



# Comparative Evaluation of Non-Mercury Thermometers in a Hospital Setting in Lebanon

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Quality

Value = 

Cost



# Healthcare Environmental Cost

“Mercury is one of the top 10 chemicals of major public health concern and is a substance which disperses into and remains in ecosystems for generations, causing severe ill health and intellectual impairment to exposed populations.”

WHO Director-General Dr Margaret Chan



# Mercury in Healthcare

- **Mercury release (31kg/year)**
- Emission factor of 2.8 grams of mercury per bed per year (UNDP, August 2007)

United Nations Development Programme (August, 2007). UNDP project document: Government of Argentina, India, Latvia, Lebanon, Philippines, Senegal, Kingdom of Tanzania and Vietnam. Retrieved on November 20, 2010 from <http://gefmedwaste.org/downloads/ProDoc.pdf>



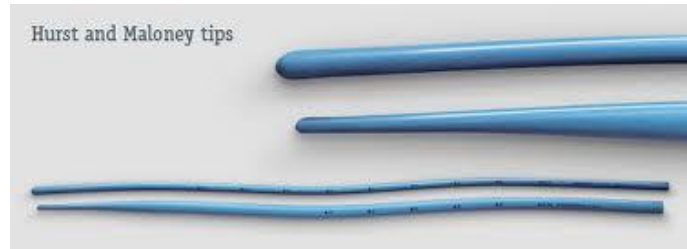
# International initiatives

- WHO Policy on Mercury in Health Care (August 2005)
- Health Care Without Harm





# Alternatives





# Literature

- incomprehensive and inconclusive
- difficult for meta-analysis because studies target different patient populations and utilize a variety of devices



# Research Methods

- Market survey
- Comparative costing
- Clinical comparison





# Market survey

- Ten vendors were identified and contacted
- Brands available
  - 10 compact electronic
  - one electronic
  - 5 infrared tympanic
  - 3 infrared temporal
  - one Galinstan-in-glass





# Comparative costing

Types of costs included in the analysis are:

Cost type	Examples	Sources of data
thermometer costs	Thermometer, accessories	Vendor's quotations
disposable supply costs	Batteries, Alcohol swabs, Probe covers	Hospital data
personnel costs	Nurses' time	User manual
equipment service costs	medical engineer time, Maintenance, Calibration	Personal experience



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Total cost at year ten	98,099	158,749	308,722	342,140	543,050



# Selection

- Electronic

Suretemp Plus 690  
(Welch Allyn – USA)





# Selection

- Compact Electronic  
10 brands

Peak temperature alarm

Flexible probe tip

Memory function

Fever warning

Start-up self-check

Meet standards

MT 200 (Microlife, Switzerland)







# Clinical evaluation

- 150 readings from five clinical departments (30 each)
- Measurement sites included oral cavity (40 %), axilla (40%), and rectum (20%)
- 62% of readings were taken on female patients



# Clinical evaluation

	Total sample	Oral	Axillary	Rectal
<b>Sample Size (readings)</b>	<b>150</b>	60	60	30
<b>Mean difference of readings (SD)</b>	<b>0.45 (0.49)</b>	0.2 (0.35)	0.775 (0.47)	0.31 (0.41)
<b>Range of difference of readings</b>	<b>-0.7 to +2.2</b>	-0.7 to +1.4	0 to +2.2	-0.4 to +1.3
<b>95% confidence interval</b>	<b>0.37-0.53</b>	0.11-0.29	0.65-0.89	0.15-0.46
<b>t-test</b>	<b>11.27</b>	4.46	12.64	4.11
<b>P value</b>	<b>&lt; 0.001</b>	< 0.001	< 0.001	< 0.001
<b>Correlation coefficient (Pearson R)</b>	<b>0.64</b>	0.7	0.65	0.81

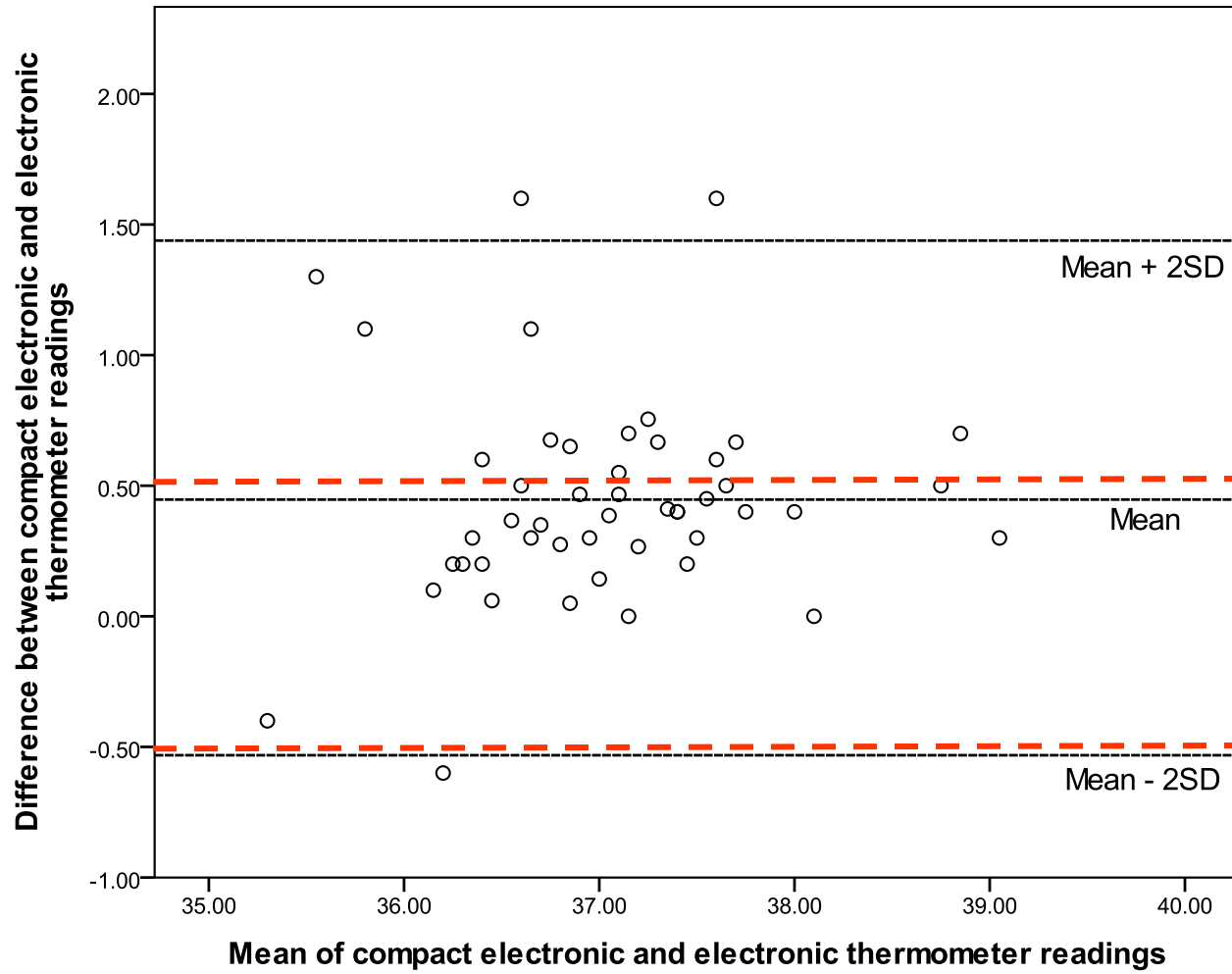


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**Figure 1: Bland-Altman Plot of Difference for the Whole Sample**





# Recommendations

- Electronic thermometers are the most cost-effective type of thermometers in the Lebanese setting.
- Compact electronic thermometers cannot replace electronic thermometers from the accuracy point of view.
- **The Electronic thermometer is the recommended replacement for the mercury thermometer in Lebanon.**



# Limitations

- The study was done in a rural governmental hospital that may differ from other Lebanese healthcare institutions in various ways.
- the clinical evaluation of the thermometers regarding accuracy lacked a standard reference thermometer which might impact the validity of the comparison.



## Two Additional Resources

- **GUIDANCE ON TECHNICAL SPECIFICATIONS FOR NON-MERCURY MEDICAL DEVICES (2010)**

UNDP GEF Project

Available from: [www.gefmedwaste.org](http://www.gefmedwaste.org)

- **GUIDE TO ALTERNATIVES FOR HEALTHCARE PERSONNEL: KEEPING HEALTH CARE MERCURY FREE (2007)**

Health Care Without Harm – Southeast Asia  
Available from :

[http://www.noharm.org/lib/downloads/mercury/Mercury-Free Guide to Alternatives.pdf](http://www.noharm.org/lib/downloads/mercury/Mercury-Free%20Guide%20to%20Alternatives.pdf)

