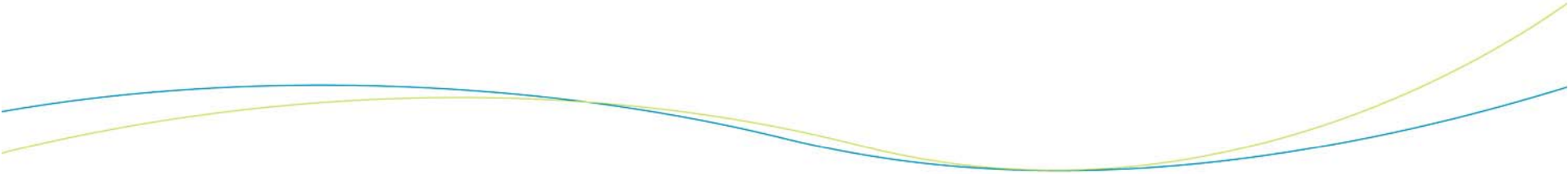




Health Technology Assessment

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- 
- Why do Health Authorities make different choices?
 - We're different: missions, structure, patients
 - Should we have a Province-wide approach?
 - Yes, if it meets certain requirements

What is Health Technology Assessment?



What is Health Technology?

... any method or intervention that is used to:
promote health;
prevent, diagnose, or treat disease; or
improve rehabilitation and long-term care.

Technologies include:

drugs, devices, diagnostic agents, equipment, and
medical and surgical procedures ... *[as well as]*
organizational and service systems that provide
health care, such as telehealth.

What is Health Technology Assessment?



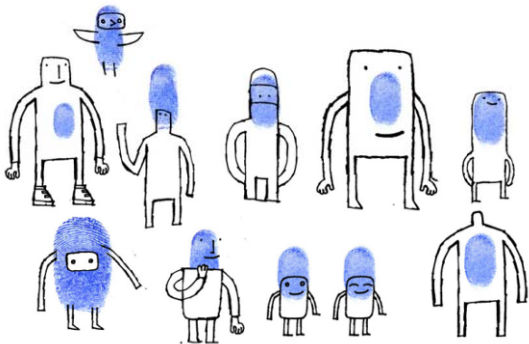
... an evaluation of the clinical effectiveness, cost-effectiveness, and...

the broader impact of drugs, medical technologies, and health systems,

both on patient health and the health care system.



Evolution of HTA



- Cost-effectiveness (usually minus the cost)
- Quality-of-life (QALY's)
 $\$50,000/\text{QALY} = \text{thumbs up}$
- Context influences effectiveness
- Field trials (great expectations, limited evidence)
- Human factors (users influence effectiveness)
- Who wants this technology?
(Public input & participation)

Recent HTA Reports from CADTH



- **Personal Electronic Health Records:** Clinical Effectiveness, Cost-Effectiveness, and Clinical Practice Guidelines
- **Quality Assurance Programs for Laboratory Medicine:** Clinical Evidence and Guidelines
- **Patient Hand Hygiene:** Clinical Effectiveness and Guidelines
- **Rounds to Improve Patient Safety:** Optimal Frequency
- **Conscious Sedation During Endoscopy Procedures:** Systematic Review of Clinical and Cost-Effectiveness and Guidelines for Short-Acting Agents and Dissociative Agents

Technology Acquisition Follows a Variety of Pathways

- Capital acquisition uses the Advisory Board prioritization system
- Non-capital requests are loosely prioritized based on:
 - Patient safety
 - Standard of care (use in other settings)
 - Efficiency (i.e. OR time, complication rates)
- Less formal processes are also important, especially for
 - Non-capital technologies, and
 - Technologies with influential champions



New Technology Prioritization by VCH's Biomed Department



Category	Evaluation Criteria	Weight
Strategy	Maintain Services - Age & UpTime	35%
Safety	Safety & Codes (Patient & Staff)	25%
Obsolescence	Ability to Support (Service - Manufacturer)	10%
Innovation	New Service (Technology)	5%
Financial	Financial Impact (Improve Operating \$s)	15%
Planning	Foreseeing Capital Needs	10%
		100%

Rational for a BC-Wide Technology Assessment Process

- New technology is a key cost driver
- To facilitate and coordinate HA decisions for the adoption of non drug health technologies.
- To restrict the diffusion of ineffective new technologies, **and support the entry of high value technologies.**
- Ensure the allocation of scarce resources is based on clinical and cost-effectiveness evidence.
- **Support system sustainability. (Invest in the future)**



BC HTA Process Objections

- Support timely evidence informed decision making ability of HAs and MOHS.
- Make use of existing resources and technology evidence reviews (e.g. CADTH HTIS, Alberta, Ontario, NICE).
- Balance the need to contain health care costs and support opportunities to improve health outcomes.
- Process be timely, fair, equitable, and transparent.
- Provide a mechanism to handle situations where promising technologies lack adequate evidence (e.g. patient pay policy, field trials etc.).

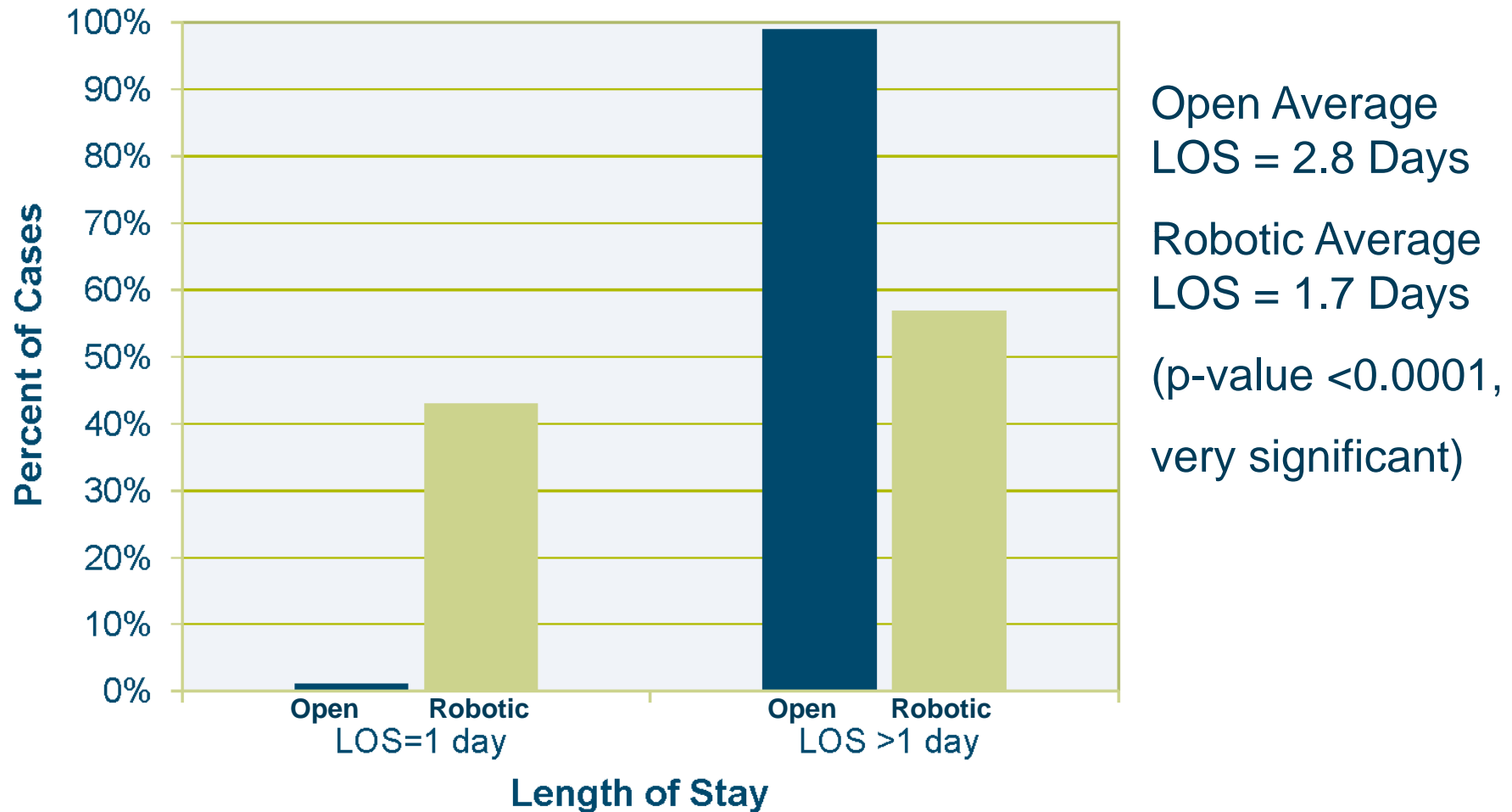
Robotic Surgery Across Canada

- 2003: First surgical robot in Canada
- 2006: Internal VCH HTA prior to purchase
- 2007: VCH Acquires Robot
- 2008: 8 sites in Canada
- 2009: VCH 20-month review
- 2010: CADTH draft report on surgical robotics

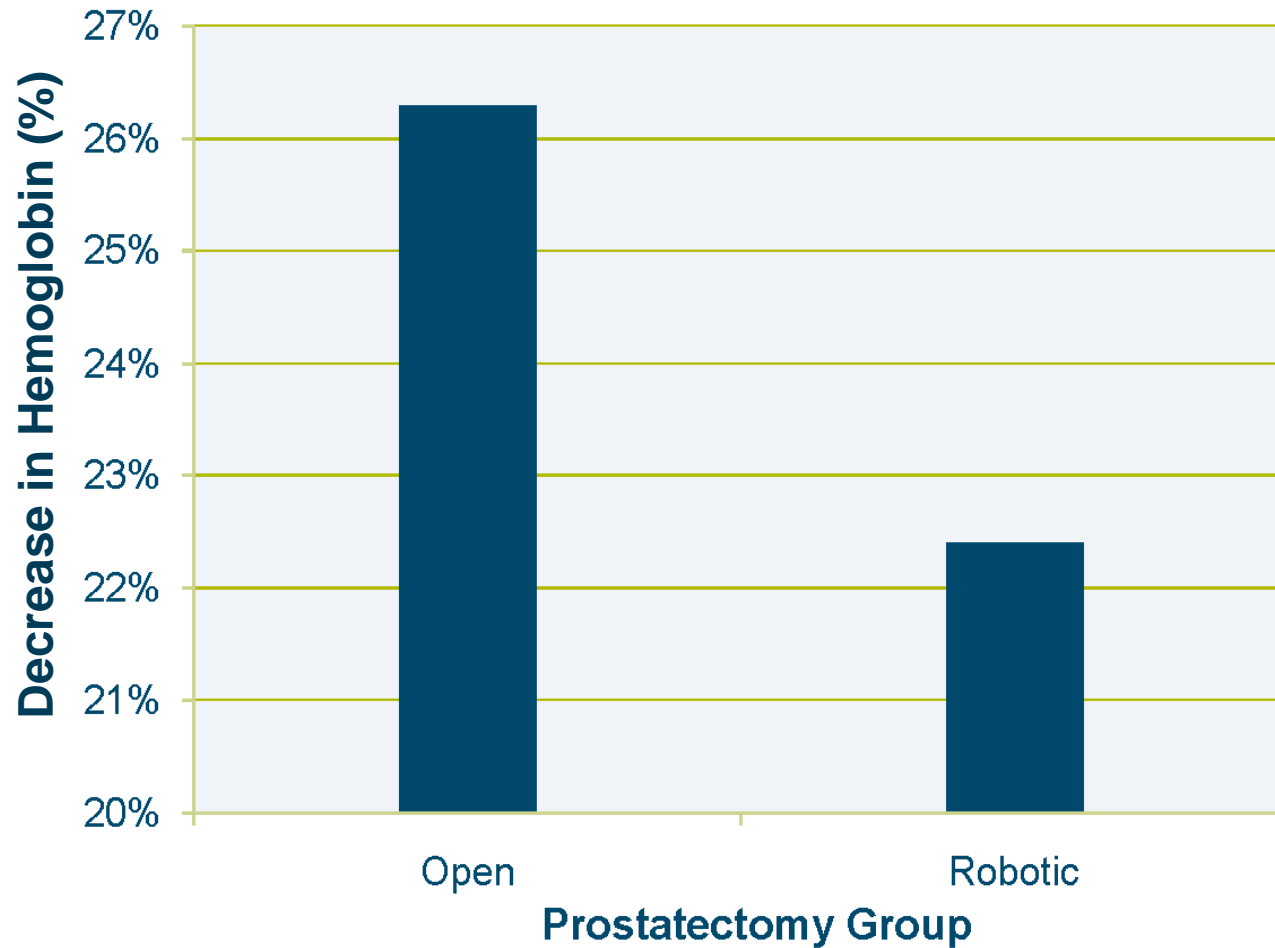


As of 2010, there are about 1200 robotic systems worldwide.

Length of Stay is Shorter After Robotic Surgery



Blood Loss is Lower (Robotic Prostatectomy)



Open Average Blood Loss = 704mL

Robotic Average Blood Loss = 470mL

(p-value = 0.0001)

General Observations

- No cost efficiency savings within peri-operative services
- Improved patient outcomes are early & promising: reduced blood loss, reduced LOS, less risk of infection and less pain in some procedures
- Surgeons report less fatigue when using Robot due to better ergonomics
- Surgeons should perform at least 50 cases per year to maintain competency on the robot
- Maintenance of surgical robot is expensive - \$165K USD per year
- Anticipate the software for Robot has relatively short shelf life (upgrades may be costly)

Technology Acquisition Stories



Da Vinci™ Surgical robot



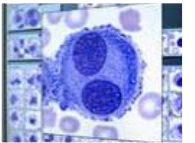
128-slice CT scanner



Smart infusion pumps



Metal-on-metal Hip Prosthesis

























Cellavison™ (Hematology)



RIVA™ (Robotic IV admixtures)

Technology Acquisition Stories, 2006-2009

Technology (champion)	Costs			Key Benefits	Evidence Base	Funding Source
	Purchase	Operating	Start-up			
Surgical Robot (surgeons)				Patient Well-being		Foundation
128-slice CT (radiologists)				Disputed		Foundation
Smart Infusion Pumps (biomed)				Patient Safety		X
Metal-on-Metal Hips (surgeons)				Patient Well-being		Patients Pay
RIVA–meds mixture (pharmacy)		Saves \$		Patient Safety, Productivity		X
Automated morphology (pathology)		Saves \$		Productivity		Special Fund



Human Factors Integration into Healthcare Equipment Acquisitions

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Quality & Patient Safety,
Vancouver Coastal Health

1. Human Factors in Healthcare
2. Examples: Good & Bad Designs
3. Human Factors Process in Procurement Decision-making

What is Human Factors?

designing for human use

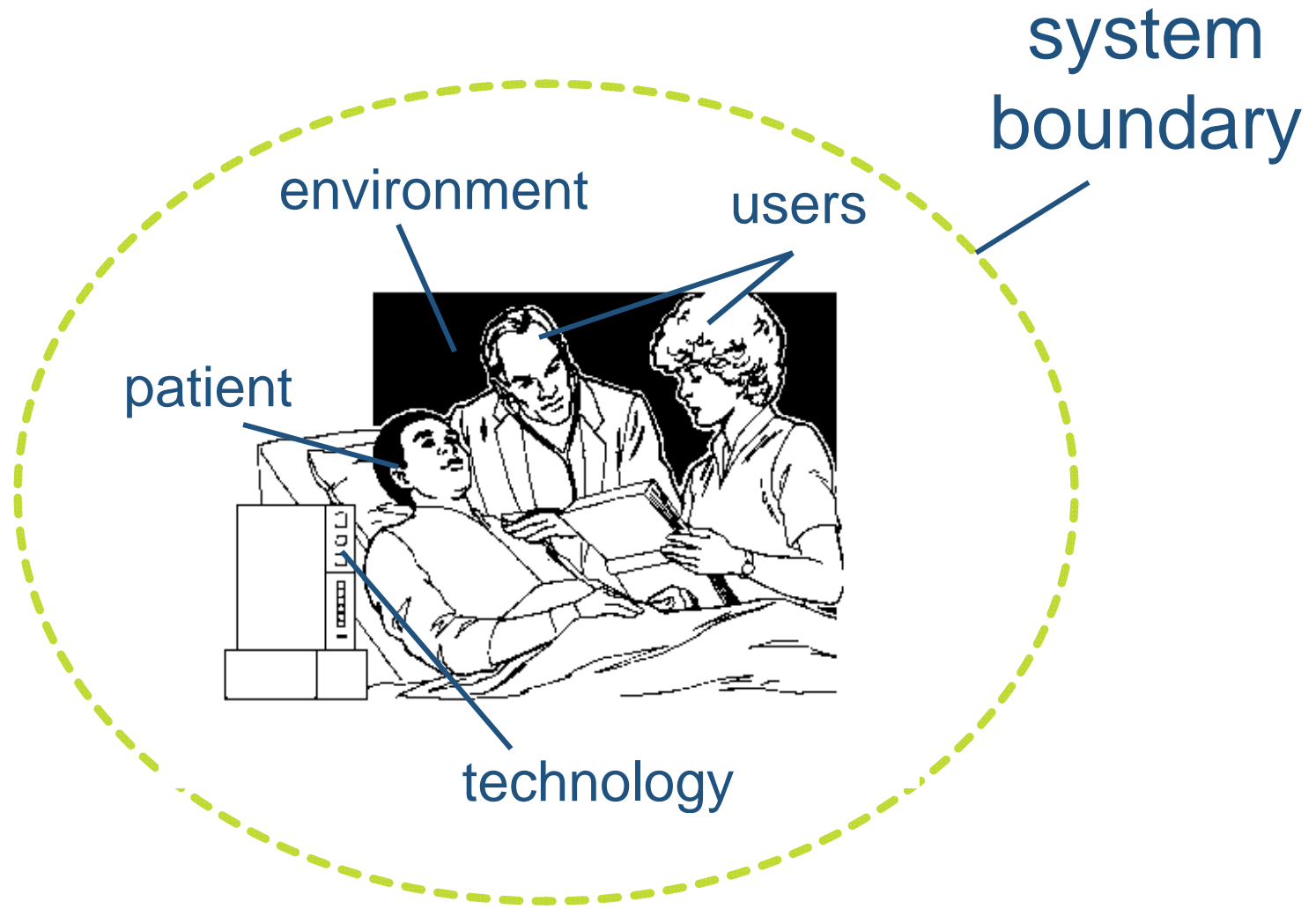
a body of information about human abilities, human limitations, and other human characteristics that are relevant to design

Chapanis, A. (1995, p. 11). Human Factors in Systems Engineering. Toronto: John Wiley.

Human Factors Engineering

the application of human factors
information to the design of tools,
machines, systems, tasks, jobs, and
environments for safe, comfortable and
effective human use

Chapanis, A. (1995, p. 11). Human Factors in Systems Engineering.
Toronto: John Wiley.



- Performance and acceptance of the system depends on the user
- Users are adaptable
- Users can learn to use a poorly designed system





Photo by Wrae Hill

Cannot assume that all users can complete a task or use a piece of equipment simply because you can.

- Reduce adverse events
- Increase safety
- Impact to users and operators
- Improve system performance

Human Factors Device Evaluations

- Medical device errors can and do occur
- Better usability and design can lead to better performance and fewer errors*
- Human factors provides tools and techniques to assist in device selection for safe, effective, and usable devices for a particular work environment

Examples

Blood Glucose Meter

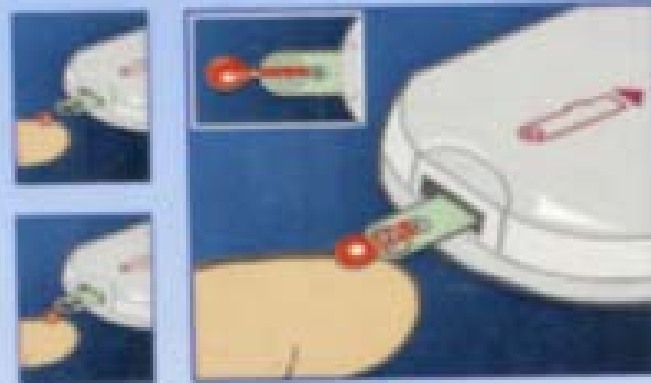
1. Open, remove, insert



2. Meter is "on"



3



4. Remove.

Wait 30 seconds, result will appear.





**DO NOT USE
THIS ORANGE
BUTTON DUE
TO POTENTIAL
FOR ERROR**

Positive & Negative Pressure Caps for CVC and PICC lines

Positive
Pressure



Negative
Pressure



Positive
Pressure

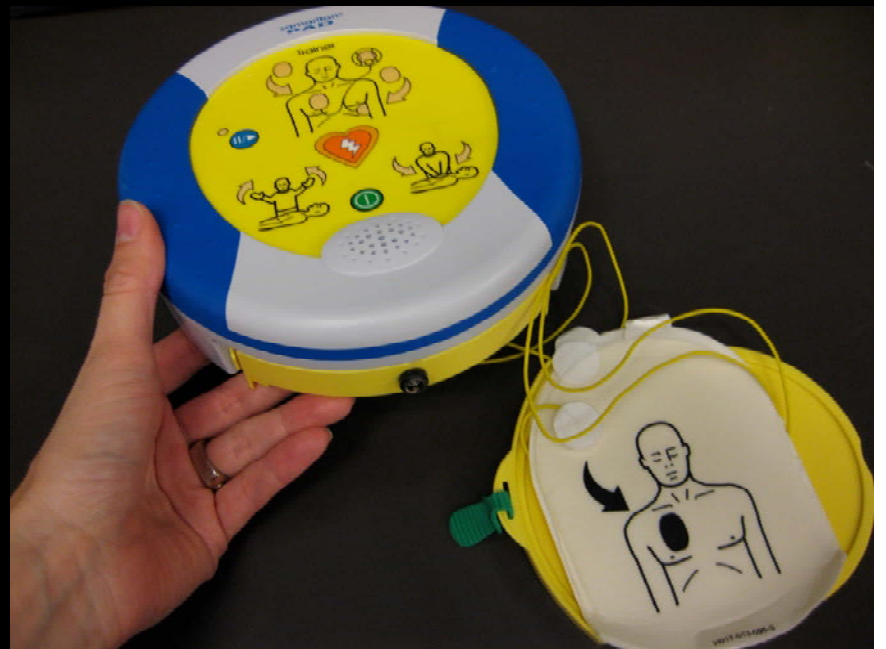
NEW



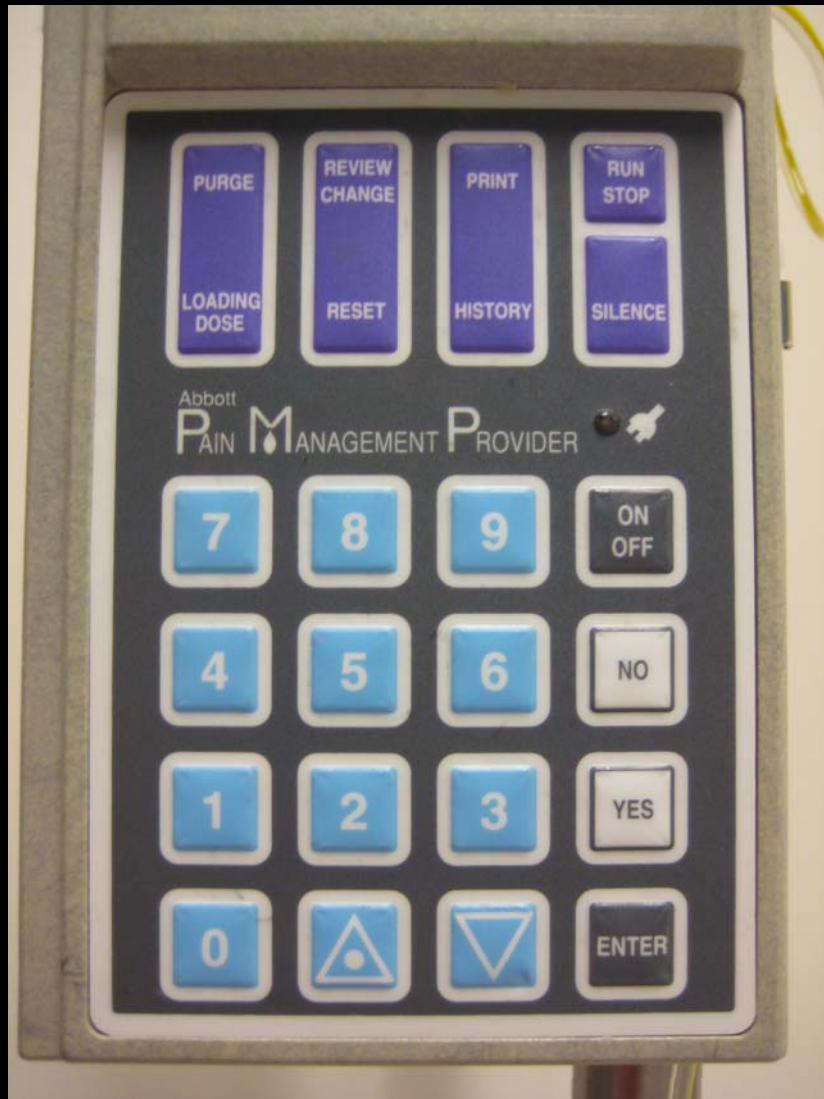
Negative
Pressure

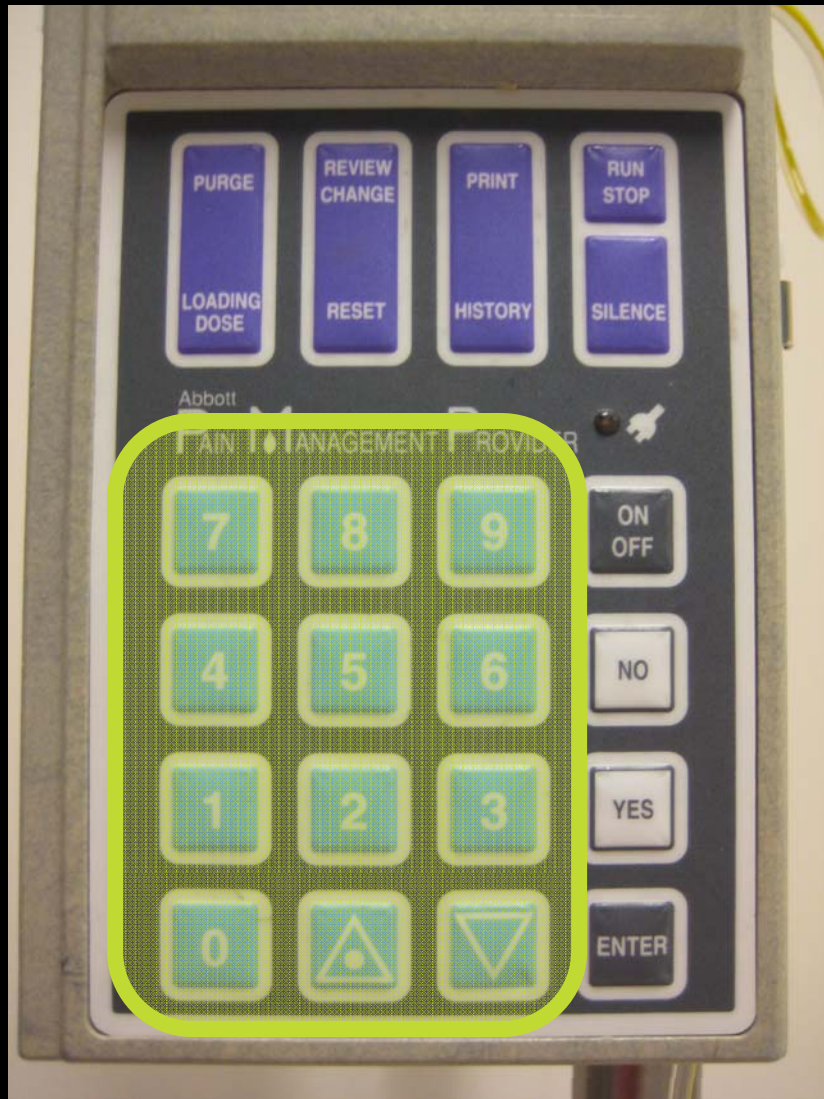


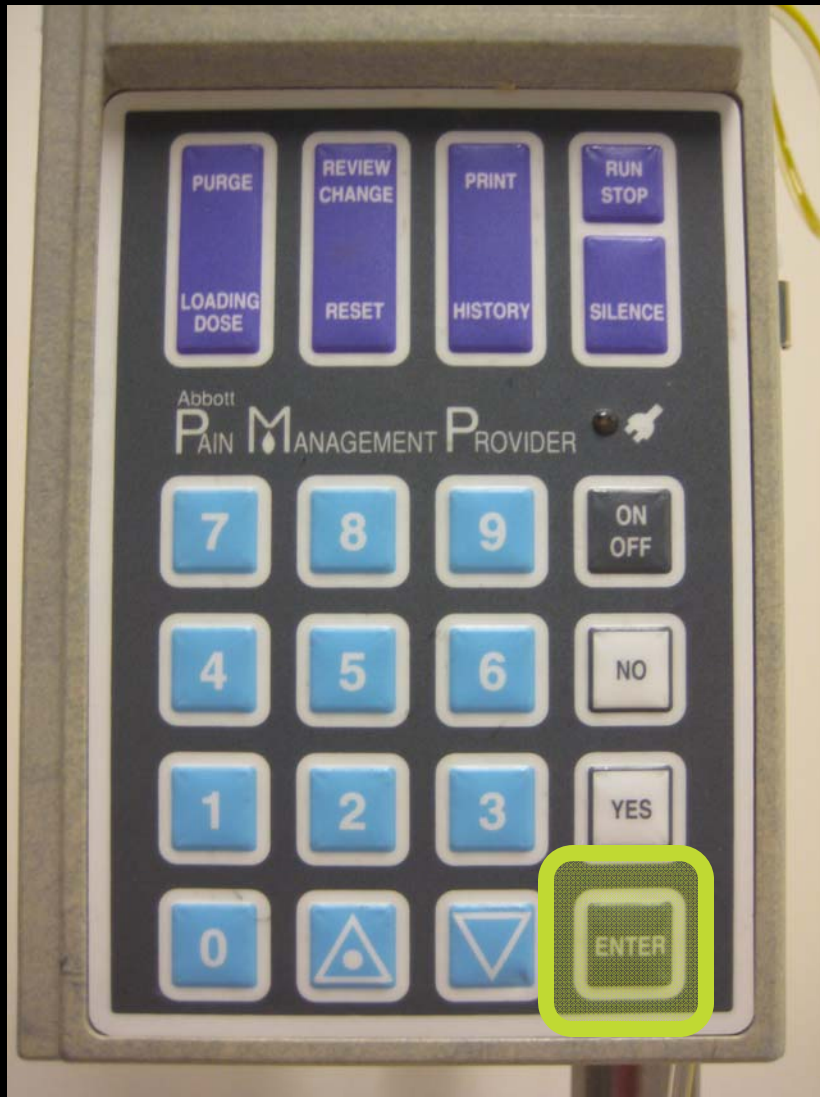
Defibrillator

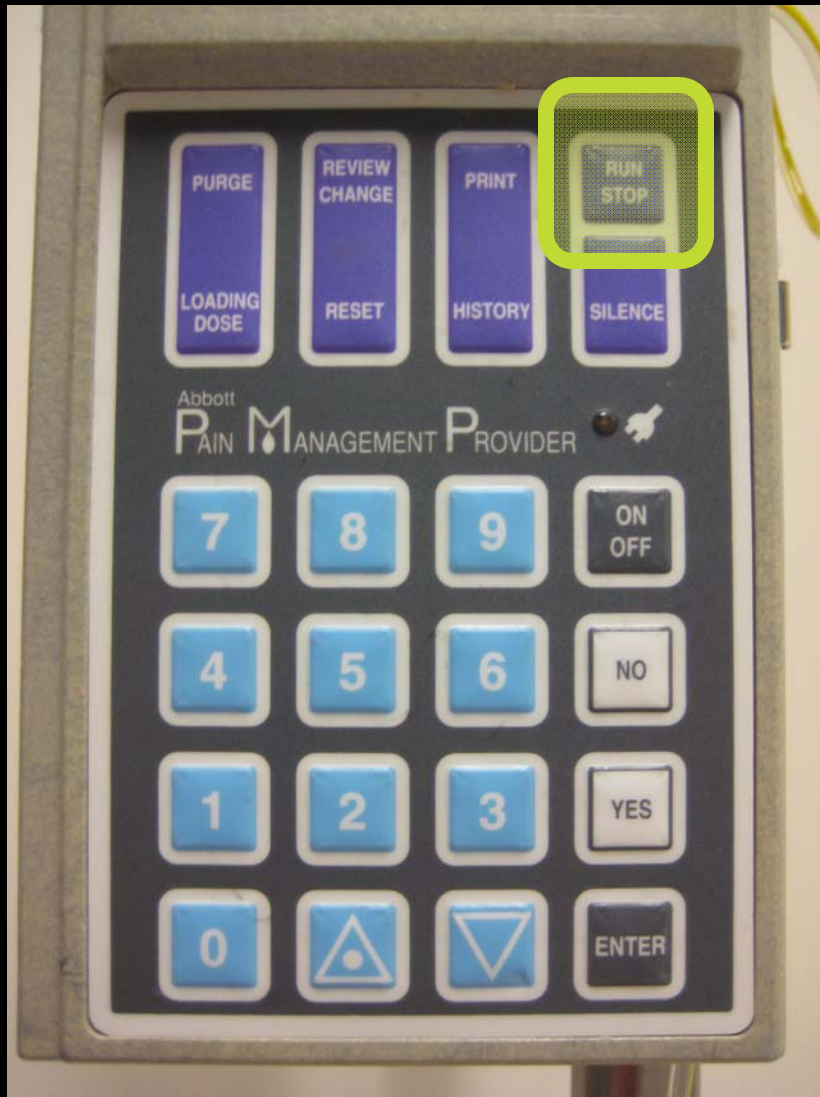


Epidural Pumps











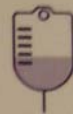
ICU



DOBUamine

10

mcg/kg/min



bolus review options titrate



ON OFF SETUP OK RUN STOP

BASIC	ABC	DEF	GHI
0	1	2	3
	JKL	MNO	PQR
*	4	5	6
	STU	VWX	YZ
	7	8	9

Evaluating Devices Before Purchase

- Regulatory bodies recognize that a poorly designed device can induce errors and operating inefficiencies even when operated by a well-trained and competent user

How can we evaluate devices before purchase using Human Factors principles?

What can we do to provide support to decision-makers during the procurement process?

Human Factors Evaluations

1. Identify design problems that may affect patient safety and quality of care
2. Provide additional information for decision-making
 - e.g. details re: implementation concerns, troubleshooting, error recovery, training design
3. Quantify level of consistency between new device and current workflow – degree of standardization and error potential

Epidural Pump Acquisition

Human Factors in Procurement Evaluation

New Epidural Pump
Required



Human Factors in Procurement Evaluation



Evaluation Weighting Criteria

Clinical: 50%

- **Heuristics 10%**
- Technical Evaluation 10%
- **Usability Study 10%**
- Real-time Clinical Evaluation 20%

Financial: 25%

Value Adds: 25%

- Academic Excellence 5%
- Supply Chain Management 10%
- Corporate Strength 10%

Total: 100%

Issue	No clear way to exit the Bolus Dose screen without giving a patient a bolus. The user must press Cancel twice to exit
Heuristic Violated	C = User Control & Freedom D = Consistency (user in control) F = Recognition rather than Recall (minimize memory load)
Severity Rating	4 (Severe; Correct before purchasing)
Recommendation	Provide a clear exit (add Exit key to bottom of screen with a screen asking user to confirm that they do not want to proceed with a bolus). User can enter 0.0 as a dose and again confirm that they are not giving a dose

Heuristic Evaluation Findings

Device	Heuristic Violations	Maximum Severity Rating
Pump A	28	4
Pump B	17	4
Pump C	3	4
Pump D	2	4

Pump A

Heuristic Violations	Example
28	<ul style="list-style-type: none">• Tube loading problems• No review capability before starting the epidural pump• Event logs and pump history are erased when a “new patient” is selected

Heuristic Evaluation Findings

Device	Heuristic Violations	Maximum Severity Rating
Pump A	28	4
Pump B	17	4
Pump C	3	4
Pump D	2	4

Usability Evaluation

- Effectiveness
 - Percentage of task completion
 - Ratio of success to failures
- Efficiency
 - Time to complete a task
 - Time to learn
 - Percent or number of errors
- User Satisfaction
 - Functions and features
 - Number of times expressed of frustration or dissatisfaction

Pump C: User Comments

“In an effort to make the pump safe and secure, I think user-friendliness got left behind :-)”

“Cassette difficult to mount”

“Too many buttons. Difficult to remember what function is under what button”

“I hate air alarms. Too many alarms for this pump. The pump alarms when you put a code in!!”

“Pump is not very intuitive”

Clinical Evaluation

- Vancouver General Hospital and St. Paul's sites
- 31 question survey with 7-point Likert Scale

Final Results	Pump C	Pump D
Average Score	4.36 out of 6.00	5.59 out of 6.0
Percentage	72.7%	93.2%



RFP – Requirements

- ✓ Determine whether or not the manufacturer conducted human factors/usability testing of the device in question **during** product development
 - AAMI Standard HE:48:1993
 - ANSI/AAMI Standard HE 74:2001

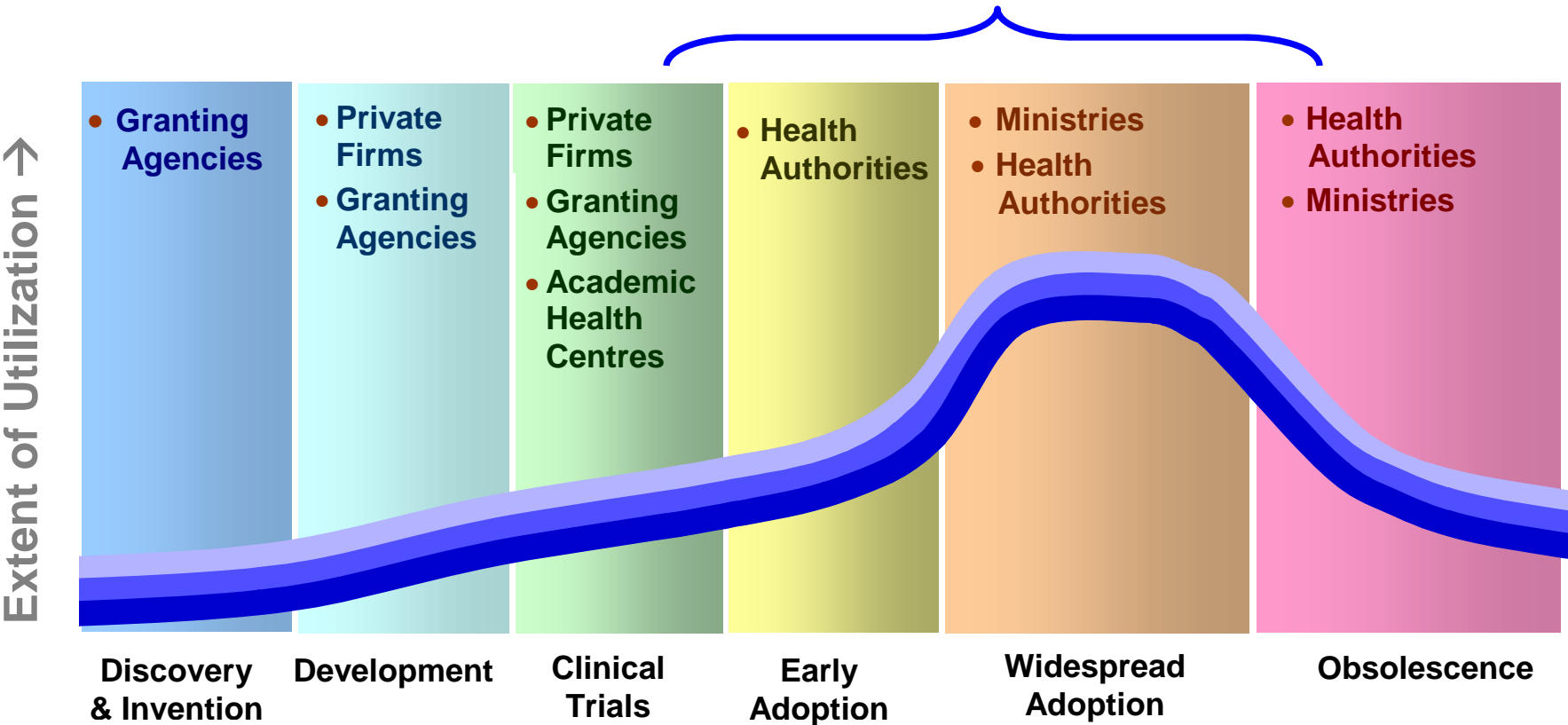
Conclusions

- Proactive about safety rather than reacting to harm
- Provide tools and criteria to analyze potential adoption of new technologies for user interaction and performance

What should we ask of our HTA policies?

1. Control spending
2. Maximize value
(quality, health outcomes, value)
3. Support equity
4. Don't choke innovation

Health Technology is Assessed Throughout its Lifecycle



Technology Needs at VCH: Costs

- Annual funding 08/09: \$2.4 billion
- Needed to sustain equipment base: \$47 million
- Medical capital equipment requested: \$27 million
- Allocated for major medical capital: \$ 3 million