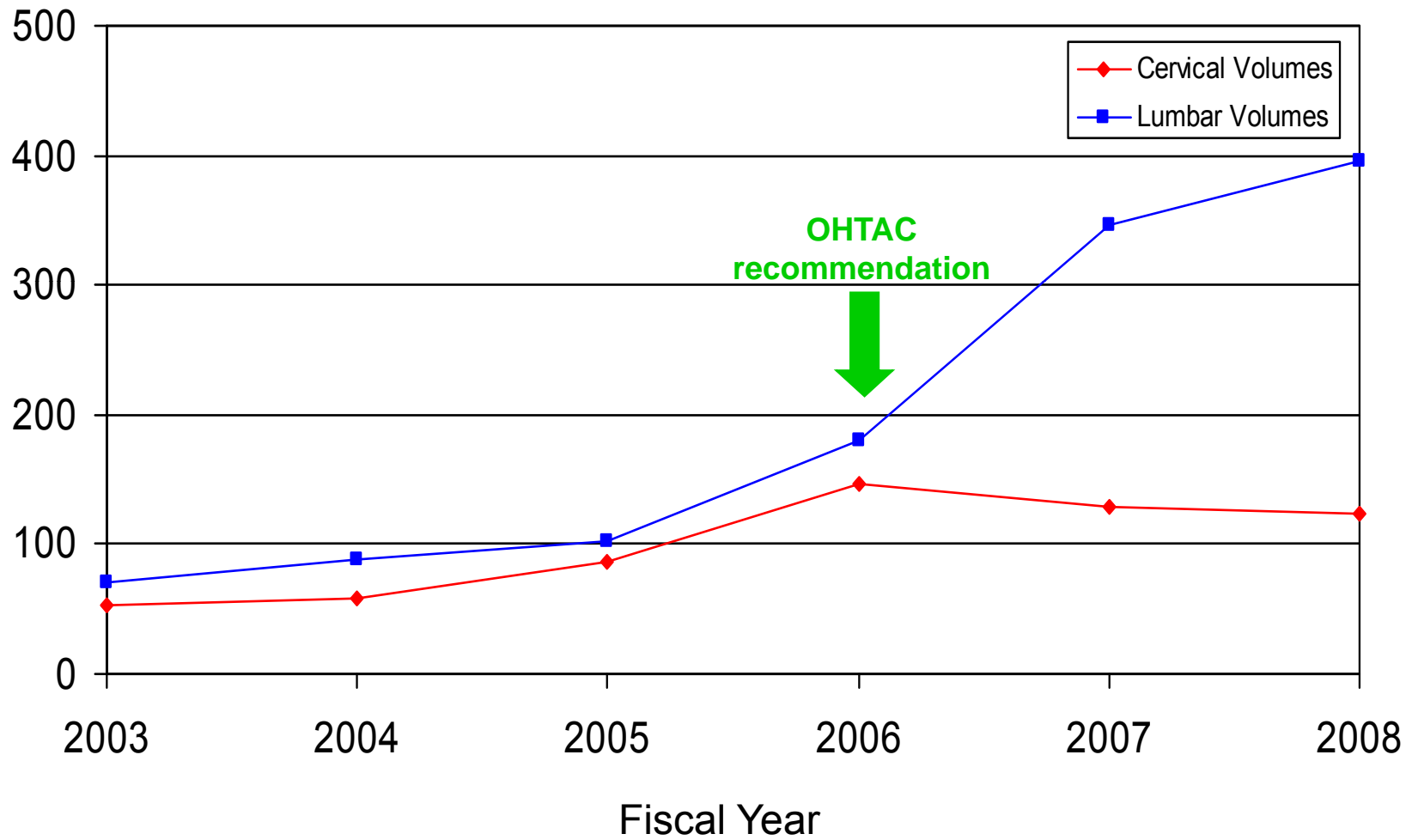
2004 (and prior)

- Balloon Kyphoplasty
- Bispectral Index Monitor
- Bone Anchored Hearing Aid (BAHA)
- Bone Morphogenetic Proteins and Spinal Surgery for Degenerative Disc Disease
- Computed Tomographic Colonography
- Computer-Assisted Hip and Knee Arthroplasty: Navigation and Robotic Systems
- Computer-Assisted Surgery Using Telemanipulators
- Endovascular Repair of Abdominal Aortic Aneurysm
- Functional Cardiac Magnetic Resonance Imaging in the Assessment of Viability and Perfusion
- Gamma Knife
- Intracoronary Radiation: An Evidence-Based Analysis
- Islet Transplantation
- Left Ventricular Assist Devices
- Neonatal Screening of Inborn Errors of Metabolism Using Tandem Mass Spectrometer
- Patient Monitoring System for MRI [PDF]
- Primary Angioplasty for the Treatment of Acute ST-Segment Elevated Myocardial Infarction
- Pyrocarbon Finger Joint Implant
- Radio Frequency Ablation for Primary Liver Cancer
- Repetitive Transcranial Magnetic Stimulation for the Treatment of Major Depressive Disorder
- Small Bowel Transplant
- Thermal Balloon Endometrial Ablation for Dysfunctional Uterine Bleeding (TBEA)
- Video Laryngoscopy for Tracheal Intubation
- Wireless Capsule Endoscopy

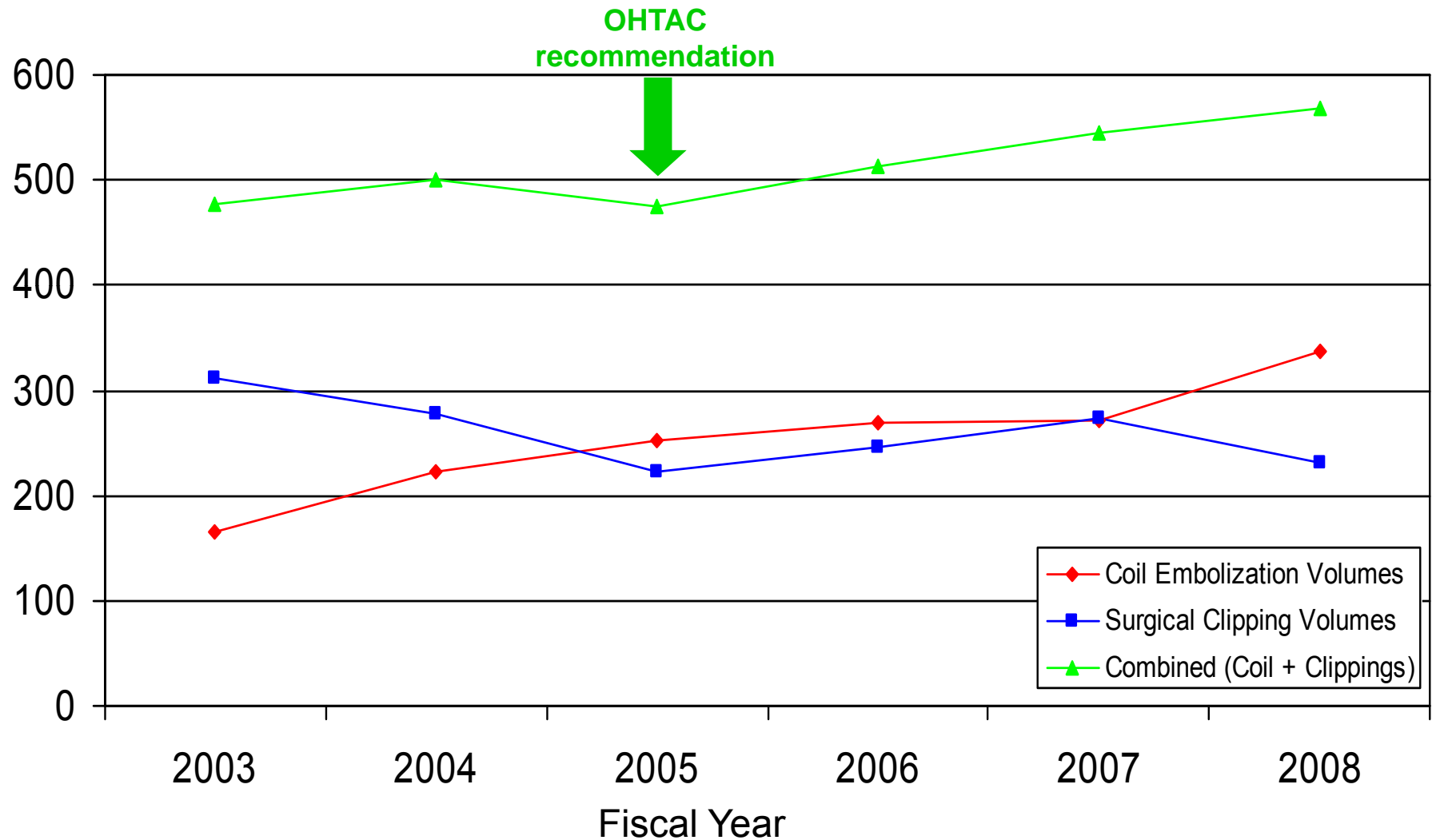
Midurethral Slings (MUS) for Women with Stress Urinary Incontinence



Artificial Disc Replacement for Degenerative Disc Disease



Coil Embolization for Intracranial Aneurysms



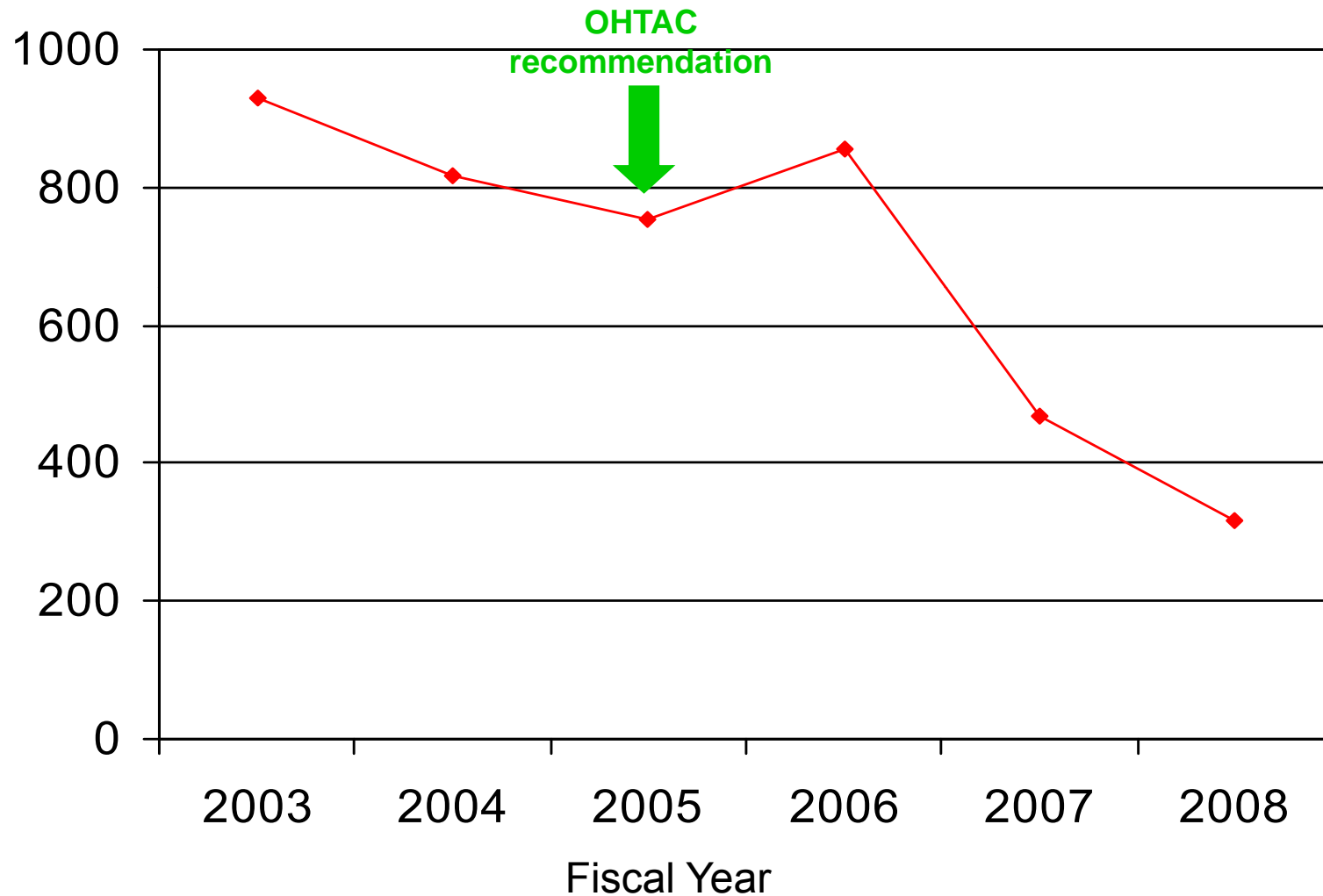
Bone Mineral Testing

- Previously approved in fee schedule for annual testing
- MAS analysis and modeling revealed:
 - testing every 7 years was sufficient provided that the first two annual tests >55 years were normal (average risk)
 - many men and women at high risk were not being tested
- OHTAC recommended increasing interval to 5-7 years for average risk individuals
- OHIP fee schedule was changed to permit testing every 5 years for average risk according to the MAS analysis
- MAS analysis confirmed by RCT published 2 years later

Mega-Analysis - a Tool for Evidence-Based Withdrawal of Obsolete Technologies: Relative Obsolescence

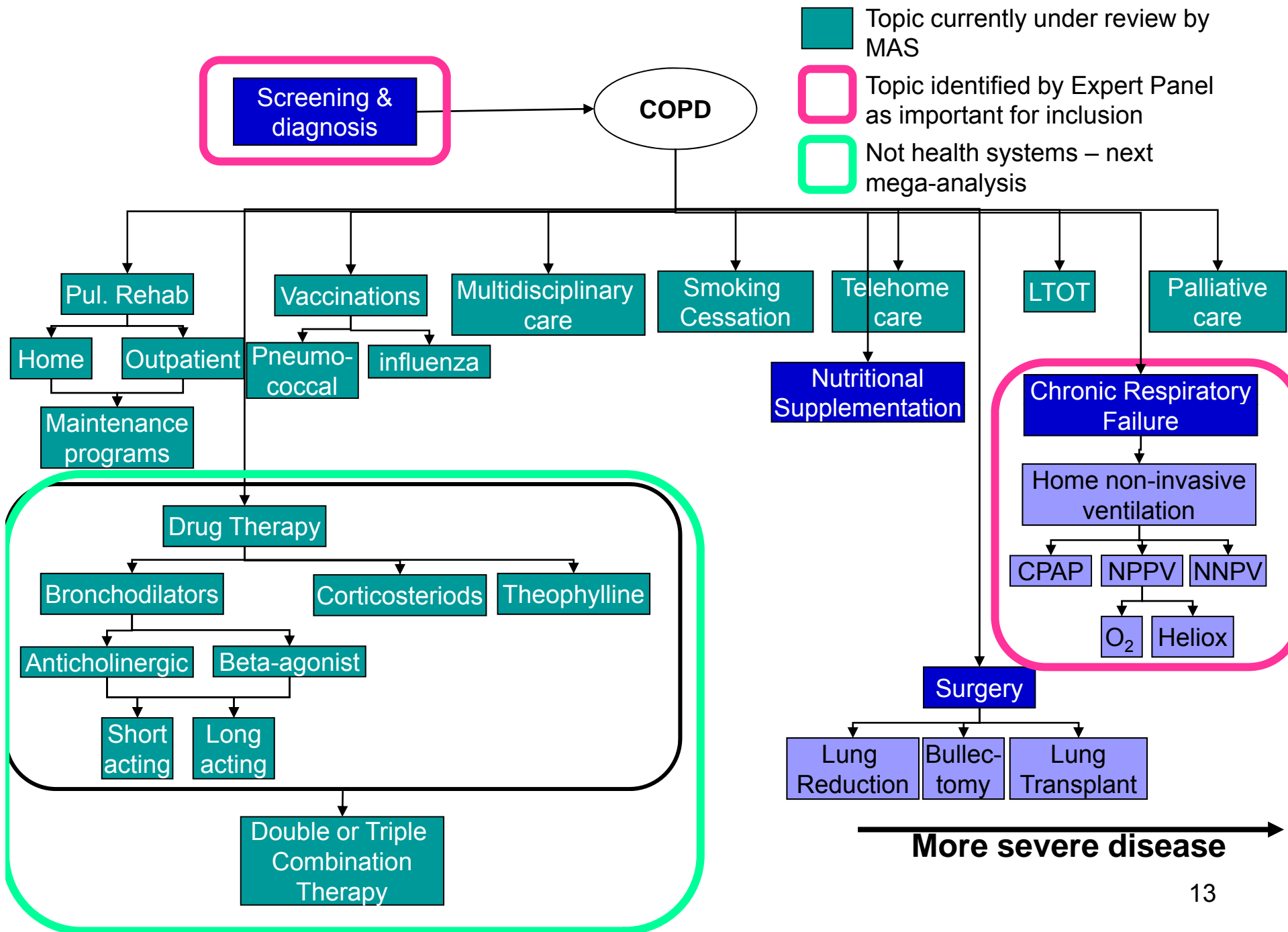
- **Mega-analysis.** Disaggregation of technologies around a disease condition or health state with re-aggregation for comparative analysis of effectiveness and cost-effectiveness
- Mega-analyses to date:
 - **Osteoarthritis of the knee** **MAS** **(2005)**
 - Cardiac viability MAS (2005)
 - Aging in the community MAS/PATH (2008)
 - Colon cancer screening MAS/PATH (2008)
 - **Diabetes** **MAS/PATH** **(2009)**
 - Intermediate care MAS/THETA (2009)
 - Wound care prevention MAS/THETA (2009)
 - Cardiac diagnostic tests MAS/THETA (2010)
 - **COPD** **MAS/PATH** **(2010)**
- **Micro-economic decision analytic models**
 - Ontario Diabetes Economic Model (PATH) (2006)
 - Ontario Cardiovascular Model (THETA) (2009)
 - Ontario Wound Prevention & Care Models (THETA) (2010)
 - Ontario Arthritis Model (PATH) (2011)
 - Ontario COPD Model (PATH) (2011)
- Turn-around time ~ 6-8 months

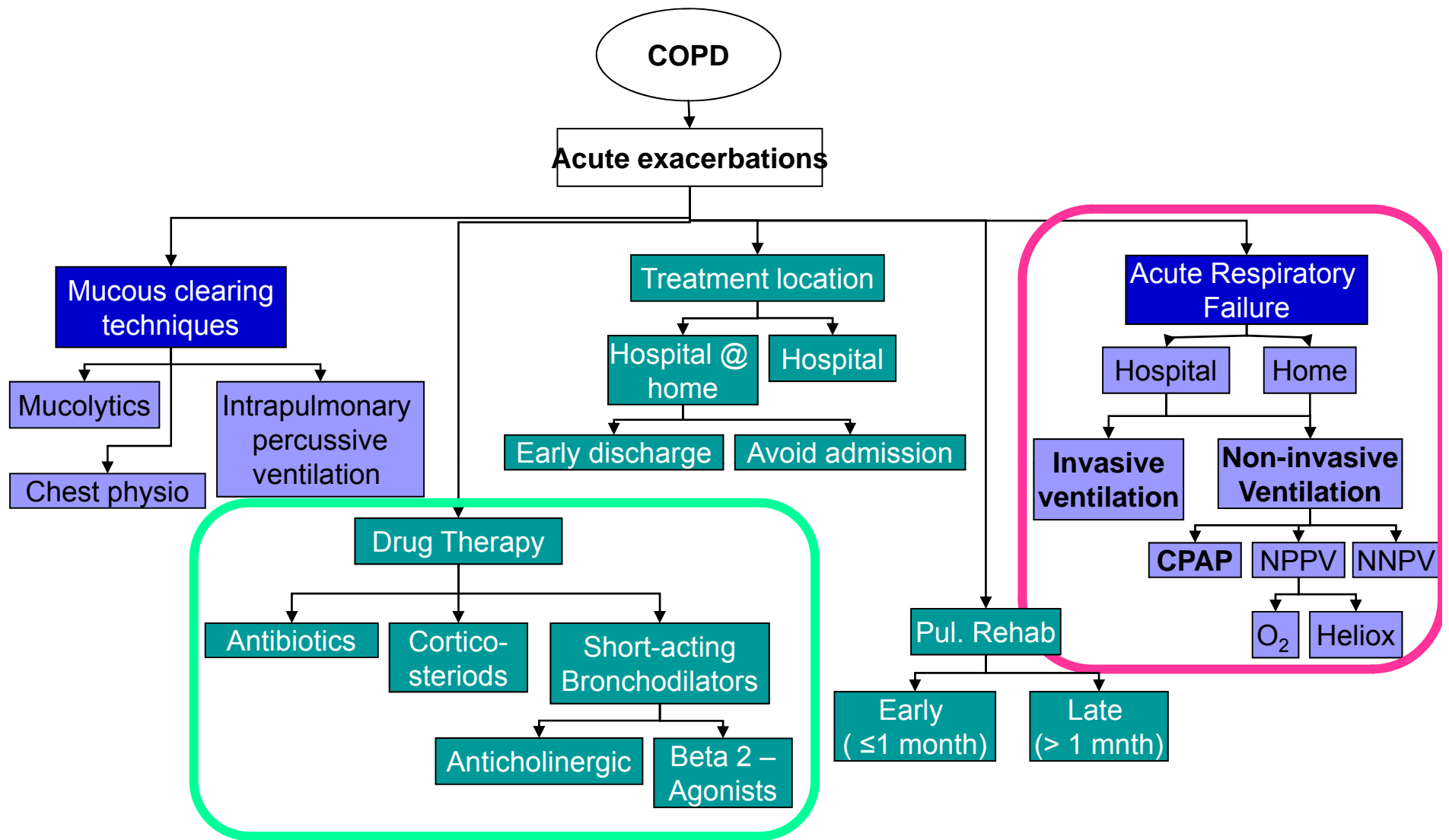
Arthroscopy, Lavage and Debridement for Osteoarthritis of the Knee.



DIABETES MEGA-ANALYSIS

	Multidisciplinary Program	Insulin Pumps for Type 2	Behavioural Interventions	Bariatric Surgery
Δ HbA1c	-1.02%	-0.14%	-0.44%	-2.70%
Δ Costs (in billions)	\$5.623	\$8.010	\$0.212	\$1.573
Δ QALYs	290,424	4,222	5,957	100,196
\$/QALY gained	\$19,869/QALY	\$1.9M/QALY	\$36,226/QALY	\$15,697/QALY
Δ IHD	15,265	201	446	2,757
Δ MI	40,882	562	521	13,839
Δ Heart Failure	8,563	462	595	31,137
Δ Stroke	14,074	361	372	8,957
Δ Amputation	13,180	201	372	2,997
Δ Blindness	6,180	281	521	4,179
Δ Renal Failure	819	-8	74	17





Topic currently under review by MAS

Not health systems – next mega-analysis

Recommended by Expert Panel Under review by MAS

CPAP, continuous positive airway pressure; NPPV, noninvasive positive pressure ventilation; NNPV, noninvasive negative pressure ventilation

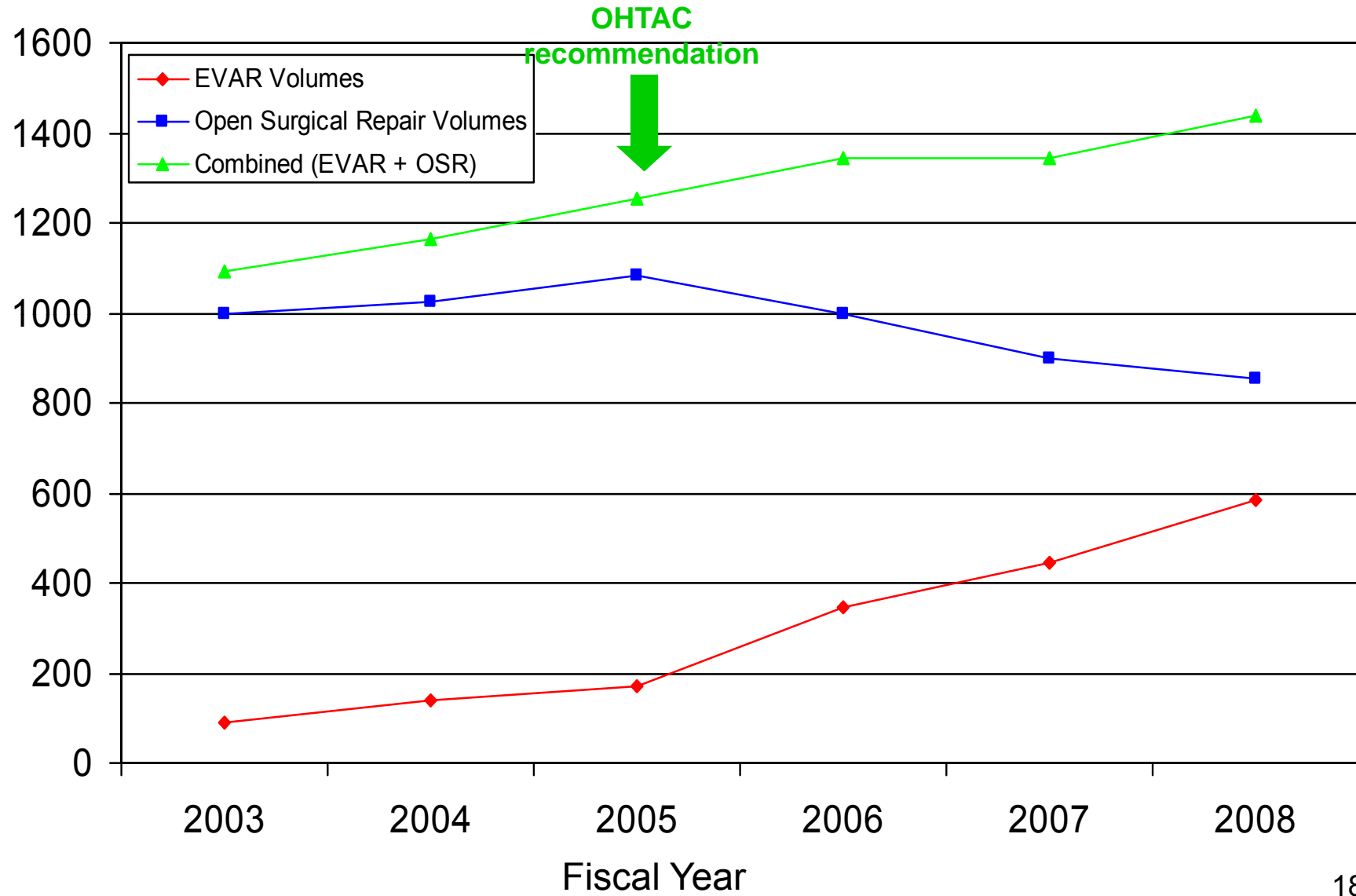
Field Evaluation EBA to Assess Performance of Health Technologies in Real World Conditions

- Appropriate adoption and preventive obsolescence for new technologies
- Ontario has developed most experience internationally
- 38 initiated since 2003:
 - 8 RCTs
 - 17 observational
 - 7 registry
 - 2 polls
 - 4 decision analytic models
- 19 completed field evaluations:
 - Significantly affected decision-making 88%
 - Shaped cost curves
 - Published in international peer-reviewed journals

TECHNOLOGY (N)	FE OVERSEEN BY	TYPE OF STUDY	REASON FOR FE	RESULT	POLICY DECISION
Drug eluting stents (DES) (21,000)	PATH, with ICES,	Prospective pragmatic registry-based	Generalisability of RCT evidence and cost effective analysis	Only effective in patients at high risk for restenosis	Funded 30% conversion from bare-metal to DES (90% in U.S.A.)
Endovascular abdominal aortic aneurysm repair (EVAR) (160)	PATH and single AHSC	Prospective observational	Safety assessment of endoleak	No endoleak. CE for high surgical risk but not low	Funded EVAAR for high but not low surgical risk patients
Multifaceted primary care diabetes program	PATH, with Oxford University,	Syst. review & micro simulation model	Prioritize investments according to downstream effects and CE of diabetes strategy.	Most CE were bariatric surgery, MDT. Least insulin infusion pumps for type II	Bariatric program funded and additional funding for MDT. No Insulin infusion pumps
64-slice CT angiography (CTA) v coronary angiography (CA) (175)	PATH, with cardiologists, radiologists, selected AHSCs	Patients for CA also underwent CTA	Uncertainty re- indications for use CE and QA parameters	Sensitivity lower than reported reducing CE	OHTAC recommended caution until sensitivity issue resolved

TECHNOLOGY (N)	OVERSEEN BY	TYPE OF STUDY	REASON FOR FIELD EVALUATION	RESULT	POLICY DECISION
PET to stage locally advanced NSCLC (310)	OCOg	RCT	Clinical utility in making treatment decisions	Terminated by efficacy & safety cmte	PET insured for this indication
PET to stage early NSCLC (322)	OCOg	RCT	Resolve inconsistencies to inform decision re- access	PET reduces futile thoracotomy rates	PET insured for this indication
PET to stage breast cancer (320)	OCOg	Prospective cohort	Compare PET to sentinel lymph node biopsy	No utility in staging	Not insured
PET for colorectal cancer metastatic to liver	OCOg	RCT	Clinical utility in decision for metastatectomy	Accrual completed February 2010	Awaiting results
PET for head and neck cancer (400)	OCOg	Prospective cohort	Clinical utility pre surgery following radiation therapy	No clinical utility	Not insured
Extracorporeal photopheresis (EP) (120)	PATH with AHSC	Prospective observational	Basis for decision whether to fund a program for GvH and Sezary	Effective in GvH. Inconclusive for Sezary	Insured for GvH. Awaiting decision on Sezary - small vol. after backlog dealt with

EVAR for Abdominal Aortic Aneurysms



Effect of Field Evaluation on Withdrawal of Diffused Obsolete Technologies Variable

- Negative pressure wound treatment (NPWT) of pressure ulcers
 - RCT of NPWT vs routine wound dressing
 - 5 patients accrued over 3 years
 - Study discontinued
- Extracorporeal photopheresis
 - Observational study
 - Unable to convince oncologists not to provide other treatments concomitantly
 - Study discontinued
- PVP laser treatment for benign prostatic hyperplasia
 - Initial reluctance to replace TURP with this newer and less invasive technology
 - Difficulty in completing study because surgeons did not want to go back to TURP

Examples of Partial or Complete Disinvestment from Diffused Technologies

- Bare metal stents
 - Vitamin D testing
 - Bone mineral testing
 - *Knee arthroscopy with debridement and /or lavage
 - *Colposuspension for stress urinary incontinence
 - *Artificial disc replacement for cervical spine
- *Followed MAS EBA and OHTAC recommendation without specific intervention

Examples of Preventive Obsolescence

- PET Scanning
- CT angiography
- Endovascular aortic aneurysm graft repair for low risk
- Drug eluting stents for low risk
- PSA for prostate cancer screening
- Mammography screening average risk under 50 years
- CT colonography
- Repetitive transcranial magnetic stimulation for depression
- Anal dysplasia screening for anal cancer
- Insulin infusion pumps for type 2 diabetes

IT IS EASIER TO SHAPE A DIFFUSION CURVE THAN BEND A DIFFUSED CURVE

Examples of Evidence Resulting in Increased Access

- PET for specified cancers
- Specified drug eluting stents (high risk)
- Bariatric surgery especially for morbidly obese diabetes
- Neonatal screening for inborn errors of metabolism
- Gama knife for specified brain surgery
- Endocardial ablation for atrial fibrillation
- Endovascular aortic aneurysm repair for high surgical risk
- Gluten sensitivity blood test (recommended and decision pending)
- PVP laser for benign prostatic hyperplasia
- Renal and liver transplantation for HIV positive
- Multidisciplinary care for diabetes
- Extracorporeal photopheresis for graft vs host disease following organ transplantation
- Artificial disc replacement for lumbar spine

Lessons - Obsolescence Experience in Ontario

- EBA is important basis for preventive and post-diffusion obsolescence
- It is easier to shape a diffusion curve (preventive) than bend a diffused curve
- Success increases when:
 - substitutive with no net negative effect on practice
 - focus is macro/meso e.g. funding, fee code or safety issue
- Do not under-estimate the ability and spontaneous adaptability of the health system to make less-effective technologies obsolete leading to disinvestment
- Obsolescence must be part of economic analysis and planned as part of adoption strategy

Examples of MAS Evidence Based Analysis (EBA) on Shaping the Cost Curve for Technologies

