4G Health- The Long Term Evolution of m-health

Robert S. H. Istepanian

Professor of Data Communications, Kingston University, London

Mobile Information and Network Technologies Research Centre
Faculty of Computing, Information Systems and Mathematics
Kingston University, London, UK
E-mail: r.istepanian@kingston.ac.uk

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Summary

- 4G Technologies
- LTE v/s WiMAX
- Evolution of m-health and defining ‘4G – Health’
- Diabetes in the Middle East.
- M-health for Diabetes Management and clinical trials
- Potential of m-health for Diabetes in the middle East
- Future trends
In 20th Century the invention of the ‘Radio’ or wireless made a major paradigm shift in healthcare.
4G Technologies and Future Networks

The two main candidates of the 4G Systems are:

- WIMAX Technology based on the IEEE802.16 standards
- The Third Generation Partnership Project’s (3GPP) Long Term Evolution (LTE)

These to be most likely to be endorsed by the ITU-R and IMT – Advanced systems

On the 8th of January the Global Certification Forum announced that it is on course to deliver a complete LTE device certification scheme before the end of 2010.
4G Technologies and Future Networks

IMT – Advanced specifies among other parameters:

- All IP packet switching
- Peak download data throughputs of at least 1Gbit/s (low mobility) and 100 Mbits/s (high mobility)
- The use of OFDM digital modulation

Neither WiMAX nor LTE support today these throughputs.

However, although both technologies have somewhat different designs, there are many concepts, features to meet common requirements and expectations in both:

For example:

1- **Physical layer**: Both systems use OFDMA with MIMO configuration and fast link adaptation
2- **MAC layer**: Both systems support multicarrier operation and heterogeneous networks of cells (macro, femto and relay nodes) for supporting wide range of applications and mobility challenges, traffic management
<table>
<thead>
<tr>
<th></th>
<th>HSPA</th>
<th>mWiMAX</th>
<th>LTE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Peak Data Rate</strong></td>
<td>Useful: 10.8 / 4.3 Mbps</td>
<td>Useful: 42 / 14 Mbps</td>
<td>Useful: 75 / 37.5 Mbps</td>
</tr>
<tr>
<td><strong>Spectral Efficiency</strong></td>
<td>Useful: 2.16 / 0.86 bps/Hz</td>
<td>Useful: 3.15 / 2.1 bps/Hz</td>
<td>Useful: 3.75 / 1.88 bps/Hz</td>
</tr>
</tbody>
</table>
| **VoIP Performance**           | • 12 concurrent users/cell/MHz**  
• 430 km/h with guaranteed QoS* | • 16 concurrent users/cell/MHz**  
• Focus on nomadic mobility, also vehicular speeds up to 120 km/h | • 24 concurrent users/cell/MHz**  
• 350 km/h target speed |

Source: *Huawei Technologies, **PA Consulting
## 4G: LTE v/s WIMAX

<table>
<thead>
<tr>
<th></th>
<th>HSPA</th>
<th>mWiMAX</th>
<th>LTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>🕍</td>
<td>🕍</td>
<td>🕍</td>
</tr>
<tr>
<td>Coverage</td>
<td>🕍</td>
<td>🕍</td>
<td>🕍</td>
</tr>
<tr>
<td>Complexity</td>
<td>🕍</td>
<td>🕍</td>
<td>🕍</td>
</tr>
<tr>
<td>Cost</td>
<td>🕍</td>
<td>🕍</td>
<td>🕍</td>
</tr>
</tbody>
</table>

Source: *Huawei Technologies, **PA Consulting
Push/ Pull of Telecom industry v/s healthcare trends

Shift to home care demands

- Quality of life
- Home care
- Residential care
- Acute care

Mobility in Healthcare

- Work flow Optimisation
- Improved clinical outcomes
- Cost

Wireless and IP based Infrastructure Growth

Advances in mobile and medical Devices
Global Diabetes and Obesity

It takes 10-12 years for the HbA1C in the body to become or start becoming higher than the normal levels.
Guest Editorial
Special Issue on Mobile Telemedicine and Telehealth Systems

Design of a Telemedicine System Using a Mobile Telephone

B. Woodward, Member, IEEE, R. S. H. Istepanian, and C. I. Richards

Abstract—This paper describes the design of a prototype integrated mobile telemedicine system that is compatible with existing mobile telecommunications networks and upgradable for use with third-generation networks. The system, when fully developed, will enable a doctor to monitor remotely a patient who is free to move around for sports medicine and for emergency situations.

Emerging Mobile Communication Technologies for Health: Some Imperative notes on m-health

Robert S. H. Istepanian¹ and Jose C. Lacal²
¹Mobile Information & Network Technologies Research Center; Kingston University (UK)
²Tele-Health Solutions; Motorola / iDEN Subscriber Group (USA)
m-Health Defined

Mobile Health Care (m-Health)

Emerging Mobile Communications 'Network and Sensor Technologies For Healthcare Systems and Applications'


Guest Editorial

Introduction to the Special Section on M-Health: Beyond Seamless Mobility and Global Wireless Health-Care Connectivity
Mobile HealthCare (M-Health)

M-health

- Wearable and Sensors (BAN, PANs etc.)
- Computing and Internet Technologies
- Information and Communication Systems

Istepanian et al. 2004
Long Term m-health Evolution

Some Interesting ‘Google’ Statistics:

Google Search - April 2010:
• ‘m-health’ > 212,000,000 Hits
• ‘wireless healthcare’ > 5,830,000 Hits
• ‘mobile Diabetes Management’ > 1,910,000 Hits
  • Personalised healthcare > 4,870,000 Hits

Opportunities in the global mobile healthcare market are estimated to be worth between $50bn and $60bn in 2010

Source: McKinsey & Company-2010
Examples of global m-health Industry

O2 debuts mHealth division
O2 looks to develop opportunities in healthcare sector with new mHealth unit

Source: Mobile News

Qualcomm, AT&T Move in on 'M-Health'
The smartphone boom has tech giants and health-care companies eyeing demand for wireless gadgets and software that can deliver health services

Source: Bloomberg Businessweek

MOBILE CLINICAL ASSISTANT

What is it?
Nurses and physicians need better access to patient information at the point of decision to provide quality care more efficiently. The Intel® Mobile Clinical Assistant (MCA) reference architecture was designed in collaboration with healthcare professionals to better access up-to-date patient care records at the point of care and to enable documentation of a patient’s condition in real time. The MCA is built for the rigors of the clinical environment and with appropriate software the MCA helps to reduce transcription and medication administration errors, enhance clinician workflows, and enable more informed decisions at the point of care.

Source: Intel
4G Health - The Long Term Evolution of m-health

Interim Definition:

‘The evolution of m-health towards targeted personalised medical systems with adaptable functionalities and compatibility with the future 4G networks’

CALL FOR PAPERS: Special Issue on

4G Health
The Long Term Evolution of m-Health
Etisalat brings mHealth to UAE
(http://www.mhealthupdate.com/?p=1376)

By
Mark
– October 19, 2010


UAE-based telecoms provider Etisalat (http://www.etisalat.ae/) unveiled a new mobile health service at GITEX 2010 (http://www.gitex.com/) in Dubai this week. The service will use mobile technology to provide users with personalised and relevant health information via their mobile devices.
Diabetes prevalence in the Middle East is among the highest in the world.

Prevalence in Diabetes in Middle East 2010-2030

<table>
<thead>
<tr>
<th>Middle-East Crescent</th>
<th>Prevalence (%)</th>
<th>Numbers of adults with diabetes (000s)</th>
<th>Mean annual increment (000s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>World population</td>
<td>National population</td>
<td>2010</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>8.6</td>
<td>9.9</td>
<td>6.6</td>
</tr>
<tr>
<td>Algeria</td>
<td>8.5</td>
<td>9.4</td>
<td>7.4</td>
</tr>
<tr>
<td>Egypt</td>
<td>11.4</td>
<td>13.7</td>
<td>10.4</td>
</tr>
<tr>
<td>Iran (Islamic Rep. of)</td>
<td>8.0</td>
<td>9.8</td>
<td>6.1</td>
</tr>
<tr>
<td>Iraq</td>
<td>10.2</td>
<td>12.0</td>
<td>7.8</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>5.8</td>
<td>7.0</td>
<td>5.6</td>
</tr>
<tr>
<td>Morocco</td>
<td>8.3</td>
<td>9.8</td>
<td>7.6</td>
</tr>
<tr>
<td>Pakistan</td>
<td>9.1</td>
<td>10.5</td>
<td>7.6</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>16.8</td>
<td>18.9</td>
<td>13.6</td>
</tr>
<tr>
<td>Sudan</td>
<td>4.2</td>
<td>5.2</td>
<td>3.3</td>
</tr>
<tr>
<td>Syrian Arab Republic</td>
<td>10.8</td>
<td>13.2</td>
<td>8.3</td>
</tr>
</tbody>
</table>

# Diabetes Expenditure and Prevalence 2010-2030

**US dollars (USD)**

<table>
<thead>
<tr>
<th>Middle-East Crescent</th>
<th>US dollars</th>
<th>% of health expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afghanistan</td>
<td>28,625.01</td>
<td>63,098.11</td>
</tr>
<tr>
<td>Algeria</td>
<td>264,177.99</td>
<td>738,362.75</td>
</tr>
<tr>
<td>Egypt</td>
<td>557,078.45</td>
<td>1,992,626.78</td>
</tr>
<tr>
<td>Iran, Islamic Republic of Iraq</td>
<td>1,048,047.21</td>
<td>3,346,829.99</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>124,544.95</td>
<td>457,842.36</td>
</tr>
<tr>
<td>Morocco</td>
<td>206,626.45</td>
<td>1,038,738.60</td>
</tr>
<tr>
<td>Pakistan</td>
<td>172,512.83</td>
<td>958,887.74</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>1,409,561.98</td>
<td>2,858,242.41</td>
</tr>
<tr>
<td>Sudan</td>
<td>34,794.99</td>
<td>117,505.35</td>
</tr>
<tr>
<td>Syrian Arab Republic</td>
<td>100,497.58</td>
<td>310,268.30</td>
</tr>
<tr>
<td>Tunisia</td>
<td>138,376.55</td>
<td>719,697.41</td>
</tr>
</tbody>
</table>

**% of health expenditure**

<table>
<thead>
<tr>
<th>Middle-East Crescent</th>
<th>% of health expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afghanistan</td>
<td>11%</td>
</tr>
<tr>
<td>Algeria</td>
<td>11%</td>
</tr>
<tr>
<td>Egypt</td>
<td>16%</td>
</tr>
<tr>
<td>Iran, Islamic Republic of Iraq</td>
<td>11%</td>
</tr>
<tr>
<td>Iraq</td>
<td>13%</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>8%</td>
</tr>
<tr>
<td>Morocco</td>
<td>12%</td>
</tr>
<tr>
<td>Pakistan</td>
<td>12%</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>21%</td>
</tr>
<tr>
<td>Sudan</td>
<td>6%</td>
</tr>
<tr>
<td>Syrian Arab Republic</td>
<td>14%</td>
</tr>
<tr>
<td>Tunisia</td>
<td>12%</td>
</tr>
</tbody>
</table>

**Health expenditure for diabetes in 2010 ('000)**

<table>
<thead>
<tr>
<th>Middle-East Crescent</th>
<th>Health expenditure ('000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afghanistan</td>
<td>248,800.70</td>
</tr>
<tr>
<td>Algeria</td>
<td>257,505.10</td>
</tr>
<tr>
<td>Egypt</td>
<td>598,984.55</td>
</tr>
<tr>
<td>Iran, Islamic Republic of Iraq</td>
<td>2,739,415.91</td>
</tr>
<tr>
<td>Iraq</td>
<td>2,246,478.24</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>2,211,440.09</td>
</tr>
<tr>
<td>Morocco</td>
<td>598,984.55</td>
</tr>
<tr>
<td>Pakistan</td>
<td>1,793,415.91</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>1,812,257.88</td>
</tr>
<tr>
<td>Sudan</td>
<td>1,702,577.88</td>
</tr>
<tr>
<td>Syrian Arab Republic</td>
<td>310,268.30</td>
</tr>
<tr>
<td>Tunisia</td>
<td>417,757.05</td>
</tr>
</tbody>
</table>

**Health expenditure for diabetes in 2030 ('000)**

<table>
<thead>
<tr>
<th>Middle-East Crescent</th>
<th>Health expenditure ('000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afghanistan</td>
<td>571,170.69</td>
</tr>
<tr>
<td>Algeria</td>
<td>461,074.27</td>
</tr>
<tr>
<td>Egypt</td>
<td>993,584.17</td>
</tr>
<tr>
<td>Iran, Islamic Republic of Iraq</td>
<td>2,186,953.76</td>
</tr>
<tr>
<td>Iraq</td>
<td>251,459.85</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>421,711.11</td>
</tr>
<tr>
<td>Morocco</td>
<td>323,799.57</td>
</tr>
<tr>
<td>Pakistan</td>
<td>623,753.16</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>3,827,378.56</td>
</tr>
<tr>
<td>Sudan</td>
<td>554,064.07</td>
</tr>
<tr>
<td>Syrian Arab Republic</td>
<td>929,193.97</td>
</tr>
<tr>
<td>Tunisia</td>
<td>740,992.48</td>
</tr>
</tbody>
</table>

**REF:** Zhang, P. Etal. : Diabetes Res. And Clin. Pract., 87,2010
The healthcare continuum and the middle east

There is urgent need on the use of innovative technologies to alleviate the Healthcare burdens of chronic diseases in the ME region.
3G-based m-health Diabetes Management System

Ref: Istepanian et al., JTT, 15, 3 2009
# Effectiveness of Diabetes Management using Cellular Phone Technologies

<table>
<thead>
<tr>
<th>Author/ year</th>
<th>Study design</th>
<th>Sample age</th>
<th>Duration in months</th>
<th>Clinical area</th>
<th>Control</th>
<th>Intervention</th>
<th>Measures</th>
<th>Results C vs I or pre–post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benhamou, <em>et al.</em>, 2007</td>
<td>RCT, crossover</td>
<td>30, 41.3 years</td>
<td>12</td>
<td>Type 1 diabetes</td>
<td>No weekly SMS support</td>
<td>Weekly clinical support via SMS</td>
<td>HbA1c, SMBG, QOL score, Satisfaction with life, Hypoglycemic episodes, No. of BG tests/day</td>
<td>+0.12 vs -0.14%, <em>P</em> &lt; 0.10, +5 vs -6 mg/dl, <em>P</em> = 0.06, 0.0 vs +5.6, <em>P</em> &lt; 0.05, -0.01 vs +8.1, <em>P</em> &lt; 0.05, 79.1 vs 69.1/patient, NS, -0.16 vs -0.11/day, NS</td>
</tr>
<tr>
<td>Hurling, <em>et al.</em>, 2007</td>
<td>RCT</td>
<td>77, 40.4 years</td>
<td>4</td>
<td>Healthy</td>
<td>Verbal advice, during clinic visit, no phone support</td>
<td>Cell phone support, i.e., exercise plan, PA charts, reminders, tailored advice</td>
<td>Change in: PA overall, MET min/week, PA leisure time, MET min/week, Hours sitting: overall, Hours sitting: weekday, Hours sitting: weekends, Accelerometer epochs, BMI, Lost % body fat, BP, diastolic, BP, systolic, Perceived control, Intention to exercise, Internal control, External control</td>
<td>4.0 vs 12, NS, -5.5 vs 4.1, <em>P</em> &lt; 0.05, -0.17 vs -2.18, <em>P</em> &lt; 0.05, 1.4 vs -5.9, <em>P</em> &lt; 0.05, -0.2 vs -5.2, NS, 208.7 vs 218.5, <em>P</em> &lt; 0.05, 0.10 vs -0.24, NS, -0.17% vs -2.18%, <em>P</em> &lt; 0.05, 0.73 vs 0.69, NS, 0.41 vs 0.13, NS, -0.37 vs 0.57, <em>P</em> &lt; 0.01, -0.01 vs 0.45, <em>P</em> &lt; 0.01, 5.85 vs 7.24, <em>P</em> &lt; 0.001, 5.33 vs 6.38, <em>P</em> &lt; 0.01</td>
</tr>
<tr>
<td>Kim, 2007</td>
<td>RCT</td>
<td>51, 47 years</td>
<td>3</td>
<td>Type 2 diabetes</td>
<td>Standard care during clinic visit</td>
<td>Weekly BG-based optimal recommendations via SMS</td>
<td>Group 1: &lt;7%, pre–post: HbA1c, FPG levels mg/dl, 2HPMG, Group 2: ≥7%: HbA1c, FPG levels mg/dl, 2HPMG</td>
<td>0.53 NS vs -0.21, <em>P</em> &lt; 0.05, -5.8 NS vs -13.4, <em>P</em> &lt; 0.05, -3.1 NS vs -56.0, <em>P</em> &lt; 0.05, 0.22 NS vs -2.15, <em>P</em> &lt; 0.05, 14.5 NS vs -3.3 NS, 24.8, NS vs -115.2, NS</td>
</tr>
</tbody>
</table>

REF: Krishna *et al.*, J. Diabetes Science and Technology, 2,3, 2008
<table>
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<tr>
<th>Author/ year</th>
<th>Study design</th>
<th>Sample , age</th>
<th>Duration in months</th>
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<th>Intervention</th>
<th>Measures</th>
<th>Results C vs I or pre–post</th>
</tr>
</thead>
</table>
| Kim, 2007   | RCT          | 51, 47 years | 3, 6, 12          | Type 2 diabetes          | Usual care and support          | Weekly patient input of SMBG, medication details, diet, and exercise and optimal advice from a nurse via SMS or the Internet | 3 months: HbA1c  
FPG levels mg/dl  
2HPMG  
6 months: HbA1c  
FPG levels mg/dl  
2HPMG  
9 months: HbA1c  
FPG levels mg/dl  
2HPMG  
12 months: HbA1c  
FPG levels mg/dl  
2HPMG  
3-, 6-, 9-, 12-month change in: total cholesterol  
triglycerides  
HDL | 0.07 vs -1.15%, $P < 0.05$  
5.4 vs -8.0, NS  
14.7 vs -85.1 mg/dl, $P < 0.05$  
0.11 vs -1.05%, $P < 0.05$  
7.3 vs -5.8, NS  
13.8 vs -63.6 mg/dl, $P < 0.05$  
0.33 vs -1.31, $P < 0.05$  
12.2 vs -10.5, NS  
-17.4 vs -66.8, $P < 0.05$  
0.81 vs -1.32, $P < 0.05$  
27.7 vs -10.7, NS  
18.1 vs -100, $P < 0.05$ |
| Kim and Jeong, 2007 | RCT          | 51, 47 years | 3, 6, 12          | Type 2 diabetes          | Usual care and support          | Weekly patient input of SMBG, medication details, diet, and exercise and optimal advice from a nurse via SMS or the Internet | 3 months: HbA1c  
FPG levels mg/dl  
2HPMG  
6 months: HbA1c  
FPG levels mg/dl  
2HPMG  
9 months: HbA1c  
FPG levels mg/dl  
2HPMG  
12 months: HbA1c  
FPG levels mg/dl  
2HPMG  
3-, 6-, 9-, 12-month change in: total cholesterol  
triglycerides  
HDL | 0.07 vs -1.15%, $P < 0.05$  
5.4 vs -8.0, NS  
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0.11 vs -1.05%, $P < 0.05$  
7.3 vs -5.8, NS  
13.8 vs -63.6 mg/dl, $P < 0.05$  
0.33 vs -1.31, $P < 0.05$  
12.2 vs -10.5, NS  
-17.4 vs -66.8, $P < 0.05$  
0.81 vs -1.32, $P < 0.05$  
27.7 vs -10.7, NS  
18.1 vs -100, $P < 0.05$ |
| Yoon and Kim, 2007 | RCT          | 51, 47 years | 3, 6, 12          | Type 2 diabetes          | Usual care and support          | Weekly patient input of SMBG, medication details, diet, and exercise and optimal advice from a nurse via SMS or the Internet | 3 months: HbA1c  
FPG levels mg/dl  
2HPMG  
6 months: HbA1c  
FPG levels mg/dl  
2HPMG  
9 months: HbA1c  
FPG levels mg/dl  
2HPMG  
12 months: HbA1c  
FPG levels mg/dl  
2HPMG  
3-, 6-, 9-, 12-month change in: total cholesterol  
triglycerides  
HDL | 0.07 vs -1.15%, $P < 0.05$  
5.4 vs -8.0, NS  
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12.2 vs -10.5, NS  
-17.4 vs -66.8, $P < 0.05$  
0.81 vs -1.32, $P < 0.05$  
27.7 vs -10.7, NS  
18.1 vs -100, $P < 0.05$ |
| Franklin , et al., 2006 | RCT          | 92, 8–18 years | 12               | Type 1 diabetes          | CIT- Grp1                        | CIT+ST - Grp2, IIT+ST- Grp3 | HbA1c  
Self-efficacy  
Adherence | 10.3 vs 10.1 vs 9.2%, $P < 0.01$  
56.0 vs 62.1, $P < 0.01$  
70.4 vs 77.2, $P < 0.05$ |
| Rami et al., 2006 | RCT          | 36, 15.3 years | 6,3-month cross-over | Type 1 diabetes          | Conventional support and paper diary | Monitoring and support by SMS | HbA1c change 3 months  
HbA1c change 6 months | +1.0 vs -0.15  
+0.15 vs -0.05 |
| Kim et al., 2006 | Pre–post     | 45, 43.5 years | 3                | Type 2 diabetes          | N/A                              | Educational messages | HbA1c  
Diabetic diet  
Exercise  
Medication  
Foot care | -1.1%, $P < 0.01$  
-0.8, days/week, NS  
0.9 days/week, $P < 0.05$  
1.1 days/week, $P < 0.05$  
1.1 days/week, $P < 0.05$ |
Summary of the cellular phone for Diabetes Management

• 18 Studies of the use of cellular phone for Diabetes and Obesity Management.

• 9 out of 10 studies reporting on the HbA1c reported significant improvement among patients receiving education and care support.

• Text messaging provided improved clinically outcomes and increase self management behaviour and self-efficacy.

REF: Krishna etc., J. Diabetes Science and Technology, 2,3, 2008
Examples of UK Clinical Studies on m-health Diabetes

Evaluation of a mobile phone telemonitoring system for glycaemic control in patients with diabetes

Robert SH Istepanian*, Karima Zitouni*, Diane Harry†, Niva Moutosammy†, Ala Sengoor*, Bee Tang* and Kenneth A Earle†

*Mobile Information and Network Technologies Centre, Kingston University, London; †St George’s Hospital NHS Trust, London, UK

Journal of Telemedicine and Telecare Volume 15 Number 3 2009

Mobile Telemonitoring for Achieving Tighter Targets of Blood Pressure Control in Patients with Complicated Diabetes: A Pilot Study

Kenneth A. Earle, M.D.,1,2 Robert S.H. Istepanian, Ph.D.,3 Karima Zitouni, Ph.D.,1,2 Ala Sengoor, Ph.D.,3 and Bee Tang, M.B.A.3

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**Clinical Results:** Baseline demographic, clinical and biochemical data of patients with diabetes randomised to the telemonitoring (TM) intervention or usual care (UC) control group.

<table>
<thead>
<tr>
<th></th>
<th>TM</th>
<th>UC</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>N (Total=137)</em></td>
<td>72</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>59.6 (12.0)</td>
<td>57.1 (13.0)</td>
<td>0.25</td>
</tr>
<tr>
<td>Duration of diabetes</td>
<td>13.3 (8.6)</td>
<td>11.7 (8.0)</td>
<td>0.27</td>
</tr>
<tr>
<td>Type 1 diabetes <em>n (%)</em></td>
<td>6 (8)</td>
<td>5 (8)</td>
<td>0.85</td>
</tr>
<tr>
<td>Type 2 diabetes <em>n (%)</em></td>
<td>66 (92)</td>
<td>60 (92)</td>
<td></td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>79.7 (17.9)</td>
<td>80.1 (20.1)</td>
<td>0.91</td>
</tr>
<tr>
<td>Ethnic group _n (%) :-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>26 (36)</td>
<td>21 (32)</td>
<td>0.79</td>
</tr>
<tr>
<td>African-Caribbean</td>
<td>24 (33)</td>
<td>18 (28)</td>
<td></td>
</tr>
<tr>
<td>Indo-Asian</td>
<td>21 (29)</td>
<td>21 (32)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1 (1)</td>
<td>5 (7)</td>
<td></td>
</tr>
<tr>
<td><strong>HbA1c (%)</strong></td>
<td>7.9 (1.5)</td>
<td>8.1 (1.6)</td>
<td>0.40</td>
</tr>
<tr>
<td><strong>Total cholesterol (mmol/l)</strong></td>
<td>4.3 (1.1)</td>
<td>4.4 (1.2)</td>
<td>0.76</td>
</tr>
<tr>
<td><strong>Total triglycerides (mmol/l)</strong></td>
<td>1.5 (0.8)</td>
<td>2.1 (2.7)</td>
<td>0.10</td>
</tr>
<tr>
<td>HD-cholesterol</td>
<td>1.2 (0.4)</td>
<td>1.2 (0.4)</td>
<td>0.81</td>
</tr>
<tr>
<td>LD-cholesterol</td>
<td>2.5 (0.9)</td>
<td>2.5 (0.9)</td>
<td>0.92</td>
</tr>
<tr>
<td>Plasma creatinine (µmol/l)</td>
<td>111.1 (102.1)</td>
<td>93.0 (43.1)</td>
<td>0.21</td>
</tr>
<tr>
<td>Systolic blood pressure (mmHg)</td>
<td>130.5 (15.1)</td>
<td>131.8 (19.7)</td>
<td>0.67</td>
</tr>
<tr>
<td>Diastolic blood pressure (mmHg)</td>
<td>76.9 (9.4)</td>
<td>76.6 (11.3)</td>
<td>0.82</td>
</tr>
</tbody>
</table>

**REF:** Earle, K., Istepanian, R., et. al., Diabetes Technology and Therapeutics, 12,7, 2010
The mean decrement in SBP

REF: Earle, K., Istepanian, R., et al., Diabetes Technology and Therapeutics, 12, 7, 2010
E-health Technology for Improving Medical Education and Healthcare Research in Iraq

2010-2012

Baghdad University Medical School
Basra University Medical School
There is urgent and major need for m-Health in Iraq

M-health

Modern Mobile Technologies

from ABC News
m-health Issues and challenges in the ME Region

1- Currently most of the likely m-health applications in ME should focus on the ‘Process’ of adopting m-health in the region.

2- Clinical ‘buy in’ is critical and the technology is the enabler not the solution.

3- Define the clinical priorities and Iraqi patients population needs.

4- Engage the governments in the region to educate them on the benefits of the m-health sector for the economy and for the perspective national healthcare systems.

5- Engage the also understand and define the relevant stake holders roles, Teleco operators and interested private sector players.

6- Pilots in the region need to be based on more on evaluating the impact of m-health for best healthcare outcomes and less on user (patients doctors, nurses etc.) satisfaction.
Future 4G-health Platforms for Diabetic care

- 4G-Health (Future network Technologies)
- 4G Health Information systems
- Medication Optimization
- Remote Patient Monitoring
- Innovative Assistive Technologies
- Remote Training and Supervision
- Cognitive Fitness and Assessment
- Diabetes Social Networking concepts
Finally!

The length of a film should be directly related to the endurance of the human bladder.

- Alfred Hitchcock
THANK YOU

Robert S. H. Istepanian
r.istepanian@kingston.ac.uk

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