Annual Review of IM/IT in Healthcare

The Search for a Cure for Baumol's Disease

Breakfast with the Chiefs Presentation

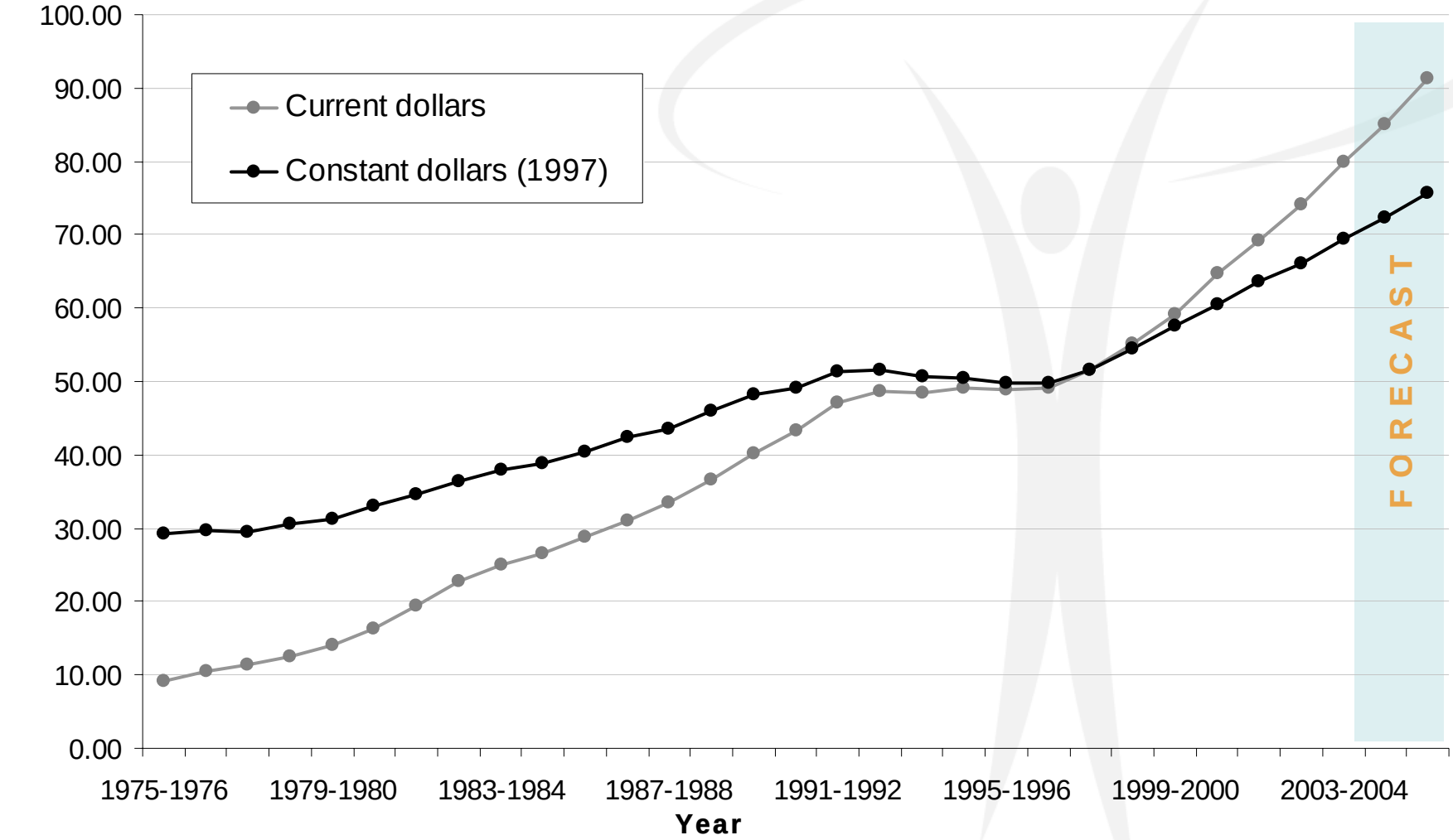
March 21, 2006

What has happened since February 2005:

- Health spending continues to increase – searching for a cure for Baumol's Disease
- Better understanding of the ROI for HIT
- Demographic challenges in the clinical professions continue to mount
- Emergence of production efficiency concepts in healthcare
- Strengthened case for chronic disease management
- New reports that poor implementation of CPOE can harm patients
- Growing shortage of skilled HIT human resources
- Epic is coming!

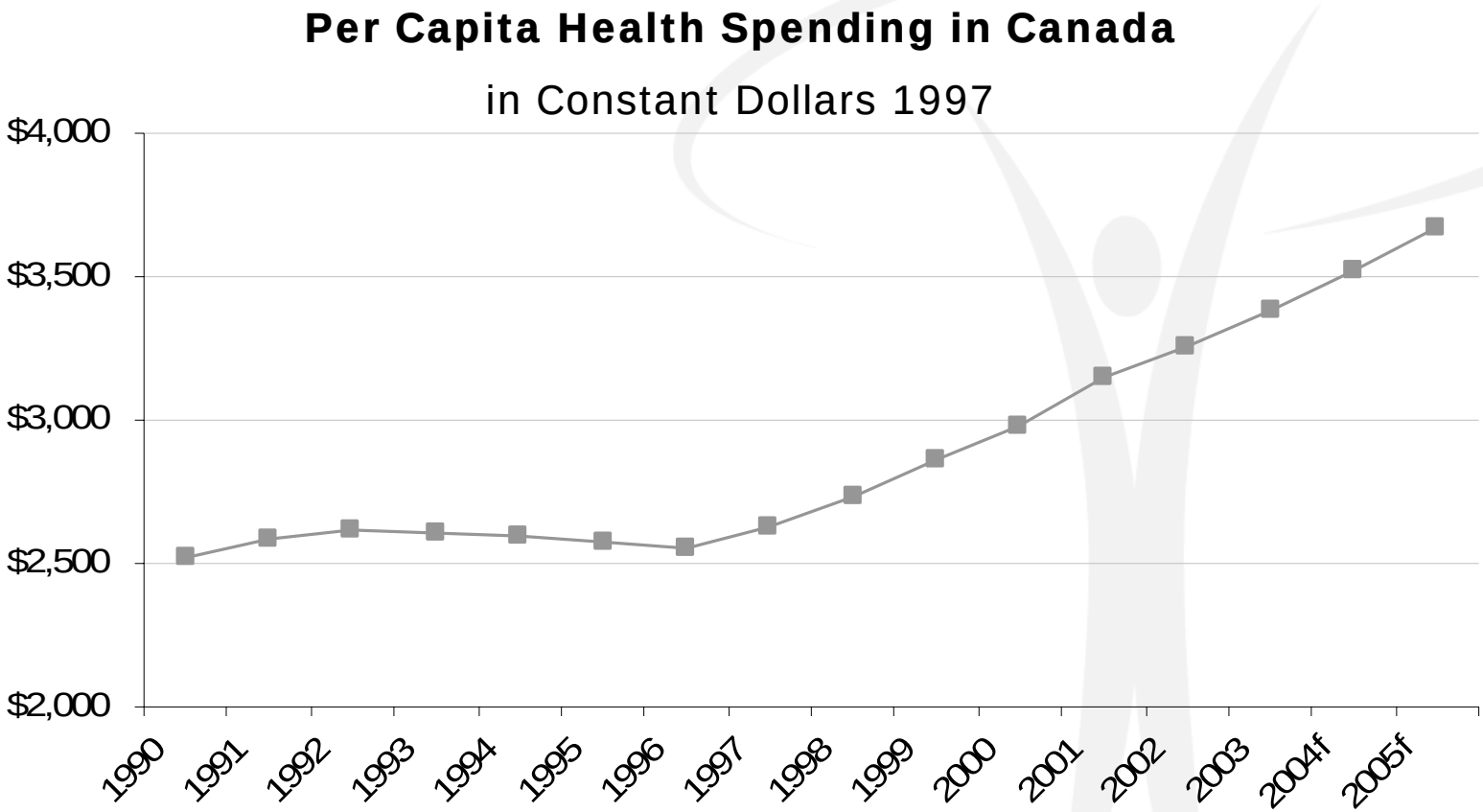
Government health expenditures in Canada (1975-1976 to 2005-2006)

*Note: 2004-05 and 2005-06 total expenditures have been forecasted.



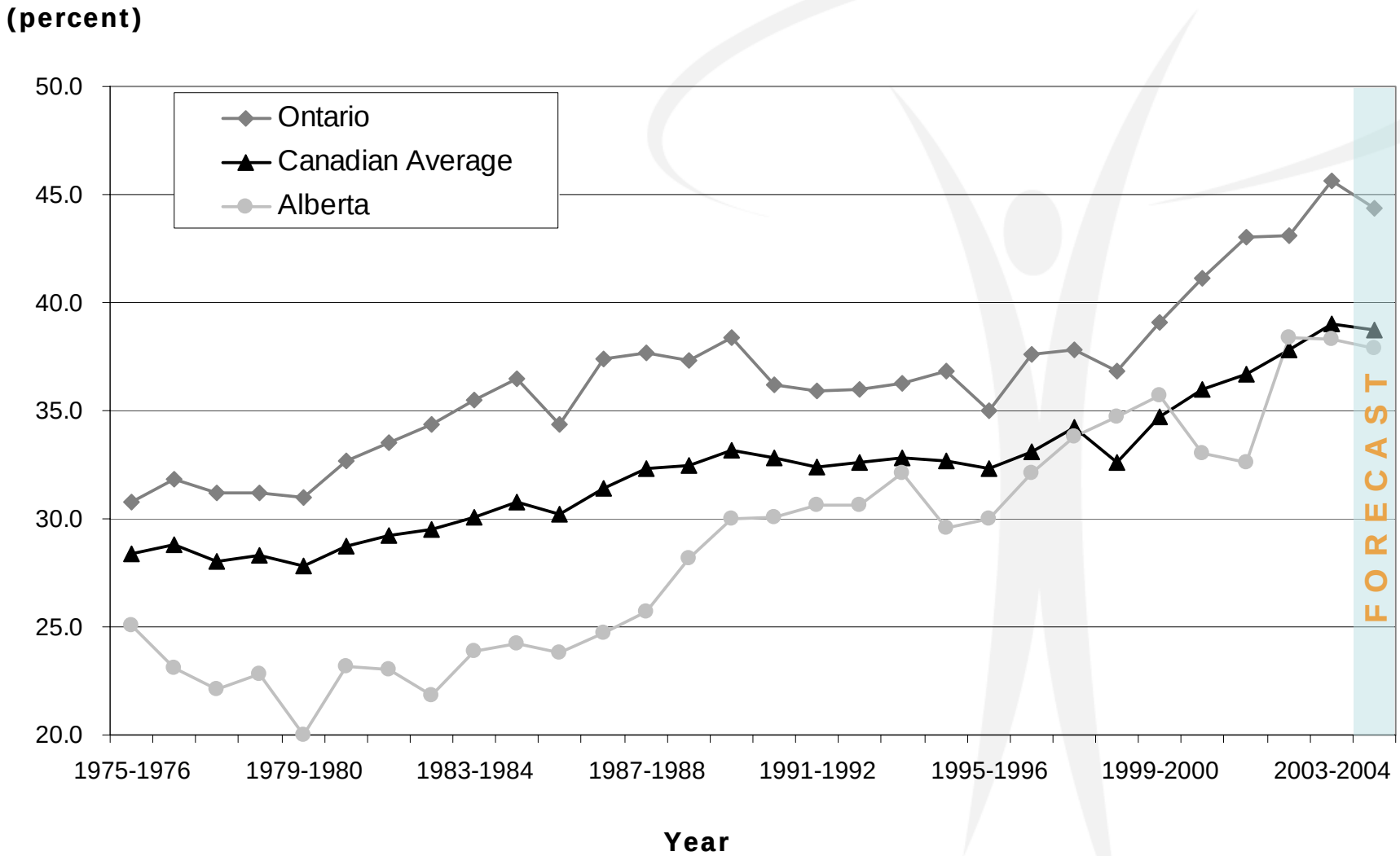
Source: CIHI. *Preliminary Provincial and Territorial Government Health Expenditure Estimates 1974-1975 to 2005-2006*. November 2005

Over the past 5 years, healthcare spending in Canada has increased by 4.3% annually after inflation



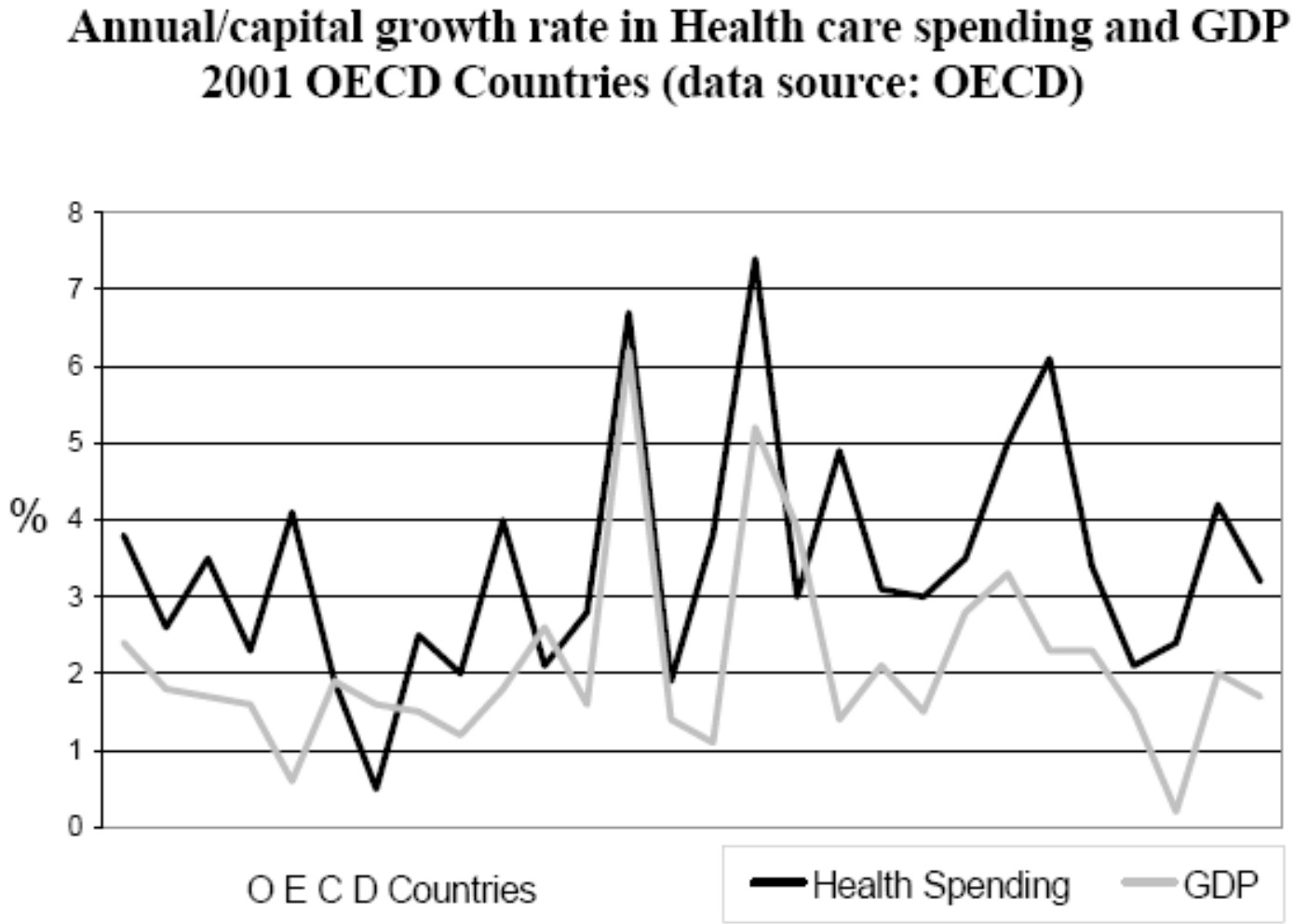
Source: CIHI. *National Health Expenditure Trends 1975-2005*

Provincial health expenditures, as a percent of total provincial program spending (1975-1976 to 2004-2005)



Source: CIHI. *Preliminary Provincial and Territorial Government Health Expenditure Estimates 1974-1975 to 2005-2006*. November 2005

Health care spending has outstripped GDP growth in most OECD countries since 1990



Should we allow private pay?

vs

How can we improve efficiency and quality?

Is the health industry suffering from Baumol's Disease?

Baumol's Disease

- In 1967, the economist William Baumol hypothesized that the **absence of productivity improvement in service industries** is due to the inherent nature of services.
- Subsequently, the service sector was deemed to suffer from **Baumol's Disease**.
- This hypothesis was borne out until 1995 when services industries experienced a marked acceleration in productivity growth rates that has continued to the present day.
- This prompted Triplett and Bosworth of the Brookings Institution to declare in a 2002 publication that "**Baumol's Disease has been cured**".

Baumol, William J. 1967. "Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crises." American Economic Review 57, no. 3 (June): 415-26

Triplett JE, Bosworth, BP 2002. "Productivity Measurement Issues in Services Industries: 'Baumol's Disease' Has Been Cured." Brookings Institution Working Paper

Baumol's Disease – Cured?

U.S. Labor Productivity
Goods-Producing and Service-Producing Industries

	1987-1995	1995-2001	Change
Labor Productivity			
Private Non-farm Business	1.0	2.5	+1.5
Goods-Producing Industries	1.8	2.3	+0.5
Service Producing Industries	0.7	2.6	+1.8

Source: Triplett JE, Bosworth, BP 2002. "Productivity Measurement Issues in Services Industries: 'Baumol's Disease' Has Been Cured." Brookings Institution Working Paper

While other service industries have found the cure for Baumol's disease, health productivity continues to lag

U.S. Labour Productivity
All Services and Health Services

	All Services*	Health Services
1977-1995	0.8 – 1.1	-0.2
1987-1995	1.3 – 2.0	-0.5
1995-2000	2.0 – 3.0	+0.7

* Average services industry labour productivity (lowest-highest) using different weightings and number of industries included in the average

Source: Triplett JE, Bosworth, BP 2002. "Productivity Measurement Issues in Services Industries: 'Baumol's Disease' Has Been Cured." Brookings Institution Working Paper

Even Baumol doubts there is a cure for healthcare

Baumol argues, the increasing productivity of the rest of the economy means that an increasing share of GDP consumed by services such as health and education is not a problem. “Contrary to appearances **we can afford ever more ample medical care**, ever more abundant education, ever more adequate support of the indigent, and all this along with a growing abundance of private comforts and luxuries. **It is an illusion that we cannot do so**, and the main step needed to deal effectively with these fiscal problems is to overcome that illusion.”

In another paper, he demonstrates that even if the differential rates of productivity meant that education and health care absorbed over half of GDP in the future, this would not matter. It would however mean that “**society must change the proportions of its income that it devotes to the different products**.”

Source:
Baumol, W.J., 1993. Health care, education and the cost disease: A looming crisis for public choice, *Public Choice,* 77(1):17–28.
Baumol, W.J., 1995. *Health Care as a Handicraft Industry*, OHE, London.

Can HIT improve productivity in healthcare?
A study by RAND Corporation, 2005

Key findings:

- Properly implemented and widely adopted, Health Information Technology would **save money and significantly improve healthcare quality**
- Health and safety benefits could double the savings while reducing illness and prolonging life
- Implementation would **cost around $8 billion** per year, assuming adoption by **90 percent of hospitals and doctors' offices** over 15 years
- **Annual savings from efficiency alone** could be **$77 billion** or more.
- As a prerequisite for successful EMR systems, the market needs to develop interoperability and robust information exchange networks
- Potential barriers to adoption and effective application of EMR include acquisition and implementation costs, slow and uncertain financial payoffs, and disruptive effects on practices

Source: Hillestad et al: Health Affairs, Vol. 24, No. 5, 2005

Potential efficiency savings with adoption of HIT: $77B annually

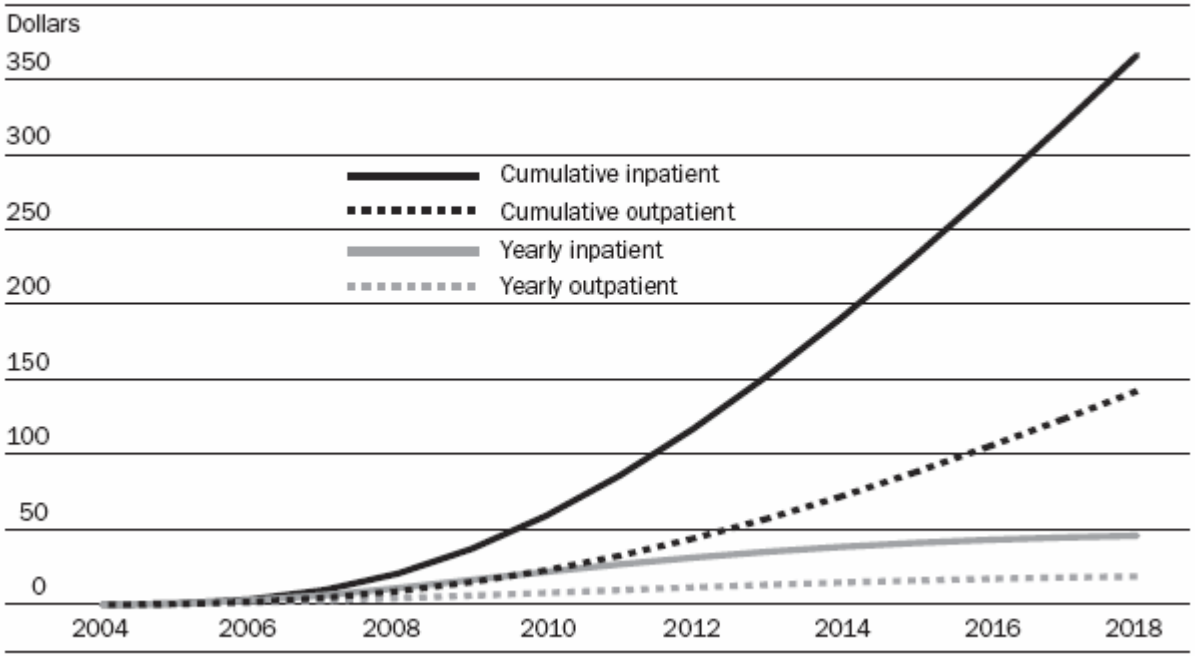
Savings category	Mean yearly savings ($ billions)	Cumulative savings by year 15 ($ billions)	Annual savings ($ billions)		
			Year 5	Year 10	Year 15 (90% adoption)[a]
Outpatient					
Transcription	0.9	13.4	0.4	1.2	1.7
Chart pulls	0.8	11.9	0.4	1.1	1.5
Lab test	1.1	15.9	0.5	1.5	2.0
Drug usage	6.2	92.3	3.0	8.6	11.0
Radiology	1.7	25.6	0.8	2.4	3.3
Total outpatient savings	10.6	159.0	5.2	14.8	20.4
Inpatient					
Nursing time	7.1	106.4	3.4	10.0	13.7
Lab test	1.6	23.4	0.8	2.2	2.6
Drug usage	2.0	29.3	1.0	2.8	3.5
Length-of-stay	19.3	289.6	10.1	27.6	34.7
Medical records	1.3	19.9	0.7	1.9	2.4
Total inpatient savings	31.2	468.5	16.1	44.5	57.1
Total	41.8	627.5	21.3	59.2	77.4

SOURCE: F. Girosi et al., *Extrapolating Evidence of Health Information Technology Savings and Costs,* Pub. no. MG-410 (Santa Monica, Calif.: RAND, 2005), sec. 4.2.6.

Source: Can Electronic Medical Record Systems transform health care? A study by RAND Corporation. Hillestad et al: Health Affairs, Vol. 24, No. 5, 2005

Potential net savings from HIT: $371B

Net Potential Savings (Efficiency Benefits Over Adoption Costs) For Hospital And Physician Electronic Medical Record (EMR) Systems Adoption During A Fifteen-Year Adoption Period (2004–2018)



SOURCE: F. Girosi et al., *Extrapolating Evidence of Health Information Technology Savings and Costs* (Santa Monica, Calif.: RAND, 2005), sec. 4.2.3.

$371B cumulative savings from hospital systems

$142B cumulative savings from physician practice EMR systems

Source: Can Electronic Medical Record Systems transform health care? A study by RAND Corporation. Hillestad et al: Health Affairs, Vol. 24, No. 5, 2005

Solo and Small Group practices on average paid for their EHR costs in two and a half years

Miller *et al.* completed a review of actual costs and benefits in 14 physician practices using EHR software from two vendors. There were no qualitative differences in EHR-related costs or benefits between the vendors.

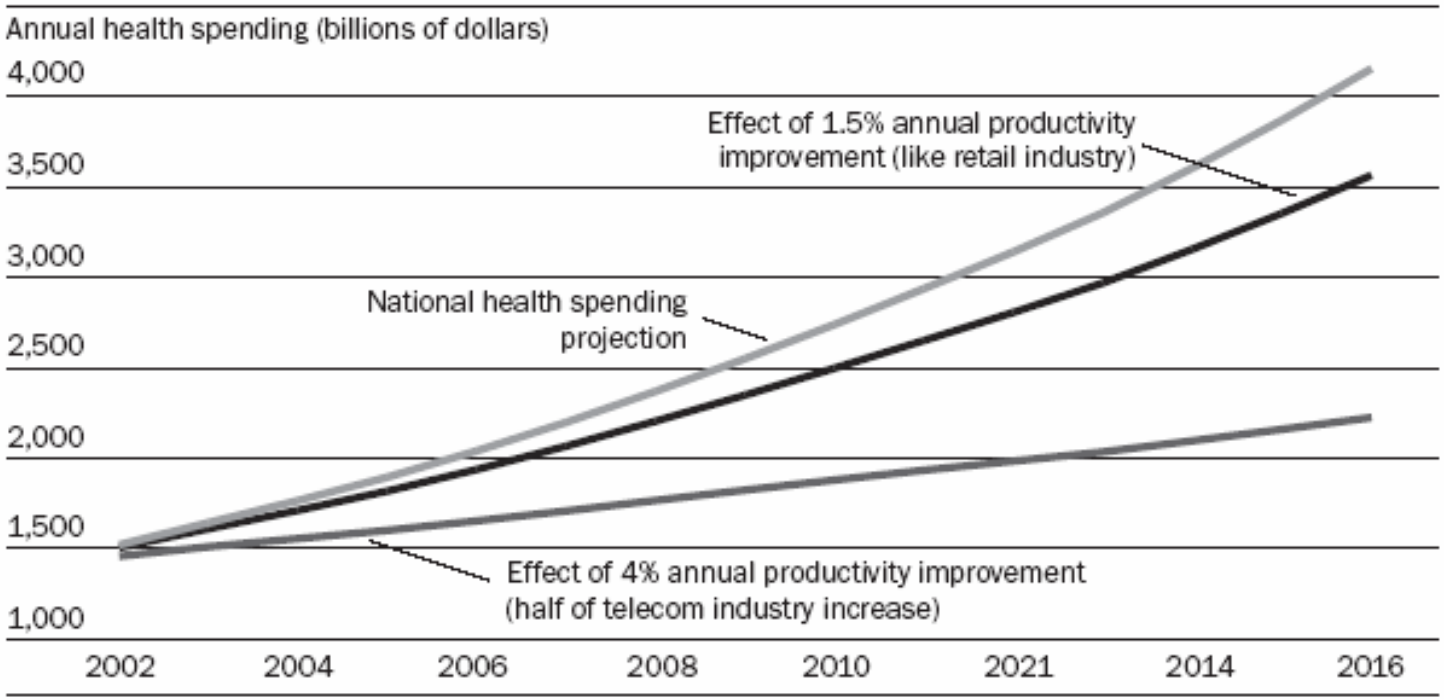
Initial EHR costs	**$44,000** per FTE provider
On-going EHR costs	**$8,500** per FTE provider
Net Benefits	**>$23,000** per FTE provider
Average ROI	**2.5 years**

* With ten of fourteen practices paid for their EHR costs within 4 years

Source: Miller et al: Health Affairs, Vol. 24, No. 5, 2005

HIT driven productivity – a cure for Baumol's Disease?

Possible Improved Productivity Effects Of Health Information Technology (IT) On Future National Health Spending, 2002–2016



SOURCE: Authors' analysis based on data from Centers for Medicare and Medicaid Services, "National Health Accounts," 17 March 2005, www.cms.hhs.gov/statistics/nhe (26 May 2005).

Source: Can Electronic Medical Record Systems transform health care? A study by RAND Corporation. Hillestad et al: Health Affairs, Vol. 24, No. 5, 2005

Others have come to a similar diagnosis

"It [the NHS] can be more efficient still which is why we expect to see **improvements in NHS productivity of 2%** per annum. This means we expect the NHS to match the productivity performance of the wider UK economy ..."

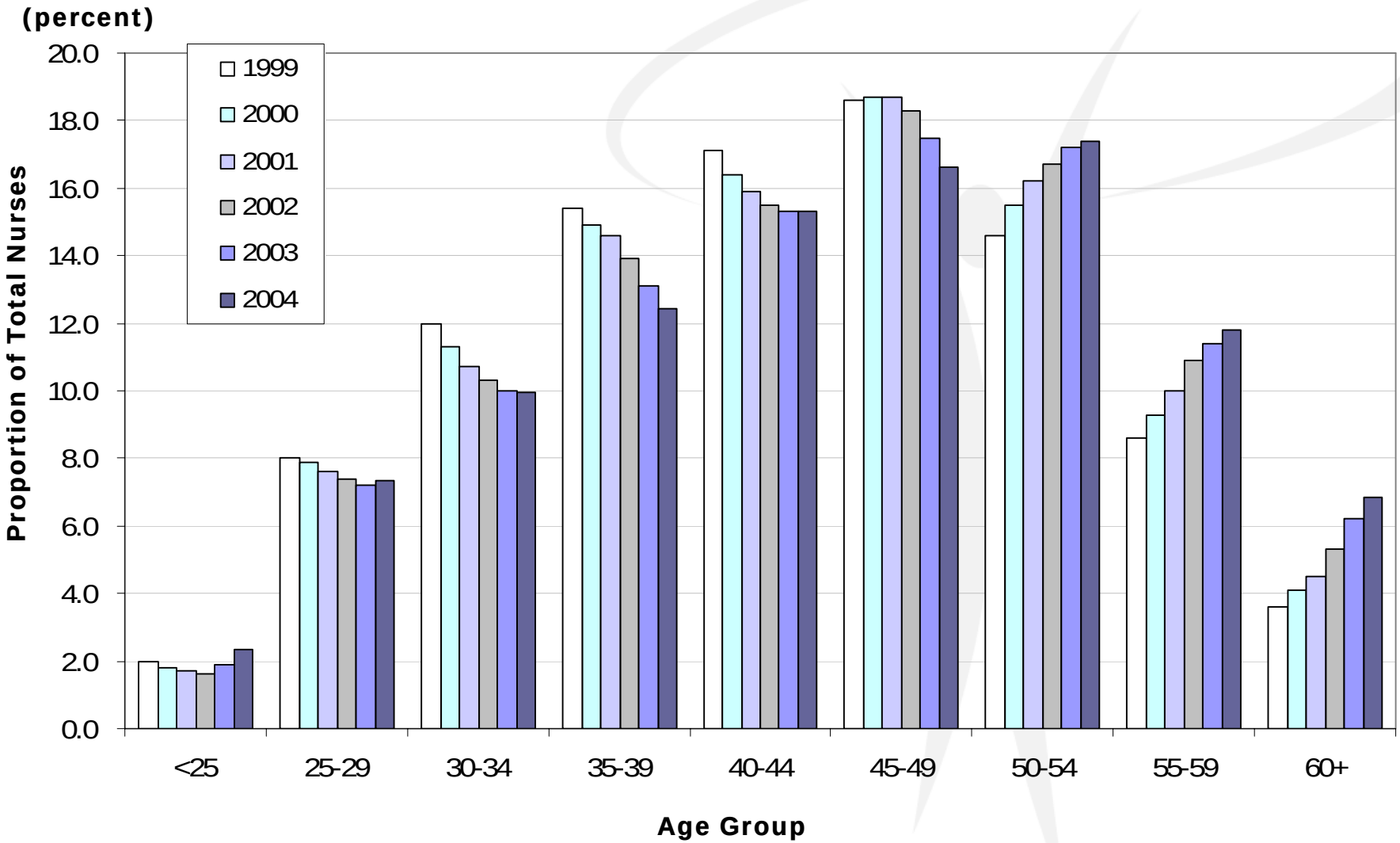
(UK Department of Health, 2002)

"Addressing the **shortage of professionals** in all health care disciplines and funding ways **to increase their individual and collective productivity** are two of the most pressing, yet complex, problems facing health care policy makers... Improving the productivity of health care professionals would reduce the number required in Canada. It is essential that detailed productivity studies of each of the health care professions be undertaken."

(Senator Kirby, the Kirby Report, Vol. 6, Ch. 11)

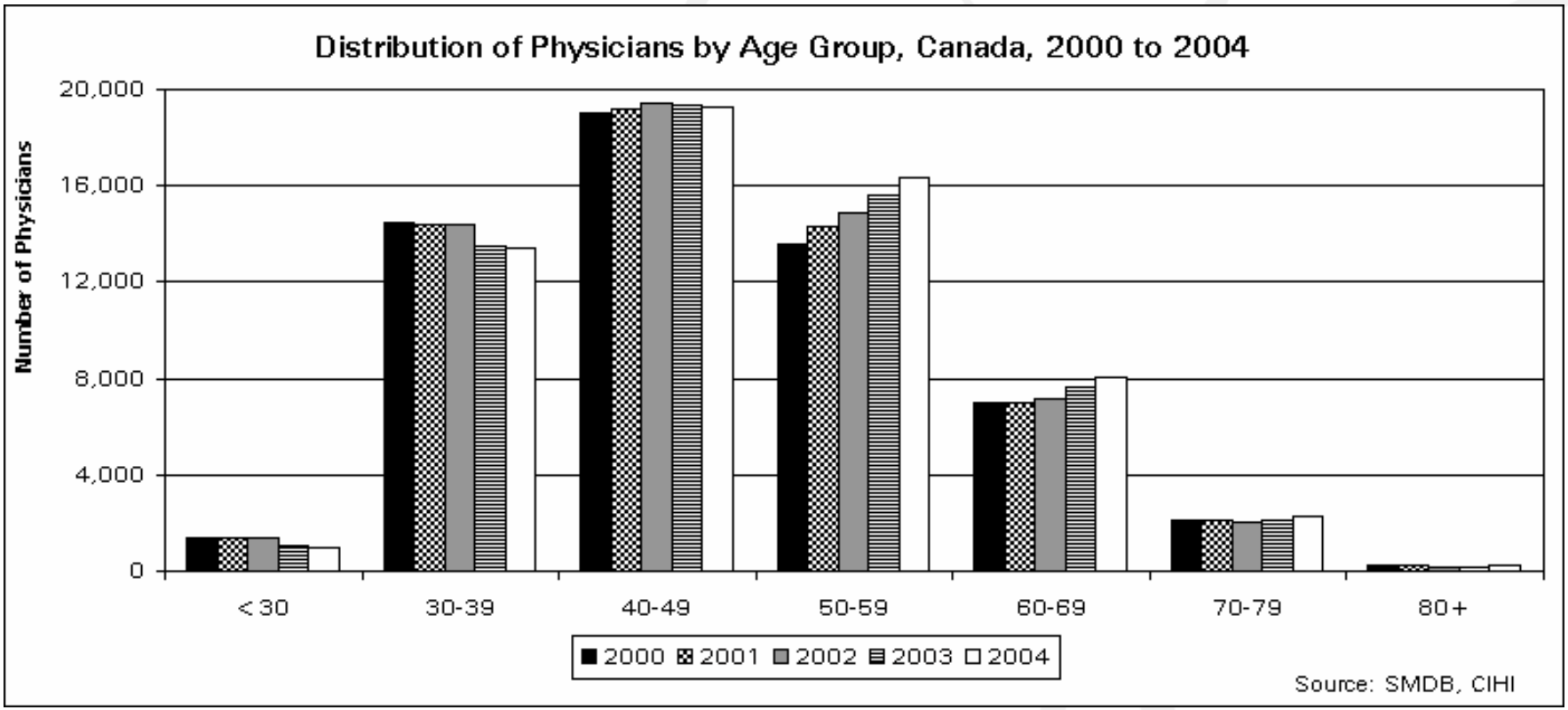
Canada needs healthcare productivity objectives

Another productivity imperative: Aging Health Human Resources



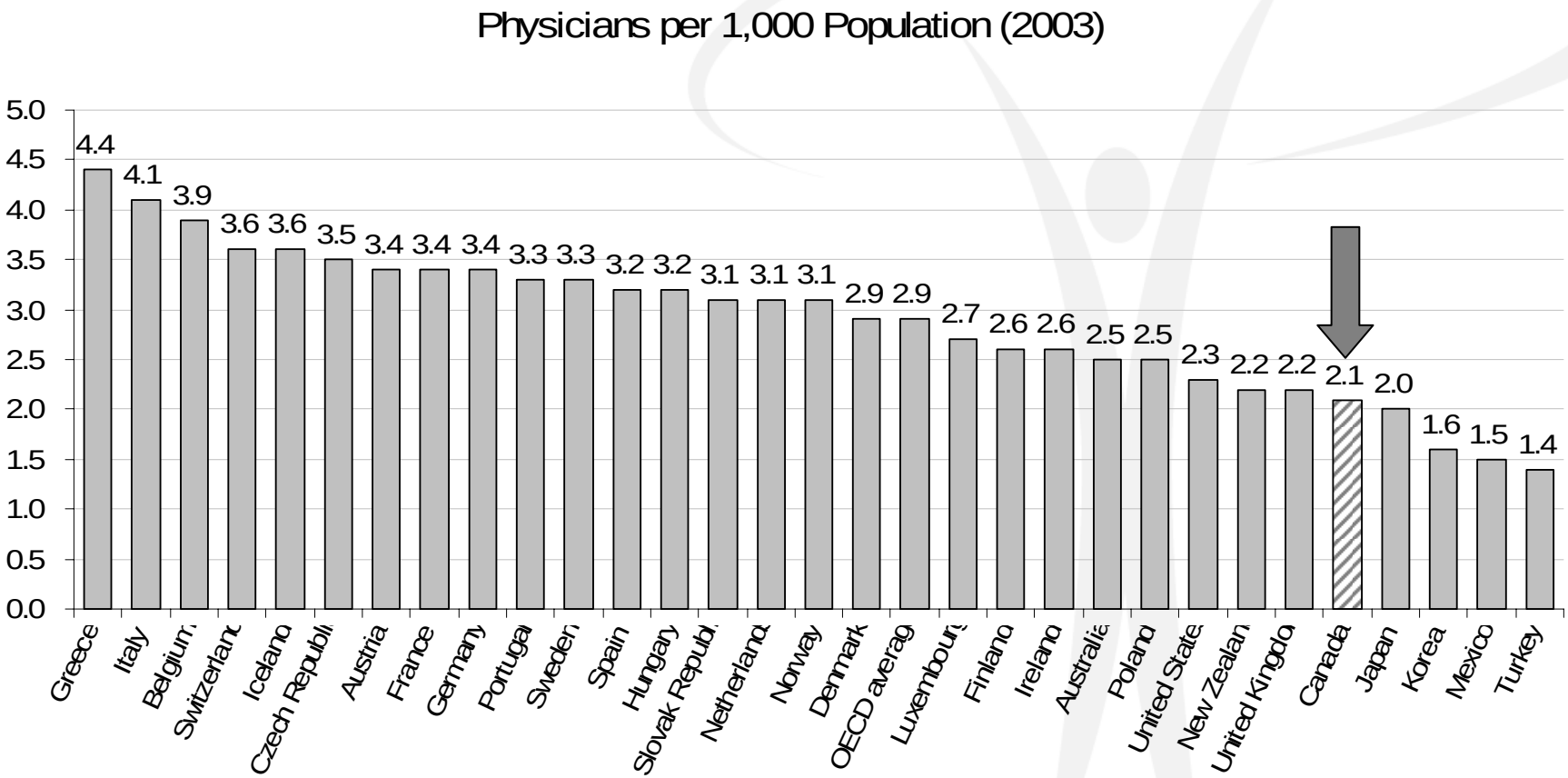
Source: Canadian Institute for Health Information. *Workforce Trends for RNs.* 2004

Another productivity imperative: Aging Health Human Resources



Source: Canadian Institute for Health Information

Canada already has less physicians than most OECD countries



Source: OECD Health-at-a-Glance, 2005

Lean management techniques have helped propel Toyota to become the leading automotive company in the world

LEAN MANAGEMENT

Distinguishing value added steps from non-value-added steps and eliminating those non-value added steps (waste) so that ultimately every step adds value to the process

Toyota Production System

- Relentless pursuit to improve processes
- The uncompromising insistence on driving out non-value-adding activities leads to Continuous Improvement in a relentless pursuit of better methods by all members of an organization

TPS Results

- Build a RX350 every 175 seconds down from 185 seconds allowing the plant to produce **3,650 extra vehicles** at no additional labour cost
- Reduce the cost of building the V-6 engines for the Camry sedan by **50%**

COURTYARD GROUP

Source:
Lippert, J. "Toyota Simple Slim cuts Camry costs". *Globe & Mail*, Feb. 22, 2006.
Cato, J. "The heart and soul of Lexus in Canada". *Globe & Mail,* Mar. 9, 2006.

Lean principles are being successfully applied to health care

Virginia Mason Medical Center, Seattle, WA has been using lean management principles since 2002. By eliminating waste, Virginia Mason created more capacity in existing programs and practices

Results of 175 Rapid Process Improvement Weeks:

Category	2004 Results (after 2 years of "lean")*	Metric	Change from 2002
Inventory	$1,350,000	Dollars	Down 53%
Productivity	**158**	**FTEs**	**36 redeployed to other open positions**
Floor Space	22,324	Sq. Ft.	Down 41%
Lead Time	23,082	Hours	Down 65%
People Distance	Traveled 267,793	Feet	Down 44%
Product Distance	Traveled 272,262	Feet	Down 72%
Setup Time	7,744	Hours	Down 82%

Savings from capital no longer required:

- **$1M** for hydrobaric chamber
- **$1M - $3M** for endoscopy suites
- **$6M** for new surgery suites

COURTYARD GROUP

Source: Womack et al. *Going Lean in Health Care*, Innovation Series 2005, Institute For Healthcare Improvement.

Focus factories allow providers to standardize care for a target condition to achieve major efficiency gains

ALBERTA BONE & JOINT HEALTH INSTITUTE:

Established a 2 year pilot project to test a new approach to hip & knee replacements from referral to recovery.

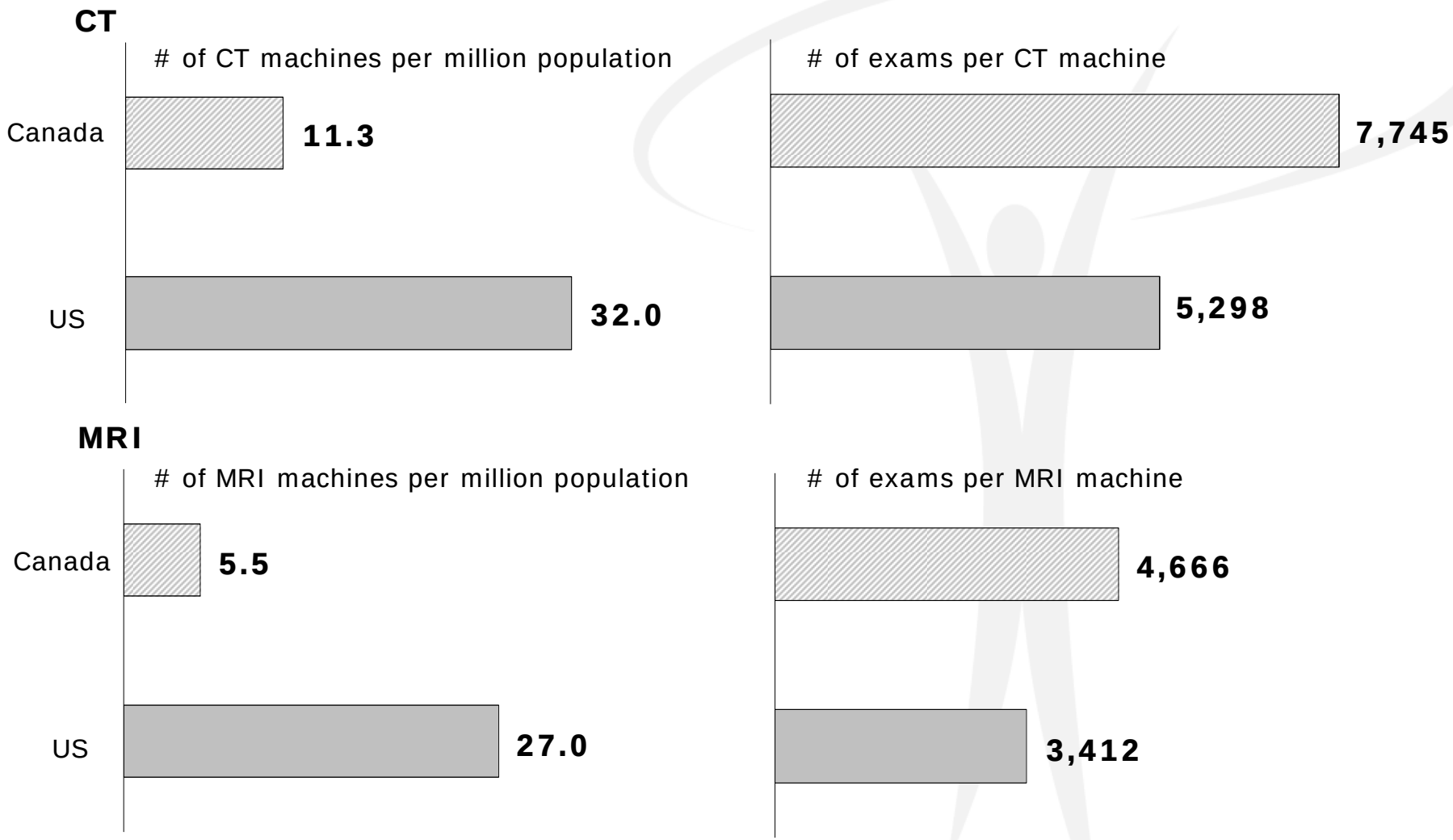
Description

- 2 year pilot to complete 1,200 surgeries
- $20 million to operate 3 clinics in Edmonton, Calgary & Red Deer
- Central referral center, with standardized referral tool
- Multi-disciplinary care team
- 526 surgeries completed as of Dec 2005

	Prior	Dec 2005	Target
Wait Time	35 weeks	<6 weeks	3.4 weeks
Wait Time	47 weeks	4.7 weeks	4-16 weeks *patient dependent
LOS	6.2 days	4.3 days	4.0 days
Follow-up	variable		14 days, 6 weeks, 3 months, 1 year

Source: Alberta Bone & Joint Health Institute website

Canadians have demonstrated the ability to obtain greater value from MRI and CT machines



Source: CIHI, *Medical Imaging*, 2005

Growing Burden of Chronic Disease In Canada

- ***16*** million Canadians live with chronic illness
- ***80%*** of adults over age 65 have a chronic disease
- ***60%*** of hospitalizations are due to chronic disease
- ***2/3*** of medical admissions via emergency are due to exacerbation of a chronic disease
- ***80%*** of family doctor visits are chronic disease-related
- ***60 to 80%*** medical costs are related to chronic disease

Source: Refining the measurement of the economic burden of chronic disease in Canada. Rapoport J et al. Chronic Diseases in Canada, 2004

Sins of Omission: Inadequate care for people with chronic illness

Getting Too Little Medical Care May be the Greatest Threat to Patient Safety

- Retrospective cohort study of 12 Veterans Affairs healthcare facilities
- Sample of 621 patients receiving care over a 2-year period
- Classification of reported quality problems:
  - 82% of patients had at least 1 error reported
  - 2,917 errors identified, only 27 were rated as highly serious
  - 4.7 errors reported on average per case
  - 95.7% of errors were identified as being problems with underuse
- Errors of omission include:
  - Obtaining insufficient information from histories and physicals (25.3%)
  - Inadequacies in diagnostic testing (33.9%)
  - Patients not receiving needed medication (20.7%)

Source: Sins of Omission. Hayward RA et al. J Gen Intern Med 2005

Diabetes Care in Six Countries

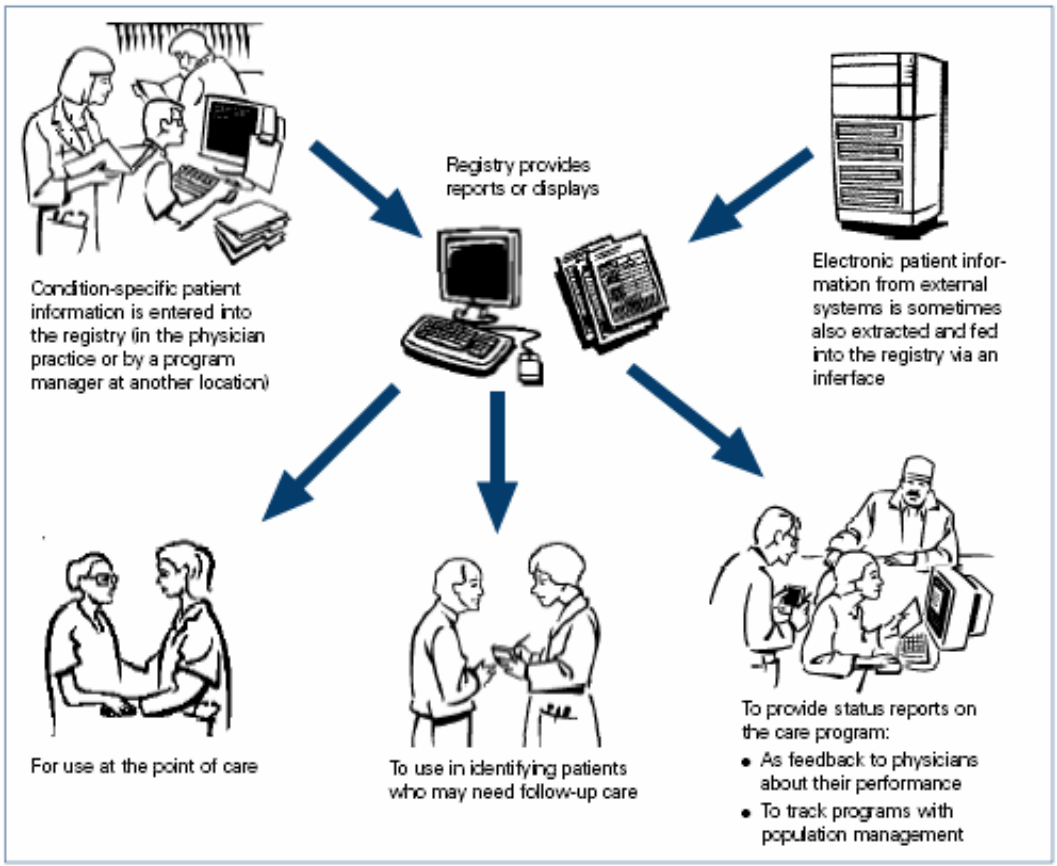
Patients with chronic diseases often do not receive the recommended care

Indicator	CAN %	AUS %	NZ %	UK %	US %	GER %
A1C in last 6 mos.	90	86	79	85	90	91
Feet exam in last yr.	52	57	66	75	70	65
Eye exam in last yr.	73	73	66	83	69	85
Cholesterol checked in last year	91	93	87	92	92	95
All 4 services received in last yr.	38	41	40	58	56	55

Source: Schoen *et al.* "Taking the pulse of health care systems: experiences of patients with health problems in six countries." *Health Affairs* , Nov. 3, 2005

Is CDM the big opportunity that will drive adoption of HIT?

Basic functions of a disease registry:



- An application for capturing, managing, and providing access to condition-specific information for a list of patients to support organized clinical care
- Health care teams with access to a registry can call in patients with specific needs, deliver planned care, receive feedback on their performance, and implement reminder systems.
- Disease registries supplement rather that replace individual patient medical records

Source: Using Computerized Registries in Chronic Disease Care, California Healthcare Foundation, 2004

HIT-enhanced CDM can change the incidence of complications in chronic conditions

Potential Annual Effects Of Near-Term Disease Management Programs For Four Diseases: Asthma, Congestive Heart Failure (CHF), Chronic Obstructive Pulmonary Disease (COPD), And Diabetes

Effect	Change
Use (millions)	
Inpatient stays	−4
Hospital outpatient visits	−5
Physician office visits	33
Spending (billions)	
Hospital	−$30.1
Physician	−$0.0
Rx drugs	$1.9
Total	−$28.5
Outcomes (millions)	
Workdays lost	−28
School days lost	−13
Bed days	−245

SOURCE: J. Bigelow et al., *Analysis of Healthcare Interventions That Change Patient Trajectories* (Santa Monica, Calif.: RAND, 2005), 137, Table 6.17.

NOTE: Assumes 100 percent participation.

Source: Can Electronic Medical Record Systems transform health care? A study by RAND Corporation. Hillestad et al: Health Affairs, Vol. 24, No. 5, 2005

The toll on patients is high: US Data

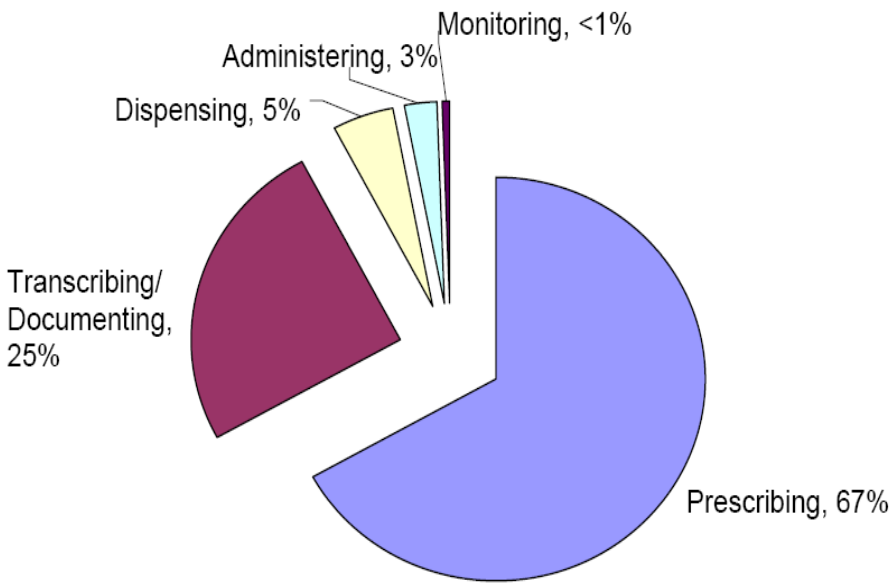
CONDITION	SHORTFALL IN CARE	AVOIDABLE TOLL
Diabetes	Average blood sugar not measured for 24%	29,000 kidney failures 2,600 blind
Colorectal cancer	62% not screened	9,600 deaths
Pneumonia	36% of elderly didn't receive vaccine	10,000 deaths
Heart attack	39% to 55% didn't receive needed medications	37,000 deaths
Hypertension	Less than 65% received indicated care	68,000 deaths

Source: Elizabeth McGlynn, et al. “The Quality of Health Care Delivered to Adults in the US.” NEJM 2003; 348:2635-45

Implementation of HIT systems results in more errors and deaths

- Computerized errors are the **4th** leading cause of medical errors
- **¾** of all computer errors occur after order is written but before medication is administered

CPOE Errors in Medication Process



Source: USP. "Computer Entry a Leading Cause of Medication Errors in U.S. Health Systems." Dec. 20, 2004

Poor implementation of any HIT system can result in an increase in errors

University of Pennsylvania Medical Center – use of CPOE since 1997

22 types of medication errors related to CPOE

75% of staff reported errors that occurred at least weekly

Most frequently cited errors:

- Used CPOE default to determine dose range
- Gap in antibiotic therapy due to delays in on-line approval
- Delayed ordering due to system downtime
- Difficulty in ordering off-formulary medications

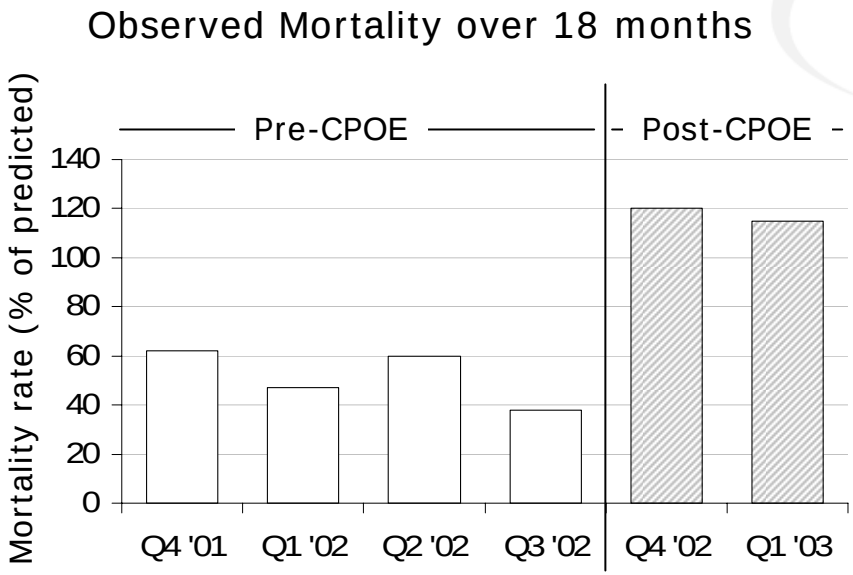
Implementation Errors

- Lack of system redundancy to prevent system down-time
- No clinician participation in design
  - Cumbersome user interface
  - Default dosage not aligned to dose guidelines
- Little emphasis on change management / clinician adoption
- Majority of issues and risks not associated with application functionality

Source: R. Koppel *et al.* "Role of Computerized Physician Order Entry Systems in Facilitating Medication Errors." *JAMA*, Vol. 293, No. 10, March 9, 2005.

Poor implementation of HIT has the potential to harm patients

Children's Hospital of Pittsburgh – Pre & Post intervention study



Unexpected increase in mortality associated with implementation of CPOE & clinical applications platform

Implementation Errors

- Little emphasis on change management / clinician adoption
- Implementation of CPOE system in 6 days
- Training conducted 3 months in advance of implementation
- No workflow re-design completed
- No ICU-specific order sets programmed at time of CPOE implementation
- Majority of issues / error risks not associated with application capabilities
- Insufficient network bandwidth for peak operational periods

Source: Y.Y. Han *et al.* "Unexpected Increased Mortality After Implementation of a Commercially Sold Computerized Physician Order Entry System." *Pediatrics*, Vol. 116, No. 6, December 2005.

Skilled health informatics professionals and improved methodologies are critical to achieve HIT benefits

"…depending on the computer's design or user competence, new points of potential errors can emerge." *– Diane Cousins, RPh, VP, USP's Center for Advancement of Patient Safety*

- e-health is a disruptive, transformational process enabled by IT - technology is the impetus to challenge the status quo
- The occurrence of CPOE errors exposes design flaws, poor or insufficient clinical decision support rules, inadequate training, and user resistance
- Improved implementation methodologies, including effective change management and clinician adoption strategies, are required to ensure that HIT systems improve quality of care
- **These implementations require personnel who are not only fluent in the technology but also in the clinical and business aspects of healthcare**
  - The American Medical Informatics Association has recognized this and recently announced an initiative to train 10,000 HIT professionals by 2010
  - This amounts to an additional 2 HIT professionals to each US hospital

Source: Conference Board of Canada – Alberta Symposium – eHealth; Training Health Care Professionals to Serve as Local Informatics Leaders and Champions. AMIA, June 2005

Successful implementation across the health system may depend on pooling of limited HIT resources

- Few organizations have been able to afford, recruit, train and retain an IT team with the technical, clinical, process redesign, project management, and informatics skills needed to implement an effective EHR.
- Pooling of scarce HIT resources has allowed some providers to leverage limited expertise more effectively to implement these systems
- Vendors, like Epic, have depended a vendor credentialing model to implement its solutions:
  - Vendors send HIT professionals to Epic's headquarters in Wisconsin to train and become certified Epic implementation specialists

EPIC is coming!

- Emergence of EPIC has taken the US HIT market by storm
- Major contracts / installs in the US include Kaiser Permanente, Cleveland Clinic, Stanford Medical Center, Sutter Health, HealthPartners
- Best in KLAS Awards
  - Acute Care CDR, Orders & Charting – EpiCare Inpatient
  - Ambulatory Billing & Scheduling (over 100 Physicians) – Epic Resolute/Prelude/Cadence
  - Ambulatory EMR (over 25 Physicians) – EpiCare Ambulatory EMR
- Has a reputation for delivering what is promised through:
  - Proactive customer service & problem resolution
    - Only 140 clients, 10% of other major HIT vendors
  - Tight integration of solutions to provide single patient record for inpatient and ambulatory care
  - Certification of implementation vendors
- EPIC is beginning to enter the Canadian HIT market

EPIC appears to be setting a new standard in the industry

	Rank (Score)							
	Epic	**McKesson**	**Misys**	**Eclipsys**	**Cerner**	**Meditech**	**IDX**	**Siemens**
Acute Care CDR, Orders & Charting	1 (88.23)	2 (79.78)	3 (78.28)	4 (77.40)	5 (75.73)	6 (73.62)	7 (71.81)	8 (70.91)
Cardiology PACS		4 (78.46)						7 (72.39)
Cardiology Reporting & Documentation		2 (78.31)						7 (69.32)
Enterprise Scheduling	2 (90.75)	5 (76.40)			6 (76.19)			
PACS		4 (87.01)					6 (80.25)	11 (60.33)
Pharmacy		2 (76.67)			3 (70.74)			4 (70.31)
Radiology			1 (78.01)		4 (72.45)		3 (74.57)	2 (75.76)

- Epic products rank either #1 or #2, if they have sufficient scores to meet KLAS confidence levels:
  - #1: EpicCare Inpatient; Epic Resolute/Prelude/Cadence; EpicCare Ambulatory EMR
  - #2: Epic Cadence Scheduling
  - Not Ranked: Epic Resolute Inpatient; Epic Inpatient Pharmacy; Epic EpicWeb

"**The product, process, implementation and cost prediction are outstanding. They are the best vendor we have ever worked with. Their implementation leadership is outstanding.**" – KLAS Performance Commentary

Source: Top 20: Year-End Best in Klas Awards, December 2005.

Concluding Remarks

- There is strong evidence that HIT can improve quality and efficiency – particularly through CDM and CPOE
- There is very limited published evidence that an EHR alone has much impact on care
- HIT can underpin a productivity agenda – hence curing Baumol's Disease
- Limited HIT expertise may hamper the implementation agenda
- Poor implementation may reduce patient safety
- The vendor community may be in the midst of a major restructuring due to EPIC setting a new performance standard
- HIT investments will accelerate once the agenda shifts from EHR implementation to productivity and quality improvement
- Canada needs a strategy that sets clear goals for quality and productivity

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