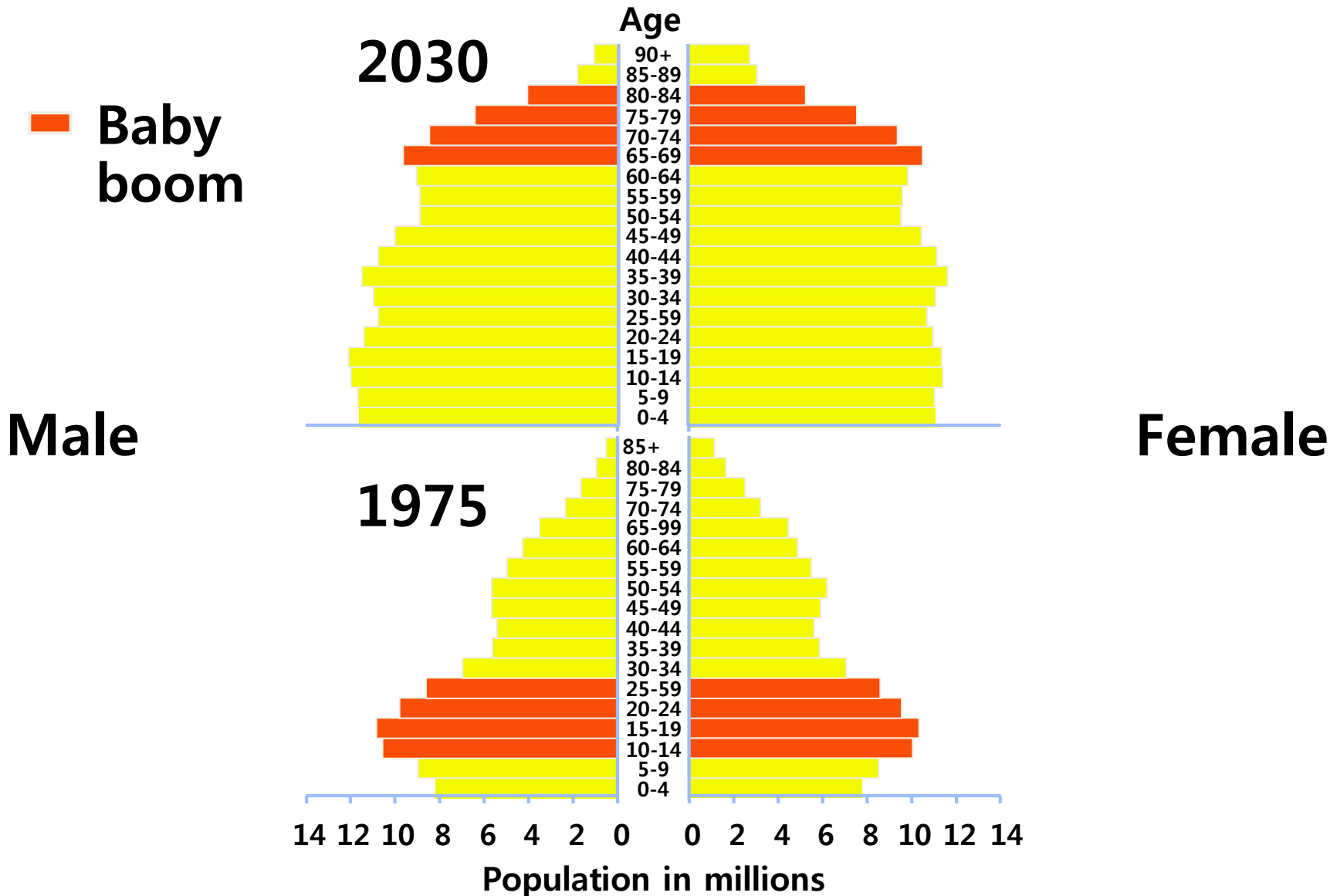


눈앞에 닥친 모바일 헬스케어

성균관대의대 삼성서울병원
박승우

The Graying of the World

Population by Age, Sex, and Development



2018

인구 절벽이 온다

THE DEMOGRAPHIC CLIFF

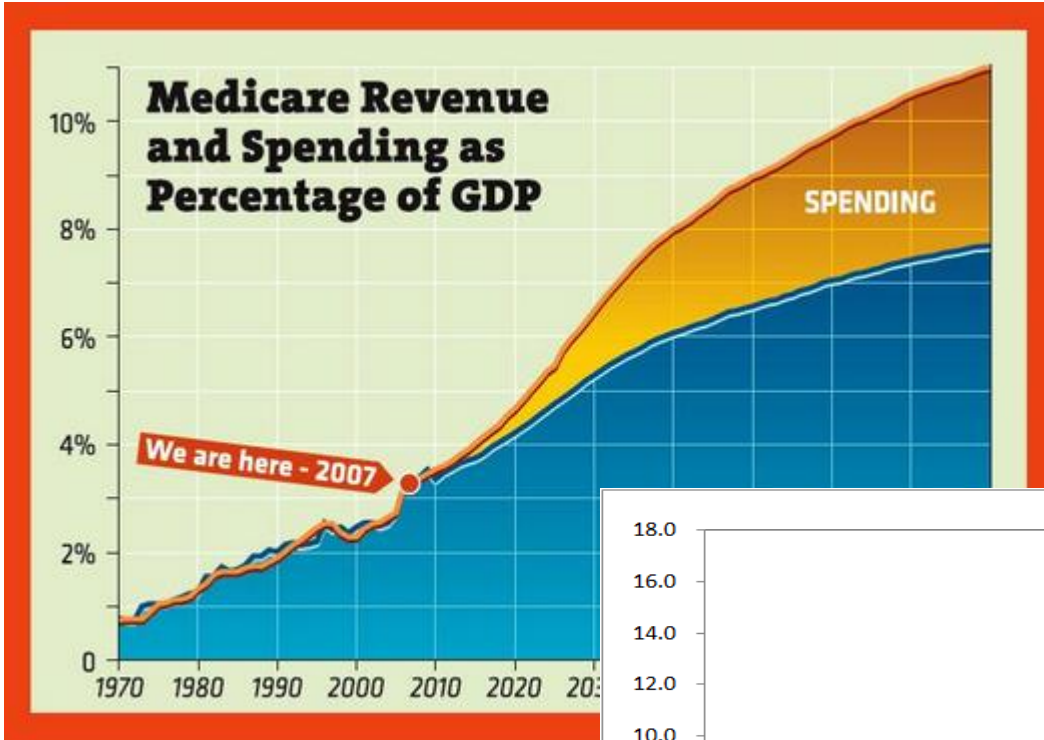
How to Survive and Prosper During the Great Deflation of 2014-2019

소비, 노동, 투자하는 사람들이 사라진 세상

헤리 덴트 지음 | 김민재 옮김

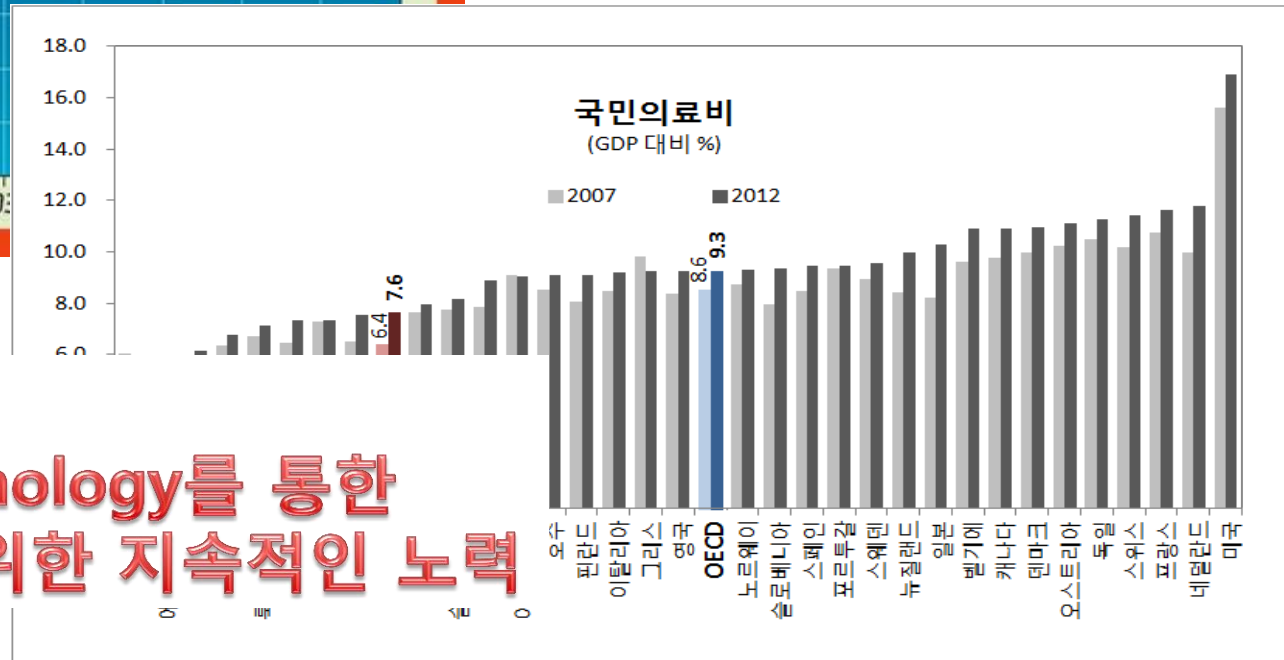
글로벌 베스트셀러 (2013-2014 세계경제의 미래) 저자 헤리 덴트의
인구통계학과 기술 트렌드로 내다본 우리의 미래상

Cost Reduction



미국

Medicare 소비 예측



Information Technology를 통한
의료 비용 감소를 위한 지속적인 노력



Project Managers

Innovators

Computer Programmers

Anthropologists

Scientists

Nurses

Analysts

Attorneys

Volunteers

Bioethicists

Administrators

Coordinators

Physicians

Marketers

Administrative Assistants

Designers

Engineers

Core Value in Healthcare IT



Streamlines
Workflow
effectively



*Cost
Reduction*



New Drugs and Technologies

Novel Wireless Devices for Cardiac Monitoring

Joseph A. Walsh III, MD, MS; Eric J. Topol, MD; Steven R. Steinhubl, MD

***Circulation.* 2014;130:573-581**

Name	Company	Link	Brief Description
Comprehensive vital sign monitoring			Skin microblush change in capillary filling to measure heart rate and chest movement to measure respiratory rate
VitalSigns Camera	Phillips	http://www.vitalsignscamera.com/index.html	
Scout	Scanadu	http://www.scanadu.com/	Measures temperature, pulse, oximetry, ECG, heart rate variability, and pulse wave transit time
BioPatch	Zephyr	http://www.zephyranywhere.com/healthcare/biopatch/	Adhesive patch transmits wirelessly pulse, R-R interval, respiratory rate, activity, respirations, ECG, position, and posture
Hexoskin	Hexoskin Wearable Body Metrics	http://www.hexoskin.com/en?utm_campaign=Listly&utm_medium=list&utm_source=listly	Shirt measures heart rate, heart rate variability, respiratory rate and volume, and activity; also estimates $\dot{V}O_{2max}$
OMSignal	OMSignal	http://www.omsignal.com/	Washable shirt that monitors 3-lead ECG, respirations, stress, and temperature
Sensor Bra	Microsoft	http://www.cs.rochester.edu/hci/pubs/pdfs/FoodMood.pdf	Sensors built into bra: heart rate, respiration, Electrodermal activity; 3-axis accelerometer; 2-axis gyroscope; designed to track emotions and study emotional eating
Intermittent ECG			
Alivecor System	Alivecor	http://www.alivecor.com/	With application able to analyze and print ECGs as PDFs; ECG data sync between the application and online ECG hub; prescription only
ECG Check	CardiacDesigns	http://cardiacdesigns.com/	With application able to analyze and print ECGs as PDFs; ECG data sync between the application and online ECG hub
EPI Mini (also EPI Life)	EPI Mobile Health Solutions	http://epimhealth.com.sg/	Separate device that transmits ECG to smartphone, which can forward it to a "health concierge" service that can send back a reading; cleared by the US Food and Drug Administration for consumer use
12-Lead ECG	MobilECG	http://mobilecg.hu/	USB-based open-source 12-lead clinical ECG

Name	Company	Link	Brief Description
Prolonged ECG monitoring			
eMotion ECG Mobile	Mega Electronics	http://www.megaemg.com/products/emotion-ecg/	3-Lead ECG data are transmitted from the wearable ECG sensor to a mobile phone via Bluetooth; the phone forwards the data over mobile network to a server, which stores the data; the data can be monitored in real time or a specialist can investigate and analyze the stored ECG data
BodyGuardian Zio XT Patch	Preventice iRhythm	http://www.preventice.com/ http://www.irhythmtech.com/?utm_campaign=Listly&utm_medium=list&utm_source=listly	Patch monitor of ECG, activity, respirations, and body position 14-d continuous cardiac rhythm monitoring with a single adhesive chest wall device; once completed, it is mailed for analysis
NUVANT Mobile Cardiac Telemetry System	Corventis	http://www.corventis.com/	Automatic and patient-triggered 30-d cardiac rhythm monitoring; arrhythmia detection: the device transmits information via a wireless data transmission device, zLink, to the Corventis Monitoring Center
Ambulatory ECG	iHealth	http://ces.cnet.com/8301-35284_1-57616620/at-ces-2014-health-monitors-join-the-wearables-parade/	Sensor attaches to chest and transmits ECG to smartphone
Heart failure			
CoVa necklace VitaLink	Perminova vg-bio	http://www.perminova.com/sensor/ http://www.vgbio.com/vitalink-remote-patient-monitoring/	Measures heart rate, respiratory rate, fluid levels Measures pulse, heart rate variability, transthoracic impedance, and activity via head band and chest strap
AVIVO Mobile Patient Monitoring System	Corventis	http://corventis.com/us/avivo.asp	Monitors thoracic impedance, heart rate, heart rate variability, respiration rate, posture, and heart rhythm with wireless transmission to the Corventis Monitoring Center
Telescale	Cardiocom	http://www.cardiocom.com/telescale.asp	For daily weights with automated verbal/feedback and communication to the patient and provider

Name	Company	Link	Brief Description
Blood pressure			
ViSi Mobile	Sotera Wireless	http://www.visimobile.com	Wireless vital sign monitoring with noninvasive continuous blood pressure monitor
Wireless wrist blood pressure monitor	iHealth	http://www.ihealthlabs.com/wireless-blood-pressure-wrist-monitor-feature_33.htm	Wireless wrist blood pressure measurement and heart rate transmitted to a mobile application
iPhone-connected blood pressure cuff	Withings	http://www.withings.com/bloodpressuremonitor	Plugs into iPhone or iPad and tracks and displays all results; also available in 2014 with Bluetooth connection between the cuff and smartphone
Continuous blood pressure watch	Quanttus	http://www.technologyreview.com/news/524376/this-fitness-wristband-wants-to-play-doctor/	Continuous monitoring of blood pressure, heart rate, and respirations.
BPro radial artery pressure monitor	HealthStats	http://www.healthstats.com	Watch-like device that samples radial artery waveforms via tonometry at regular time intervals over a 24-h period; for assessment of ambulatory blood pressure
Wearable, wireless ambulatory blood pressure monitor	iHealth	http://ces.cnet.com/8301-35284_1-57616620/at-ces-2014-health-monitors-join-the-wearables-parade/	Vest-like device that allows blood pressure to be measured as frequently as every 15 min throughout the day
Ultrasound			
VScan	GE	http://www3.gehealthcare.com/en/Products/Categories/Ultrasound/Vscan	Standalone ultrasound imaging device that can download and transmit images
MobiUS SPI	Mobisante	http://www.mobisante.com/product-overview/	Smartphone-based ultrasound
Terason USmart 3200T	Terason	http://www.terason.com/index.asp	Comprehensive ultrasound
Nanomaxx	Sonosite	http://www.sonosite.com/products/nanomaxx	Standalone ultrasound imaging device that can download and transmit images.

Alivecor real-time monitoring of ECG. Finger contact on the case activates ECG recording of bipolar lead I and is transmitted to the smartphone.



Joseph A. Walsh III et al. Circulation. 2014;130:573-581

Zio Patch, an adhesive ECG patch.



Joseph A. Walsh III et al. Circulation. 2014;130:573-581

A \$10 MILLION COMPETITION TO BRING HEALTHCARE TO THE PALM OF YOUR HAND

Imagine a portable, wireless device in the palm of your hand that monitors and diagnoses your health conditions. That's the technology envisioned by this competition, and it will allow unprecedented access to personal health metrics. The end result: Radical innovation in healthcare that will give individuals far greater choices in when, where, and how they receive care.

[LEARN MORE ABOUT THE COMPETITION >](#)





Scanadu Scout, a wireless vital sign monitor.



Joseph A. Walsh III et al. *Circulation*. 2014;130:573-581

Implantable ECG Sensor



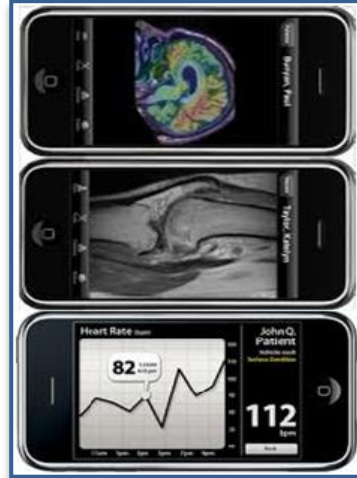
J.-H. Lee, Y.-N. Kim et al., Exp. Clin. Cardio., 2015.

Mobile Health App

- ❖ m-Health App은 B2C형태의 건강관리, 식단관리 등이 중심이었으나 최근 병원의 병원의 의료정보시스템에 연결되어 의료진을 위한 서비스를 제공하는 B2B 형태로 발전



의료교육 / 리서치



진료기록 / 정보 수집



정보공유 / 회진



응급상황 대처

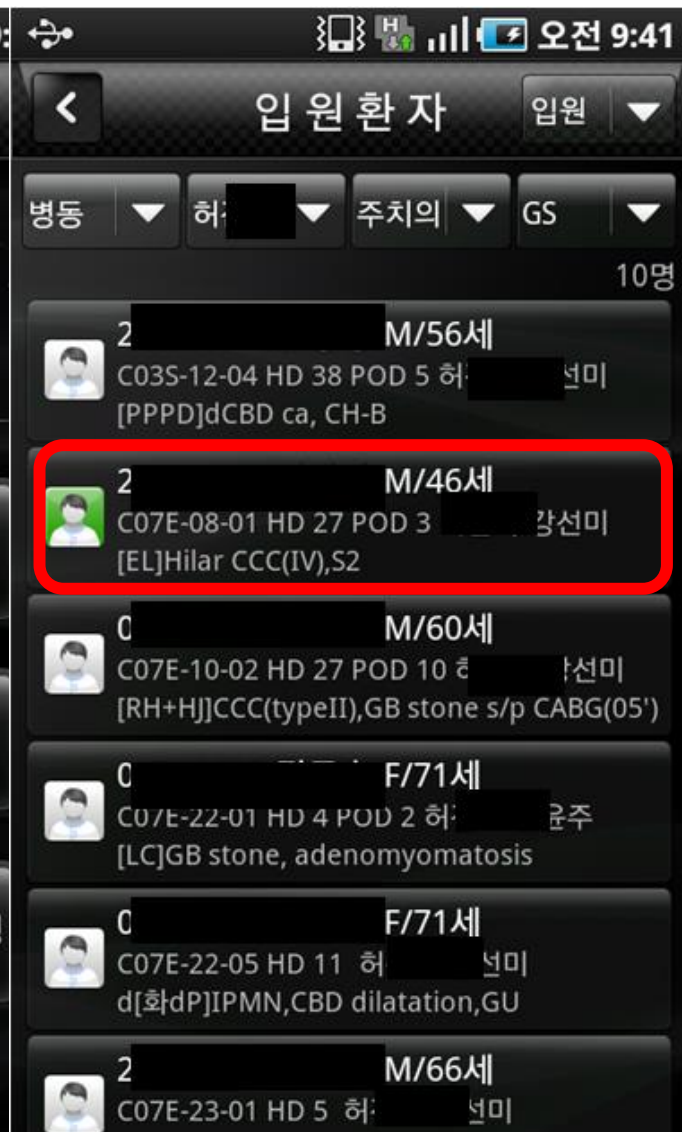
- 의료 전문가를 위한 학습도구, 사전 등 제공
- 의학용어, 논문, 교재, 사례 등 검색
- 환자교육, 처방의약품, 진료결과 설명

- 진료기록 저장 (m-EHR, m-PHR 등)
- 영상 및 사진 저장, 병원간 정보공유
- 유사증상 환자내역, 검사결과 등 검색 (의료진 대상)

- 환자와 진료결과, 현 상태 등 공유
- 영상정보 등 진료내역 모바일 전송
- 임상 의사결정지원, 메일, 의사회진 등

- 외진환자 모니터링, 긴급대처방안 전달
- 생체신호 이상 시 자동호출, 119 연락 등
- 진료, 진단, 수술, 처지 **one-stop 진료실** (하이브리드 진료실)

스마트폰용 Dr.Smart



오전 9:45

기본정보

2() 길 C07E-08-01
M/46 HD 27 /POD 3
[EL]Hilar CCC(IV),S2

계측정보
59.4kg / 170cm (BMI : 20.6kg/m²)

상병이력
- [EL]Hilar CCC(IV),S2
- r/o hilar CCC, r/o HCC
- digestive tract Ab Dx imaging

수술이력
- Lt. trisegmentectomy

V/S 처방 검사결과 영상

오전 9:45

환자상세

2() 길 C07E-08-01
M/46 HD 27 /POD 3
[EL]Hilar CCC(IV),S2

12/14(화)

more

V/S 처방 검사결과 영상 EMR

오전 9:48

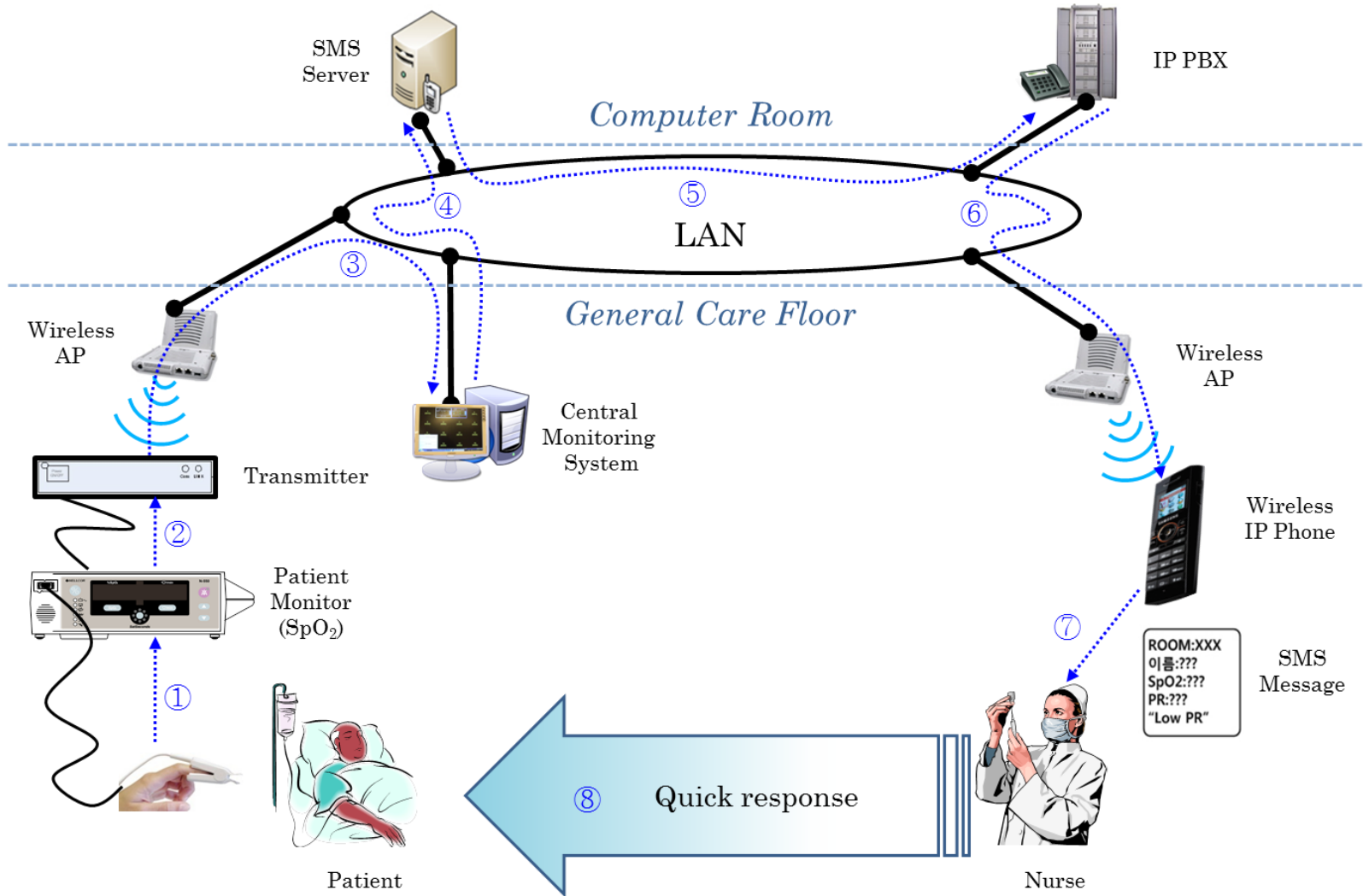
환자상세

2() 길 C07E-08-01
M/46 HD 27 /POD 3
[EL]Hilar CCC(IV),S2

시간	검사명	결과	영상
11:18	pH	7.490 ▲	
11:18	pCO2	30.3 ▼	
11:18	pO2	286.7 ▲	
11:18	HCO3	22.6 ▼	
11:18	BE(Base Excess)	0.0	
11:18	O2 Saturation	99.6	
11:18	Na (ABGA)	138	
11:18	K (ABGA)	3.3 ▼	
11:18	Ca, Ionized (ABGA)	1.12 ▼	

V/S 처방 검사결과 영상 EMR

수술 후 환자 산소포화도



[Legends]

- AP : Access Point
- IP : Internet Protocol
- LAN : Local Area Network

- PBX : Private Branch eXchange
- SMS : Short Message Service
- SpO₂ : Saturation of Peripheral Oxygen

[사설] 정부가 신산업을 가로막고 있는 이 이상한 나라

입력: 2015-04-15 20:33
수정: 2015-04-15 20:33

가- 가+

정부 규제가 빅데이터, 모바일 헬스케어 같은 신산업을 막고 있다는 호소가 터져나왔다. 새누리당과 전경련이 연 정책간담회 자리에서다. 기업들은 빅데이터 사업은 개인정보 활용을 금지하는 개인정보보호법, **모바일 헬스케어는 모바일 의료기기에 대한 의료법 규제에 막혀 있다**고 털어냈다. 또 수소차는 안전 등의 규제로 충전소가 부족한 탓에 진전이 안 되고, 야간시간대 전력을 저장하는 에너지저장장치(ESS)는 일률적인 여름철 냉방온도 제한으로 수요가 늘지 않는다는 것이다. 기업들이 한목소리로 새누리당과 정부에 획기적인 규제개혁을 요청한 것은 너무 당연하다.

무언가 새로운 것이라면 일단 규제부터 하고 보는 것이 정부라는 푸념들도 제기됐다. 사물인터넷(IoT) 시대에 시대착오적 규제 일변도이니 신사업이 나올 수가 없다. 스마트 헬스케어는 원격의료 금지에 막혀 온통 위법이 됐고, 외국에선 IT업체까지 개발 중인 무인자동차는 도로 테스트를 금지하는 현행 자동차관리법 체계 하에선 실험조차 불가능하다. IT를 적용한 안전헬멧조차 안전규정이 없어 시판되기까지 무려 1년9개월이 걸렸을 정도다. 대표적인 면허산업인 금융업에선 핀테크가 중국에 뒤지고 말았고, 푸드트럭은 대통령까지 언급했는데도 아직 규제가 여전하다.

기술이 없어서가 아니다. 정부가 온갖 것을 규제하는 게 문제다. 정부가 허용하지 않으면 신사업도, 발명도, 혁신도 불가능하다. 일자리도 자동차 튜닝 규제 하나만 풀어도 2만3000여개가 나온다는 게 고용노동부 분석이다. 신사업이 안 나오는 데엔 다 이유가 있다. 낡은 규제를 놔두고 창조경제, 혁신을 말해봐야 아무 소용없다.

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Textbook of **Diabetes**

4th edition

Edited by **Richard I.G. Holt, Clive S. Cockram,
Allan Flyvbjerg, Barry J. Goldstein**



 WILEY-BLACKWELL



Efficacy of self monitoring of blood glucose in patients with newly diagnosed type 2 diabetes (ESMON study): randomised controlled trial

Maurice J O'Kane,¹ Brendan Bunting,² Margaret Copeland,³ Vivien E Coates,³ on behalf of the ESMON study group

ABSTRACT

Objectives To assess the effect of self monitoring of blood glucose concentrations on glycaemic control and psychological indices in patients with newly diagnosed type 2 diabetes mellitus.

Design Prospective randomised controlled trial of self monitoring versus no monitoring (control).

Setting Hospital diabetes clinics.

Participants 184 (111 men) people aged <70 with newly diagnosed type 2 diabetes referred to the participating diabetes clinics. Major exclusion criteria were secondary diabetes, insulin treatment, previous self monitoring of blood glucose.

Interventions Participants were randomised to self monitoring or no monitoring (control) groups for one year with follow-up at three monthly intervals. Both groups underwent an identical structured core education programme. The self monitoring group received additional education on monitoring.

Main outcome measures Between group differences in HbA_{1c}, psychological indices, use of oral hypoglycaemic drugs, body mass index (BMI), and reported hypoglycaemia rates.

Results 96 patients (55 men) were randomised to monitoring and 88 (56 men) to control. There were no baseline differences in mean (SD) age (57.7 (11.0) in monitoring group v 60.9 (11.5) in control group) or HbA_{1c} (8.8 (2.1)% v 8.6 (2.3)%, respectively). Those in the monitoring group had a higher baseline BMI (34 (7) v 32 (6.2)). There were no significant differences between groups at any time point (12 months values given) in HbA_{1c} (6.9 (0.8)% v 6.9 (1.2)%, P=0.69; 95% confidence interval for difference -0.25% to 0.38%), BMI (33.1 (6.4) v 31.8 (6.0); adjusted for baseline BMI, P=0.32), use of oral hypoglycaemic drugs, or reported incidence of hypoglycaemia. Monitoring was associated with a 6% higher score on the depression subscale of the well-being questionnaire (P=0.01).

Conclusions In patients with newly diagnosed type 2 diabetes self monitoring of blood glucose concentration has no effect on glycaemic control but is associated with higher scores on a depression subscale.

Trial registration ISRCTN 49814766.

INTRODUCTION

Although self monitoring of blood glucose concentrations is widely advocated by healthcare professionals for patients with type 2 diabetes mellitus who do not require insulin, there is conflicting evidence as to its value.¹ We investigated the effect of self monitoring on glycaemic control and attitudes and satisfaction with treatment in patients with newly diagnosed type 2 diabetes.

METHODS

The ESMON study was a randomised control trial of self monitoring of blood glucose concentration (intervention) versus no monitoring (control). Patients aged <70 with newly diagnosed type 2 diabetes were recruited from the outpatient diabetes services at four hospitals between 2002 and 2005. See bmj.com for exclusion criteria.

Outcomes

Pre-designated primary end points were differences between groups in HbA_{1c}, psychological indices, and incidence of hypoglycaemia. Secondary end points were differences between groups in body mass index and use of oral hypoglycaemic drugs.

Randomisation

Participants were recruited from among those patients with newly diagnosed type 2 diabetes referred to the hospital diabetes clinics. Eligible patients were randomised into intervention (self monitoring of blood glucose) or control (no monitoring) groups.

Those in the self monitoring group were all provided with a glucose monitor, and asked to monitor four fasting and four postprandial capillary blood glucose measurements each week. They were advised on appropriate responses to high or low readings (for example, dietary review or exercise). At each clinic visit, concordance with the self monitoring regimen was verified by downloading meter readings. Patients in the no monitoring group (control) were asked not to acquire a meter or perform monitoring for the duration of the study.

Conclusions In patients with newly diagnosed type 2 diabetes self monitoring of blood glucose concentration has no effect on glycaemic control but is associated with higher scores on a depression subscale.

Cost effectiveness of self monitoring of blood glucose in patients with non-insulin treated type 2 diabetes: economic evaluation of data from the DiGEM trial

Judit Simon,¹ Alastair Gray,¹ Philip Clarke,² Alisha Wade,³ Andrew Neil,⁴ Andrew Farmer,⁵ on behalf of the Diabetes Glycaemic Education and Monitoring Trial Group

ABSTRACT

Objective To assess the cost effectiveness of self monitoring of blood glucose alone or with additional training in incorporating the results into self care, in addition to standardised usual care for patients with non-insulin treated type 2 diabetes.

Design Incremental cost utility analysis from a healthcare perspective. Data on resource use from the randomised controlled diabetes glycaemic education and monitoring (DiGEM) trial covered 12 months before baseline and 12 months of trial follow-up. Quality of life was measured at baseline and 12 months using the EuroQol EQ-5D questionnaire.

Setting Primary care in the United Kingdom.

Participants 453 patients with non-insulin treated type 2 diabetes.

Interventions Standardised usual care (control) compared with additional self monitoring of blood glucose alone (less intensive self monitoring) or with training in self interpretation of the results (more intensive self monitoring).

Main outcome measures Quality adjusted life years and healthcare costs (sterling in 2005-6 prices).

Results The average costs of intervention were £89 (€113; \$179) for standardised usual care, £181 for less intensive self monitoring, and £173 for more intensive self monitoring, showing an additional cost per patient of £92 (95% confidence interval £80 to £103) in the less intensive group and £84 (£73 to £96) in the more intensive group. No other significant cost difference was detected between the groups. An initial negative impact of self monitoring on quality of life occurred, averaging -0.027 (95% confidence interval -0.069 to 0.015) for the less intensive self monitoring group and -0.075 (-0.119 to -0.031) for the more intensive group.

Conclusions Self monitoring of blood glucose with or without additional training in incorporating the results into self care was associated with higher costs and lower quality of life in patients with non-insulin treated type 2 diabetes. In light of this, and no clinically significant differences in other outcomes, self monitoring of blood glucose is unlikely to be cost effective in addition to standardised usual care.

Trial registration Current Controlled Trials ISRCTN47464659.

INTRODUCTION

Self monitoring of blood glucose has been shown to be the largest single component of management costs associated with implementing more intensive glycaemic control in the UK.¹ Improvements in haemoglobin A_{1c} levels are associated with reduced rates of long term complications from diabetes. Although these improvements may lead to gains in quality adjusted life expectancy and generate savings within the healthcare system, self monitoring has opportunity costs as funds could be used to finance other aspects of managing non-insulin treated type 2 diabetes. We carried out an economic evaluation of self monitoring of blood glucose using data from the diabetes glycaemic education and monitoring (DiGEM) trial.²

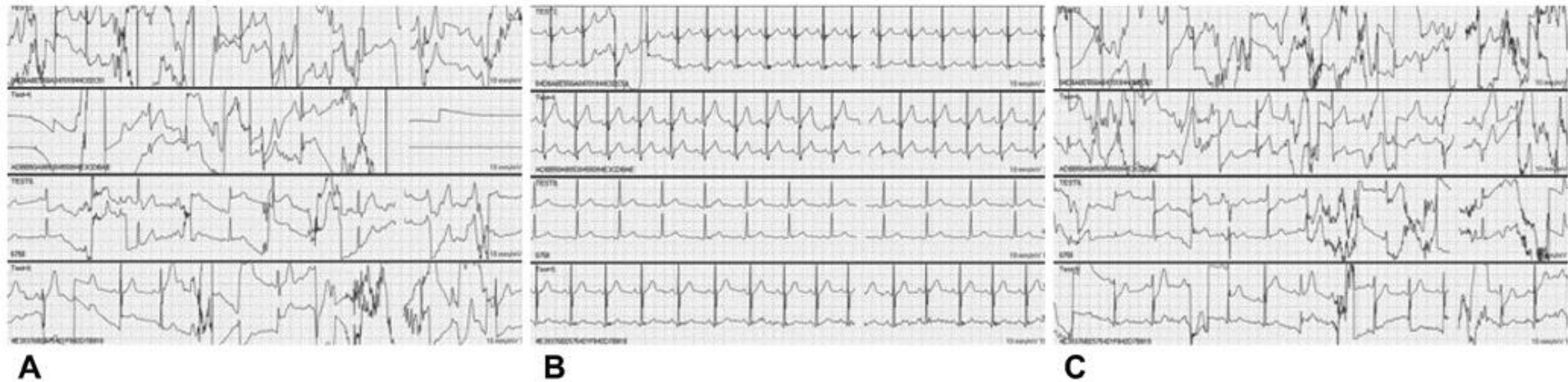
METHODS

The diabetes glycaemic education and monitoring trial was an open, randomised study of 453 patients with non-insulin treated type 2 diabetes who had haemoglobin A_{1c} levels of 6.2% or more and were self monitoring not more than once a week.² These patients were allocated to either standardised usual care (control, n=152), a blood glucose meter with advice for participants to contact their doctor for

Conclusions Self monitoring of blood glucose with or without additional training in incorporating the results into self care was associated with higher costs and lower quality of life in patients with non-insulin treated type 2 diabetes. In light of this, and no clinically significant differences in other outcomes, self monitoring of blood glucose is unlikely to be cost effective in addition to standardised usual care.

Trial registration Current Controlled Trials
ISRCTN47464659.

Electromagnetic Interference of Wireless LAN on ECG Monitoring System



모바일 헬스케어 연구포럼



모바일 헬스케어 연구포럼에
많은 관심 부탁드립니다.

참여하실 분은 성함, 소속, 이메일 주소를 서울대 순환기내과 김용진 교수 (kimdamas@snu.ac.kr) 에게 보내주시면 됩니다.