VI CONVEGNO NAZIONALE
CENTRO STUDI E RICERCHE - FONDAZIONE AMD
NAPOLI, 18-20 OTTOBRE 2012
CENTRO CONGRESSI
STAZIONE MARITTIMA

Nuove tecnologie per la gestione del diabete e loro utilizzo in gravidanza

D.Mannino
UOC Diabetologia Endocrinologia
A.O. BMM Reggio Calabria

A simple computer program for insulin dose adjustment in diabetic patients.

Bellomo G, Santucci S, Mannino D, Alessi R.

Comput Methods Programs Biomed. 1988 May-Jun; 26(3):257-8

Telemedicine in the treatment of diabetic pregnancy.

di Biase N, Napoli A, Sabbatini A, Borrello E, Buongiorno AM, Fallucca F.

Ann Ist Super Sanita. 1997;33(3):347-51.

Diabete e gravidanza

Diabete pregravidico

- Tutte le donne con diabete in età fertile **devono essere informate** …….
- Le donne con diabete in gravidanza devono praticare **l'autocontrollo domiciliare** …….
- Il **monitoraggio continuo del glucosio sc** può essere utile in gravidanza……
- Le donne con diabete pre-gestazionale tipo 1 devono essere trattate con plurime somministrazioni di insulina sc, con schemi basal-bolus, o con l'utilizzo **del microinfusore (CSII)**.

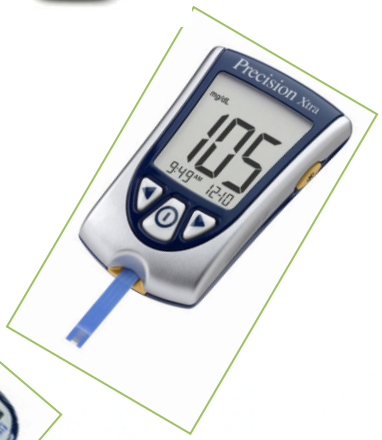
Diabete gestazionale

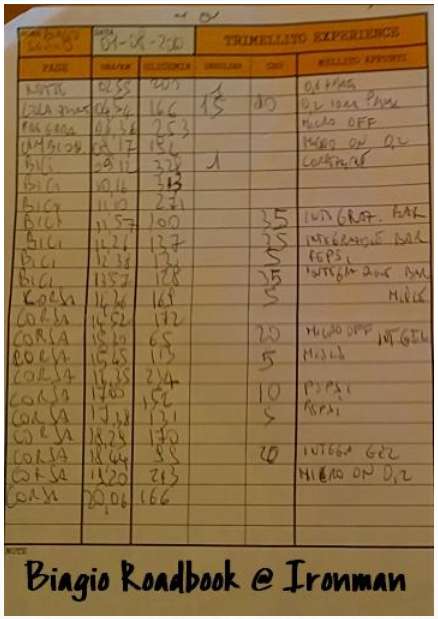
- L'autocontrollo glicemico deve essere iniziato immediatamente dopo la diagnosi
- Nelle donne con diabete gestazionale la terapia insulinica deve essere iniziata prontamente se gli obiettivi glicemici non sono raggiunti entro 2 settimane di trattamento con sola dieta.

- Programmi di educazione
- Sistemi di monitoraggio glicemico
- Sistemi di somministrazione dell'insulina

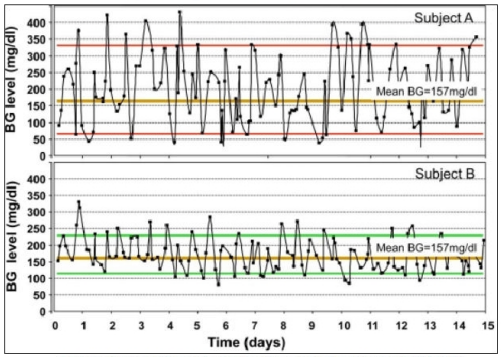
Glucose Monitoring

First Glucose Meter

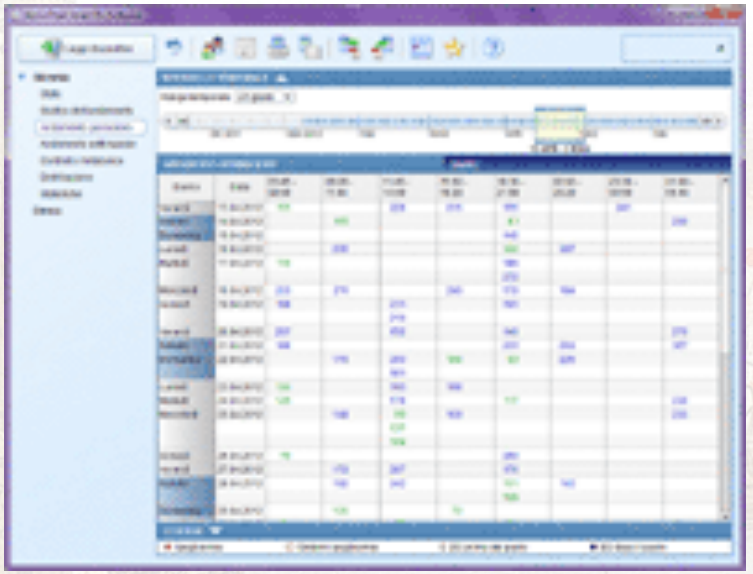




Due profili glicemici a confronto…



Kovatchev BP, Is Glycemic Variability Important to Assessing Antidiabetes Therapies, Current Diabetes Reports 2006, 6: 350 -356



La gestione dei profili è una strategia raccomandata ed approvata per ottimizzare il controllo glicemico[1]

Oggi la ricerca dei profili può risultare difficoltosa e non fornisce un riscontro immediato: il diario non basta!

La maggior parte dei pazienti reagisce trattando subito il singolo valore glicemico fuori controllo e non ricerca eventuali profili glicemici[2]

Pochi pazienti controllano precedenti valori glicemici alti e bassi per verificare se i propri valori glicemici sono parte di un profilo glicemico nascosto[2]

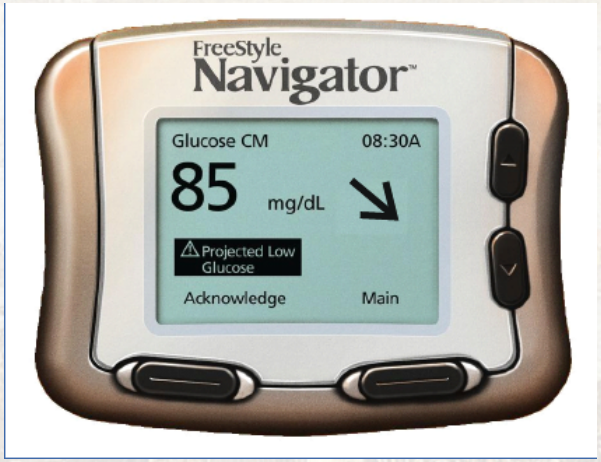
Il 13% dei pazienti in terapia insulinica scarica i dati glicemici del proprio strumento a casa[2]

1 Pearson J. Bergenstal R. Diabetes Spectrum Vol. 14 No 2. 2001
2. People with Diabetes in the United States - A&U Study 2011. TNS.

CGMS

Continuous Glucose Monitoring System

LifeCare (Bergen, Norway)



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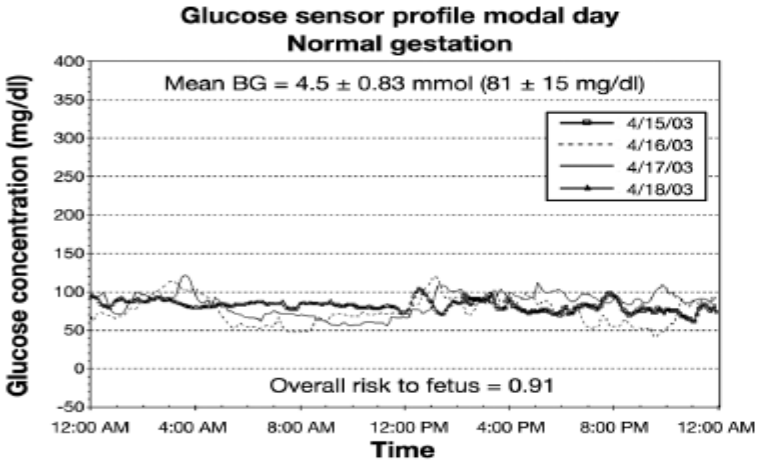
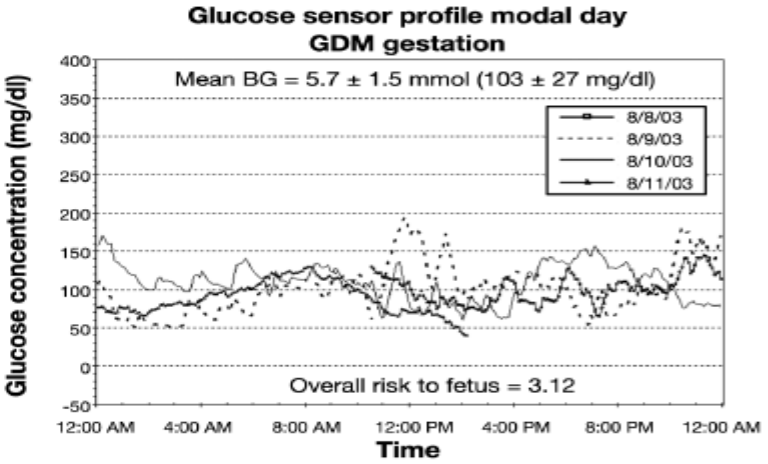
Journal of Diabetes Science and Technology
Volume 4, Issue 6, November 2010

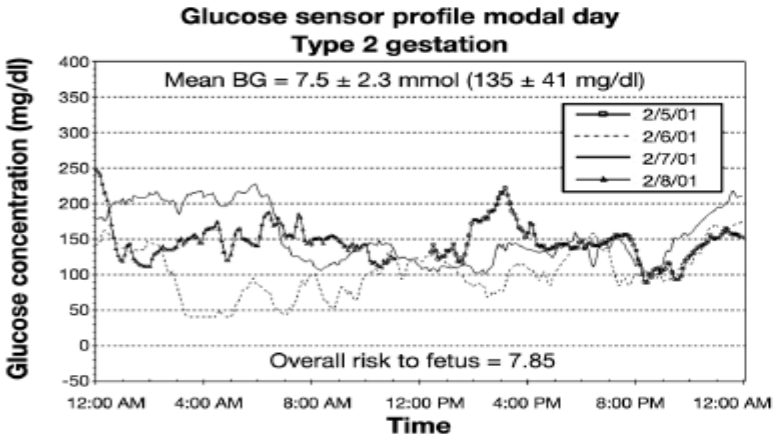
ORIGINAL ARTICLES

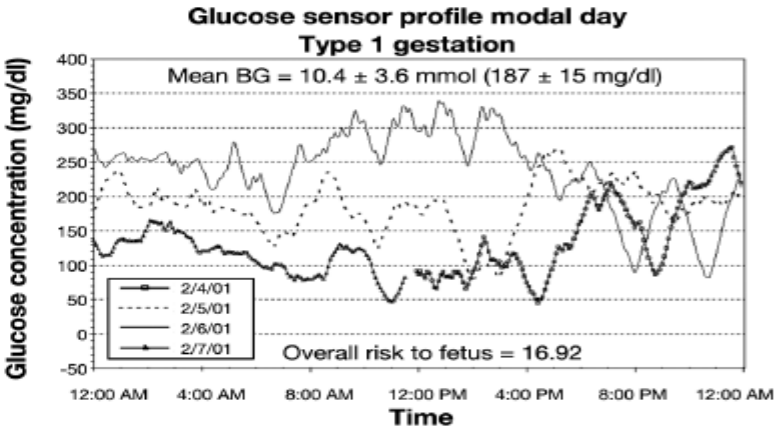
Fetal Risk Assessment in Pregnancies Complicated by Diabetes Mellitus

Howard C. Zisser, M.D.,[1] Michael A. Biersmith, B.S.,[1] Lois B. Jovanovič, M.D.,[1] Yariv Yogev, M.D.,[2] Moshe Hod, M.D.,[2] and Boris P. Kovatchev, Ph.D.[3]





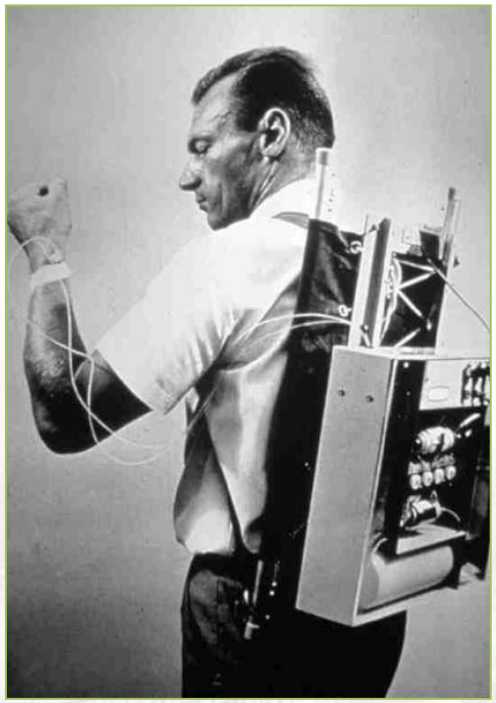




Insulin Delivery Modes

Insulin Delivery Modes

Insulin Pumps

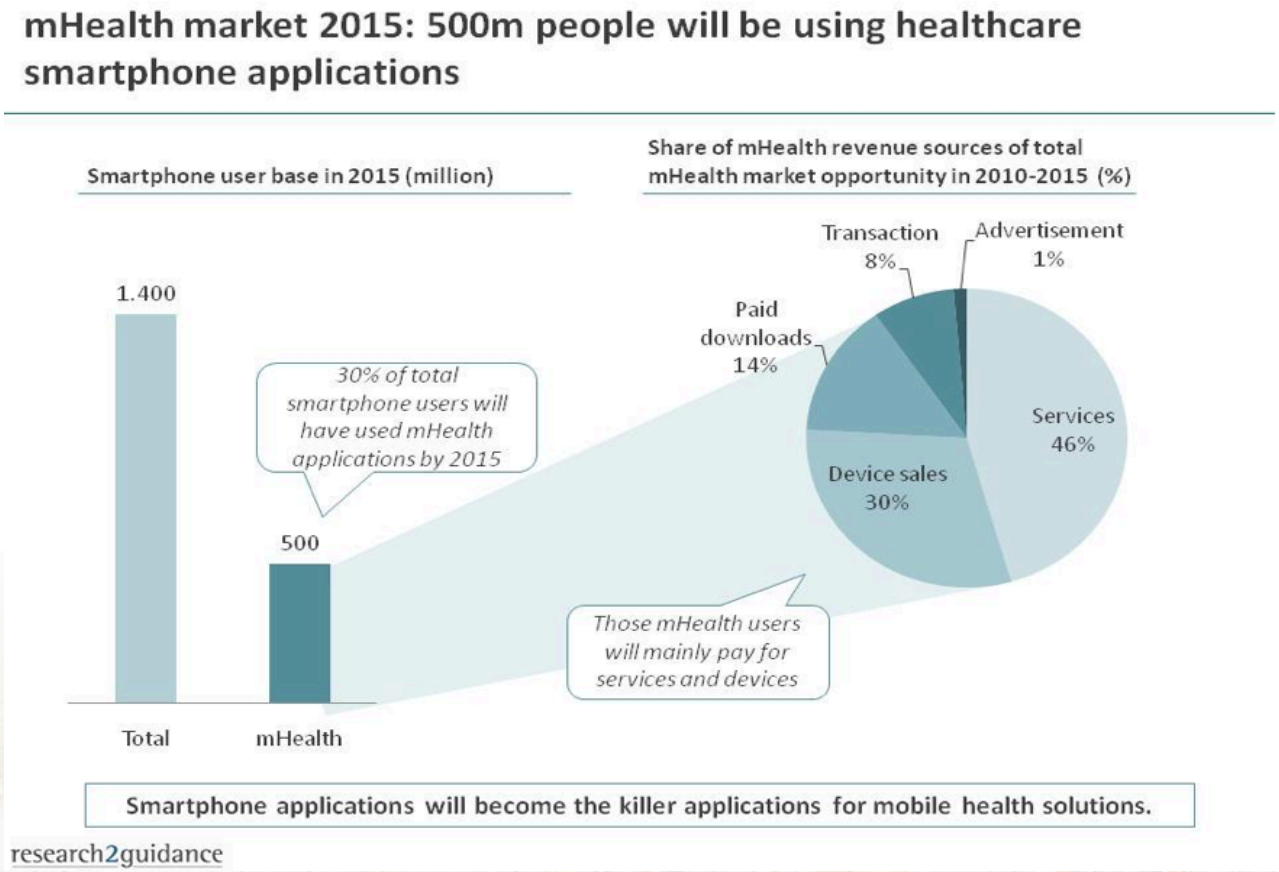


- provide continues insulin delivery
- infusion site needs to be changed only every 2-3 days

iOS

Android
Via Buetooth Adapter

The iLickit iPhone App makes me question the progress of humanity. This app wants you to achieve size zero as it encourages you to lick the screen whenever it flashes a sumptuous meal. Not my idea of dieting. Price - $1.99.



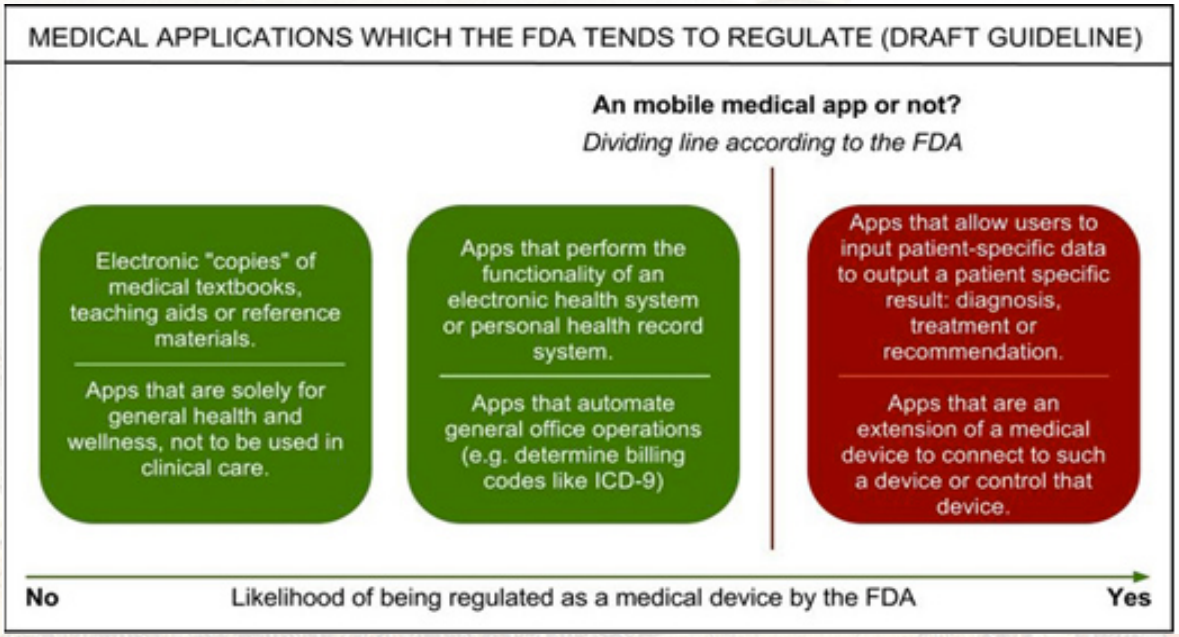
Global mobile health market report 2010-2015
http://www.research2guidance.com/shop/index.php/mhealth-report

What makes a good quality app?

Who is it made by?

Is it evidence based? Has the content been reviewed?

Does it cross the line to being a medical device?



Draft US FDA guidelines

Glucose Buddy - Diabetes Helper 3.6.5 w/cross-device sync + BP/WT tracking

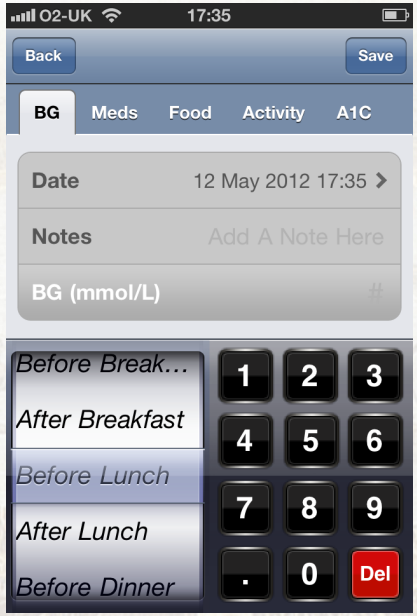
Description

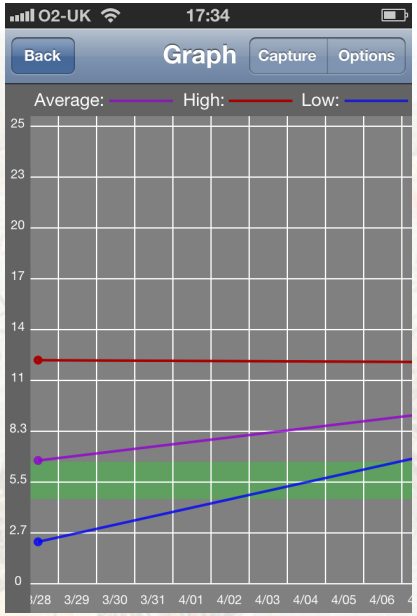
- Ranked #1 Diabetes iPhone Application by Manny Hernandez, Founder of TuDiabetes.com

- As seen in American Diabetes Association's Diabetes Forecast Magazine, NYTimes, Wired Magazine, DiabetesMine.com,...

...More

Cost: Free
Pros: Integrates with calorie track, forum, graph, log BG, activity, insulin
Cons: display, adverts, poor graph display





Carbs & Cals - A visual guide to Carbohydrate & Calorie Counting

Description

This is the Carbohydrate and Calorie Counting App you have always wanted! We've responded to user feedback, and it now contains over 1400 food & drink photographs so you can more easily judge the carbs and calories in your food and drinks th...

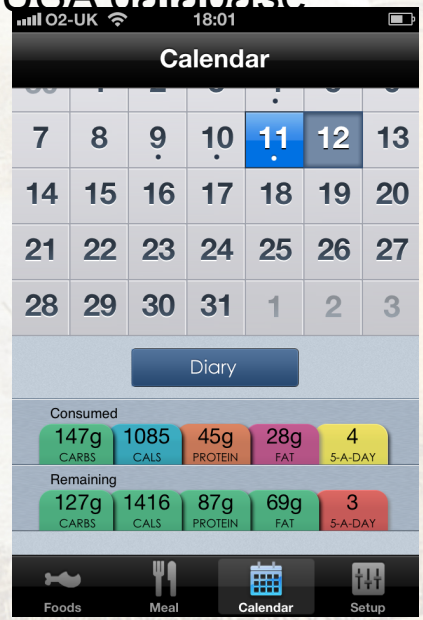
...More

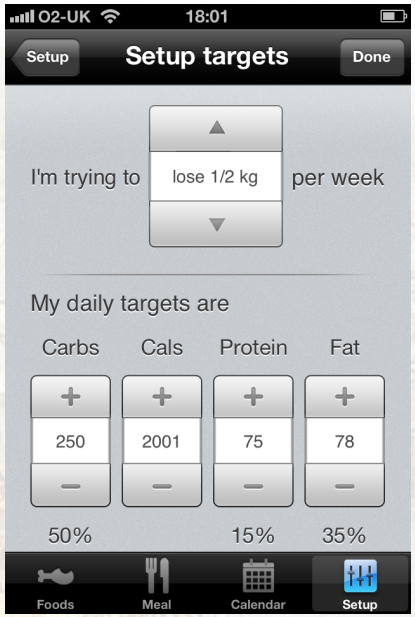
Chello Publishing Web Site › Carbs & Cals - A visual guide to Carbohydrate & Calorie Counting Support ›

Cost: £3.99

Pros: Unique photographic database of foods, iPhone & Android (Blackberry very soon), growing database including branded foods, set up targets, log exercise

New features coming very soon include: recipe builder, barcode scanner, diabetes area, bolus advisor, USA database





DID Che cos'è

DID – Il Diario Interattivo del Diabete

*è un software che può installato **iPhone**, **iPad** e **iPod Touch** con firmware3, che:*

I. **Supporta** il **paziente diabetico** *insulino-trattato* nell'applicazione pratica della **conta dei carboidrati**

II. E' fornito di un setup per il calcolo del **bolo insulinico appropriato** e l'**aggiustamento immediato** dell'**insulina** in base alle variabili impostate dal diabetologo

III. E' predisposto per lo **scambio** di **informazioni** tra *paziente (iPhone)* e *diabetologo (Eurotouch)* in remoto (**Telemedicina**)

DID

Come funziona

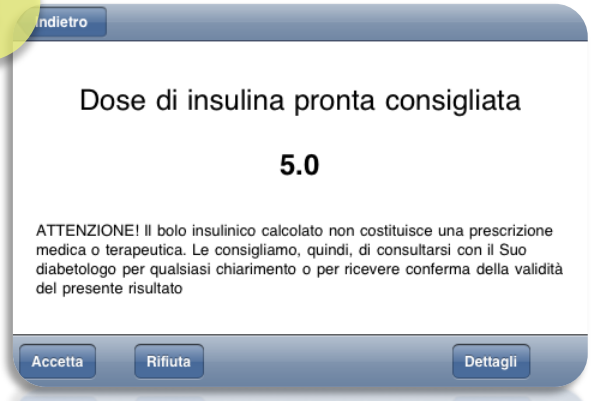
Il paziente inserisce il suo valore glicemico **1**

PAZIEN

Il paziente può scegliere tra una vasta gamma di alimenti presenti in un database fotografico. Ogni porzione può essere personalizzata ed il paziente riceve in automatico il calcolo esatto del contenuto dei carboidrati. **2**

3

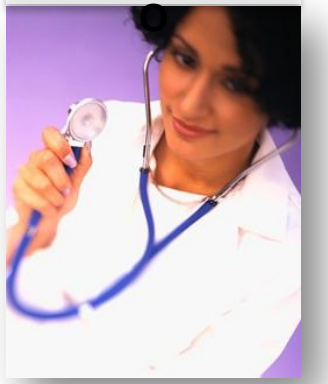
Adesso il diario interattivo contiene **tutti i dati** sull'alimentazione e sulla vita di Paola necessari per **calcolare il bolo insulinico** appropriato per la somministrazione.



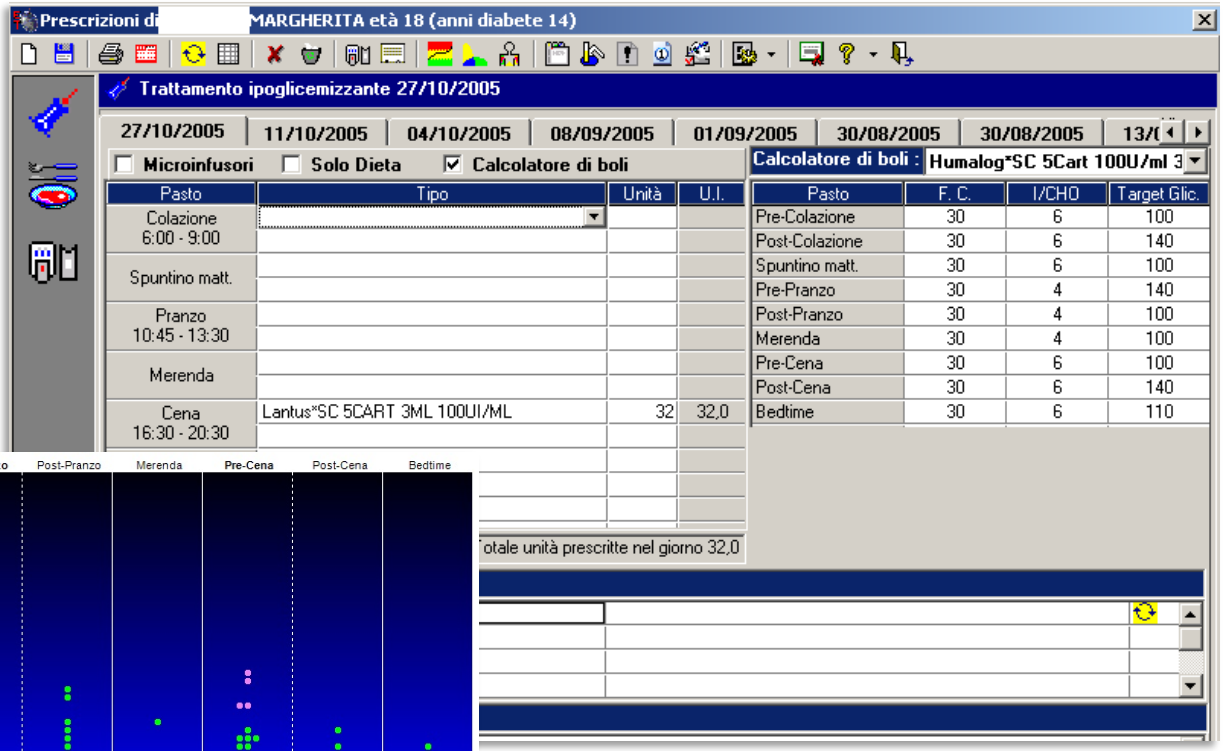
DID

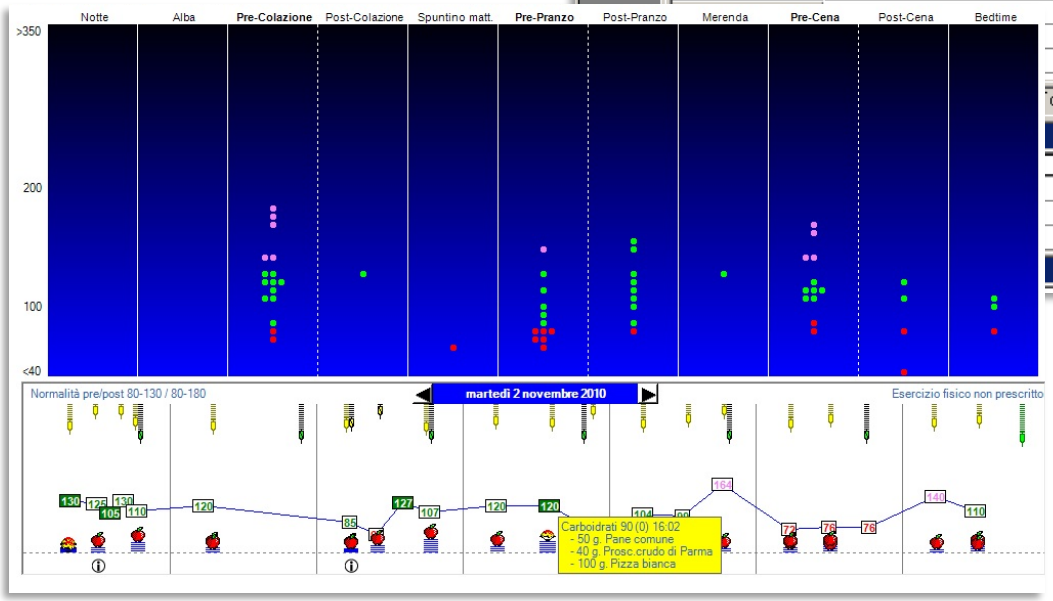
Come funziona: le prescrizioni del Diabetologo

DIABETOLOGO



Il Diabetologo, attraverso **EuroTouch**, riceve i dati e verifica il profilo glicemico del paziente e se lo ritiene opportuno , cambia l'algoritmo per il calcolo del suggerimento insulinico e aggiunge commenti in ***Note***.





Invio dei dati corretti al paziente.

Policy Implication

- Telemedicine program effective in diabetes monitoring & reducing diabetes related crisis
- Intervention program design more essential than technology in program success
- Telemedicine has the potential for larger scale community based tele-diabetes intervention
- Collaboration may involve organizations with interoperable personal health record systems
- Large scale intervention has the potential of efficiency of scale

Study Limitation

- Most of the studies reviewed enrolled sample sizes < 50 patients
- Nevertheless, irregular sample size & varied study designs did not permit comparison of intervention effectiveness that were context specific

Authors	Study group	Control group	Results
Di Biase et al (1997)	DIANET system	Regular ambulatory visits	1. Better metabolic control and higher insulin doses in the study group.
Frost et al (2000)	CareLink system	Regular ambulatory visits	1. No differences in HbA1c improvements between the two groups. 2. MBG and MFG markedly lower in the study group.
Wojcicki et al (2001)	Telematic Intensive Care system	Regular ambulatory visits	1. Better glycemic control in the study group, as assessed by MBG and J-index variations. 2. Significantly lower variations in the glycemic control indices applied in the study group.
Ladyzynsky et al (2001)	PTM and CCU system	---	1. Significant improvement in metabolic control
Ladyzynsky et al (2007)	Home Telecare system	Clinical examinations every 3 weeks	1. Similar levels of metabolic control and insulin adjustment in the two groups

Table 1. Brief outline of the studies conducted on telemedicine for type 1 diabetes mellitus in pregnancy

Authors	Study group	Control group	Results
Hernando et al (2000)	DIABNET system	---	Two different experiments evaluated the system's performance compared to physicians, based on answers to questionnaires and quantitative comparisons of the system's and experts' recommendations
Pèrez-Ferre et al (2009)	Telemedicine system (Internet and text messages)	Traditional face-to-face visits at the outpatient clinic	1. Women in the study group went significantly less to the outpatients clinic. 2. No differences in HbA1c levels between the two groups 3. No significant differences in delivery modality between the two groups 4. No difference in the rate of LGA babies between the two groups
Homko et al (2007)	Telemedicine system (website for recording of glucose values)	Information recorded in a paper logbook	1. No differences between the two groups regarding fasting or after-meals glucose values 2. No significant differences in pregnancy or neonatal outcomes 3. Study group patients had stronger "feelings of self-efficacy"

Table 2. Short outline of studies on telemedicine for pregnancies complicated by gestational diabetes mellitus (GDM)

Telemedicine in Pregnancy Complicated by Diabetes

Annunziata Lapolla, Nino Cristiano Chilelli and Maria Grazia Dalfrà

In:"Advances in Telemedicine: Applications in Various Medical Disciplines and Geographical Regions", 2011 InTech ED., ISBN: 978-953-307-161-9
AUTORI: Georgi Graschew and Theo A. Roelofs

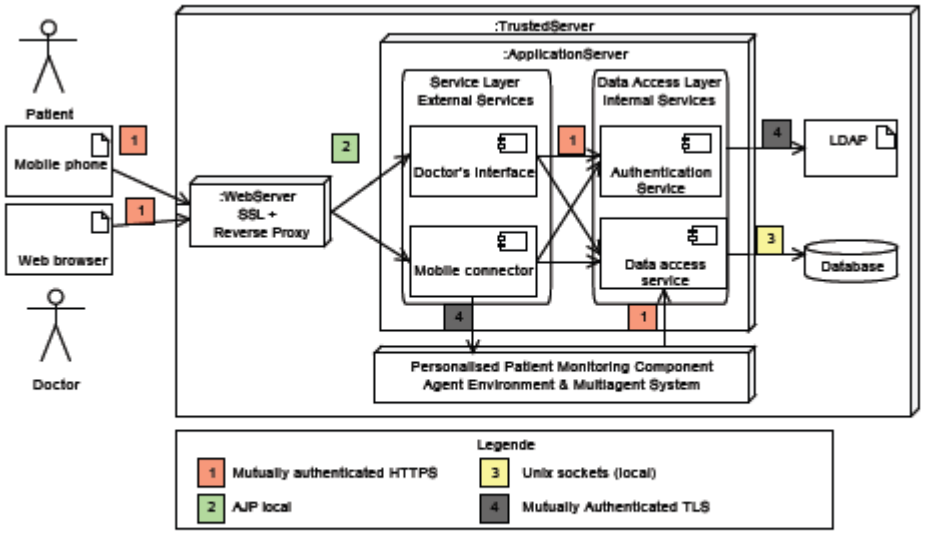


Figure 3. Security of the GDMM system

Enforcing Security in Pervasive Healthcare Monitoring Gestational Diabetes Mellitus

Stefano Bromuri, Johannes Krampf, René Schumann, Michael Ignaz Schumacher
Institute of Business Information Systems,
University of Applied Sciences Western Switzerland,
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DIABETES TECHNOLOGY & THERAPEUTICS
Volume 14, Number 7, 2012

DOI: 10.1089/dia.2012.0010

Original Article

Impact of a Telemedicine System with Automated Reminders on Outcomes in Women with Gestational Diabetes Mellitus

Carol J. Homko, R.N., Ph.D., C.D.E.,[1,2,3] Larry C. Deeb, M.D.,[4,5] Kimberly Rohrbacher, R.N., C.D.E.,[4]
Wadia Mulla, M.D.,[3] Dimtrios Mastrogiannis, M.D.,[3] John Gaughan, Ph.D.,[6]
William P. Santamore, Ph.D.,[6] and Alfred A. Bove, M.D., Ph.D.[1]

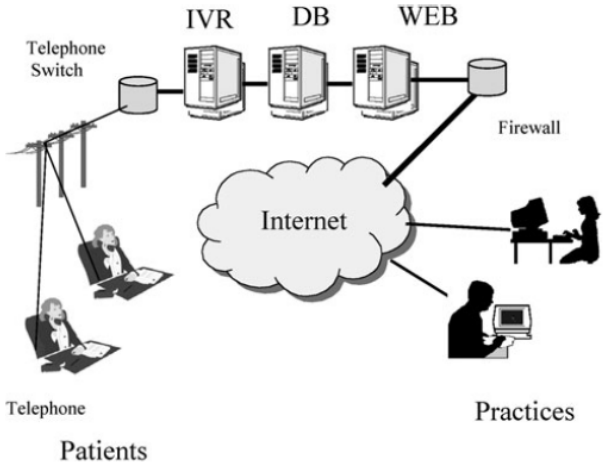

FIG. 1. Schematic representation of the integrated Internet-based informatics application and interactive voice response (IVR) system. DB, database.

In summary, our enhanced telemedicine monitoring system increased contact between women with GDM and their healthcare providers but did not impact upon pregnancy outcomes. The expectation that such systems may lead to improved control and outcomes among pregnant women with GDM may be unrealistic. However, the real potential of these emerging healthcare technologies may be their ability to increase efficiency while maintaining the quality of care. Future studies should focus on these issues as well as the impact of health technology on patient satisfaction with treatment.

The effect of **telemedicine** on outcome and quality of life in pregnant women with **diabetes**.

Dalfrà MG, Nicolucci A, Lapolla A; and TISG

J Telemed Telecare. 2009;15(5):238-42.

Clinical variables and pregnancy outcomes were no different between the two telemedicine groups, whereas women with gestational diabetes in the telemedicine group had a better metabolic control in the 3rd trimester and a lower rate of caesarean sections and macrosomia. As for QoL, women in the telemedicinegroups showed lower levels of frustration and concerns about their diabetes, and a better acceptance of their diabetic condition.

Home Uterine Activity Monitor

Non Stress Test Home Monitor

Obstetrical hypertension management

Vantaggi clinici dell'utilizzo di cartelle elettroniche

Fonte: Ann Intern Med. 2 October 2012; 157(7): 482-489.

I medici americani possono ricevere incentivi federali per l'utilizzo di pacchetti e cartelle cliniche elettroniche certificate (EHR). Tali applicativi possono intervenire efficacemente nei processi di cura e di controllo della malattia nei pazienti con diabete.

Conclusioni

- I sistemi di monitoraggio glicemico e di terapia utilizzati nella cura delle persone con diabete possono essere utilizzati in gravidanza con efficacia.
- Non esistono modelli educativi,fondati sulle nuove tecnologie, dedicati alla gravidanza.
- Con l'incremento progressivo dei costi del SSN è opportuno "esplorare" alternative di cura che possono risultare più economiche
- La telemedicina nelle gravidanze ad alto rischio sembra essere " cost effective".
- Uno studio di Morrison et al (2001) conclude che "each pregnancy in the telemedicine group cost an average of $7, 225 compared to the $21,684 cost to those who did not receive outpatient services".
- Secondo Matria Healthcare ,assicurazione USA, "for each $1 spent in home preterm management services, $3 to over $5 is saved by reducing antepartum and neonatal nursery days."
- Il costo dei sistemi attuali è ribaltato quasi esclusivamente sulle pazienti
- Non esistono RCT su grandi numeri di pazienti
- Non è stato individuato un modello unico di piattaforma
- Devono ancora essere risolti i problemi legati alla sicurezza dei sistemi