Cloud-Enabled Wellness Ecosystems

IBM Research Collaboratory – Taiwan Research Program

Sreeram Ramakrishnan, Ph.D.
Manager and Research Staff Member
Wellness Ecosystems and Analytics – Taiwan Healthcare Healthcare Transformation, IBM T J Watson Research Center

sramakr@us.ibm.com
Executive Summary – Taiwan Research Colloboratory

- **Taiwan Colloboratory**
  - Ministry of Economic Affairs funded 4 year research project
  - Enhancing device industry capabilities
  - Enhancing Services Science discipline & research
  - Government research institutions (ITRI and III) – key partners
  - Partners from providers, nutrition/exercise, academia and devices

- **Cloud-based platform to facilitate service compositions**
  - Focus on chronic care management
  - Clinical and non-clinical process hand-offs
  - Facilitated networks, skill transference ~ *Ecosystem-as-a-service*

- **In-market experimentation**
  - Service model pilots
  - Risk stratification ➔ Personalization ➔ Compliance and Adaptation

- **Scalable platform components**
  - HL7 and Continua
  - Assets for compliance monitoring and personalization of treatment plans
Value layers - Collaboratory Program

- **Clinical Value Layer**
  - Role of risk stratification in identifying interventions
  - Role of personalization in clinical outcomes
  - Basis for comparative effectiveness studies

- **Technology Layer**
  - Role of information intervention in improving health outcomes
  - Leveraging unified view of patient information
  - Cloud-enabled process improvement / technology infrastructure

- **Ecosystem Layer**
  - New service models leveraging cloud
  - Exportability/Scalability
  - Economic impact for Taiwan partners and enhanced global channels
Collaboration Themes

- **Designing new service models**
  - Focus on personalization (intervention strategies)
  - Focus on analytics (evidence-generation, adapting interventions)

- **Technology infrastructure**
  - Services amenable for “cloud”
    - Opportunities for data sharing/management/analytics with multiple sites
    - Personalization algorithms/Recommendation engines

- **Cloud-enabled process improvement**
  - Reduction of screening times ("Refining the science of personalization for screening")
  - Patient portal and experience management
  - Business process lean analysis/“cloud” enabled value maps
  - Facilitate new business models (food delivery services, for example)

- **Data management and analytics**
  - “Owned by patient, Managed as a Service”
  - Evidence generation using analytics / licensing

- **In-market experiment**
  - Social media and interventions
    - Clinical impact
    - Service model ideas
Business Models - Evidence-centric models

- **Evidence-generation**
  - Impact of specific diets on patients with condition X
  - Redesigning exercise regimens/physical therapy programs

- **Evidence delivery**
  - Licensing wellness/+ evidence to other providers, pharma, hospitals
  - ePocrates for Wellness?

- **Value added services for device manufacturers/ pharma**
  - Studying impact of specific medications with monitored nutrition/exercise

- **Employer managed wellness or prevention programs**
  - Risk stratification (screening) and individualized intervention programs
  - Education and coaching
    - Could be to educate/coach case managers?

- **Monitoring and compliance** for (a) providers (b) patients
Two main workstreams

1. Health management ecosystem
2. Guidelines-based CDSS (Wellness)
Health Management Core Service Flow

1. Health Screening + Fitness Test → Evaluation → Consultation
2. Medical Referral
3. Other Wellness Plan
4. Personalized Nutrition Plan
5. Personalized Activity Plan
6. Follow Up

Controlled environment
Controlled @ Partners
Freestyle Interventions
Compliance Monitoring
Assessment
Adaption

Location Dependent
Location Independent
Platform view

Personalized e-health service solutions
(Behavior models, Nutrition, Fitness, Social network, disease mgmt with Health plan monitoring and compliance)

Patient-controlled Devices

Patient Similarity Analytics, Personal Wellness Data (PWR)

Clinical Decision Support System

Mobile application platform

Evidence based guideline platform (EPC3)

Event driven situational awareness platform
Reference Operation Flow Model

PWR-Apps Front End
Input / Display / Reporting

PWR-Apps Business Rule / Components

PWR-Apps Operation Database
MJ’s DB  Agoss  Zgoss  Puli  XXX  PWR Stage DB

Configuration Management (Version Control)

PWR Data Schema(s) Development

Schema+ Biz rule Feedback

Add on Specific Sub-domain

For Exercise
For Nutrition
For PWR stage DB
For PWR Data Warehouse

Schema(s) & biz rule Repository

Data Cubes
SPSS
Analytics Components

- Enterprise health model
- Social-aware Health Promotion
- Wellness-sensitive Localization service

- (Dynamic) Personalized Care Service Delivery
  - Data Collection
  - (1) Active Characterization
  - (2) Active Recommendation
  - (3) Proactive Adaptation

- Information Presentation

- Risk Modeling

Application
Application framework
Library
Service Pilot Scenario

Health Screening
Metabolic Rate Analysis

Intervention Portfolio (nutrition, activity, clinical)
Personalization (activity)

Gaming Interface
Social Gaming

Compliance Monitoring
Effectiveness Assessment

Two main companies
1. Company T (Taiwan)
2. Company N (US)
Initial Service Pilot

- **Key hypothesis**
  - Social gaming based interventions can facilitate *behavior modification to improve functional outcomes for patients with high risk for metabolic syndrome*

- **Supporting hypotheses**
  - Compliance-based value-added services can improve customer retention
  - Aggregated *information about peer behavior* can further incentivize treatment compliance
    - Impact of providing peer group behavior information to individual patients?
      - Impact of social networks – peer group visualization
  - Role of personalized information intervention in improving compliance?
    - *Personalized* treatment plans
    - *Visualization* and information consumption

- **Key framing of pilot design**
  - Social gaming v/s individual gaming
  - Competition v/s aggregated information
  - Facilitating service portfolio design

- **Initial service pilot to commence in 1Q 2012**
  - Cross-licensing service model facilitated by IBM Cloud
Summary

- Information intervention portfolio for disease management
  - Predominantly in non-clinical situations

- Technology components
  - Cloud platform
  - Event management system, mobile platform & Personal Wellness Record
  - Relatively mature assets ~ 20-25% customization

- Key design elements of cloud platform
  - Service composition
  - Scalability
  - Customizability
  - Evidence generation, evidence delivery for care coordination
  - Facilitate a new service model

- In-market experiments
  - Various service feasibility studies concluded
  - An end-to-end pilot with two main partners to commence in 2012