Monetizing the Future: Business Model Transformation in Healthcare

Digital health technologies and value based reimbursement spur new opportunities

December 2016
Advanced Woundcare Market Update
Global Woundcare Market Value Based Care Transition, Opens the Door For New Services & Solutions

How big is the market and how fast is it growing?

<table>
<thead>
<tr>
<th>Region: Global</th>
<th>Revenue ($ Billion)</th>
<th>Growth Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>16.8</td>
<td></td>
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<tr>
<td>2017</td>
<td>17.3</td>
<td>3.2</td>
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<tr>
<td>2018</td>
<td>17.8</td>
<td>3.4</td>
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<tr>
<td>2019</td>
<td>18.4</td>
<td>3.4</td>
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</tbody>
</table>

Source: Frost & Sullivan Research

Global Woundcare Market Revenue Share by Sector, 2016

Global Advanced Woundcare Market Revenue Share by Competitor, 2016

“What was once a payment is now a cost. What was once a cost is now a potential savings.” - Hospital CEO

Opportunities For Business Model Transformation In Woundcare

- Where is it Performed?
- Who Performs it?
- What is Tracked/Measured/Documented?
- How is it Paid for?
Market Snapshot U.S.
Election and 21st Century Cures Act Alter Market Landscape

MACRA
- Chronic Care Management Focus
- Codes for Mobility Related Disability
- Screening

In The News
- Election/ New HHS and CMS head
- Device Tax/ Cadillac Tax
- 21st Century Cures Act

Industry Shifts
- Consolidation
- Products to Services
- Patient Education
Market Snapshot Europe
New Rules Transform Regulation to be More like the FDA

Regulatory • Stricter Requirements (High Risk)
  • Increased Transparency & Traceability
  • BREXIT Impact?

In The News • NHS Modernization Initiatives
  • Precision Medicine Initiatives (France, UK, Germany)

Industry Shifts • Product Portfolio Strategies
  • Managed Care Services (Medtronic)
  • R&D Strategy
Digital Transformation in Healthcare
Six Big Themes for Business Model Transformation
Driving Factors For Change

Value Based Reimbursement

Digital Transformation of Care Delivery

New Market Entrants

Collaboration & Partnerships

As-a-Service Centric Business Models

Healthcare Consumerism
The Internet of Medical Things (IoMT) entails any ecosystem of connected medical technologies supporting targeted health and well being services.
Right Care, Right Place, at the Right Time
Value Drivers in the New Healthcare Economy

INSTANT HEALTHCARE
Virtual office visits reduce wait times

CONTINUOUS HEALTHCARE
Information is transmitted and shared in real time between individuals and caregivers

ERROR FREE HEALTHCARE
Sensors, real-time analytics improve diagnoses, reduce procedural errors, and errors in medication administration

MY HEALTHCARE
Care will increasingly be customized to fine tune the approach to the individual and their family

COST EFFECTIVE HEALTHCARE
The most innovative companies improve quality while collapsing extraneous outdated processes and costs

Source: Frost & Sullivan
Global Perspectives
Digital Transformation Occurring in Varying Degrees within Each Region

United States
- $200 M Precision Medicine Initiative
- 75% of large employers now offer some form telehealth services as part of plans (48% in 2015).
- Clarity on FDA guidelines regarding regulation of digital health technologies helping to accelerate growth.

Western Europe
- Google DeepMind working with NHS in UK on a number of health data initiatives.
- Notable start ups targeting care coordination platforms.
- Companies like Philips, Siemens, Nokia investing heavily in consumer digital health.

India
- Make in India movement, and industry accelerator initiatives to lead to the rise of a new breed of home grown medical technology developers.
- Tools are helping to bridge gaps in care continuum.

China
- Regulatory barriers removed for private insurance.
- Over $1.1 B in funding for digital health start ups in 1H 2016 (Pin An Good Doctor, Spring Rain, iCarbonX)

Source: Frost & Sullivan Analysis
Business Model Transformation
Evolving Medical Device Service-Based Business Models
Shifting Focus from Selling Products to Insights

- **Medical Products**
  - Wearables/Biosensors
  - Big Data & Health Analytics
  - mHealth
  - Artificial Intelligence
  - Augmented Reality
  - Robotics

- **Medical Platforms**
  - Product-as-a-Service
  - Data-as-a-Service
  - Platform-as-a-Service
  - Managed Services

- **Medical Solutions**
  - Insight-as-a-Service
  - Automation-as-a-Service
  - Robotics-as-a-Service

**Value for Customer**

- Near Term
  - Sell Parts/Hardware
  - Consumables/Upgrades
  - Repair/Maintenance Support
  - Leasing and Buying Support

- Mid Term
  - Evidence Based Care
  - Real-time Outcome based Care

- Long Term
  - Predictive & Preventive Care

**Technology & Application**

- Wearables/Biosensors
- Big Data & Health Analytics
- mHealth
- Artificial Intelligence
- Augmented Reality
- Robotics

**Market Segments**

- Medical Products
- Medical Platforms
- Medical Solutions

**Strategic Focus**

- Evidence Based Care
- Predictive & Preventive Care

**Additional Technologies**

- Wearables
- Big Data
- Augmented Reality
- Robotics

**Business Models**

- Product-as-a-Service
- Data-as-a-Service
- Platform-as-a-Service
- Managed Services
Emerging Business Models in Healthcare
How do you find the right model for your solution?


Note:
- The size of the bubble represents customer outreach. These business models are not exclusive to each other.
- Some of these models represent B2B2C relationships. The ratings for the business models are relative to each other.

Source: Frost & Sullivan
Novel Point of Care Technologies Transform mHealth
Innovations in Product as-a-Service Business Models

mHealth Enabled Care Market: Revenue Forecast, Global, 2013–2021

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<td>21.4</td>
<td>27.0</td>
<td>27.9</td>
</tr>
</tbody>
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Note: All Figures are rounded. The base year is 2015; Source: **mHealth App Developer Economics 2014, 2015, Frost & Sullivan

Mobile Point of Care Tools

- Withings Blood Pressure
- Philips Lumify
- CliniCloud Smart Devices
- MobiUS SP1 System
- MedWand
- Silhouette Aranz Medical
- EyeNETRA’s NetraG
- Scout Wound Vision
Clinical Grade Wearables Gain Commercial Traction
Novel Data and Platform as-a-Service Business Models

### Healthcare Wearables Segment: Revenue Forecast, Global, 2014–2020

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue ($ Billion)</th>
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<tbody>
<tr>
<td>2014</td>
<td>1.5</td>
</tr>
<tr>
<td>2015</td>
<td>2.4</td>
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<tr>
<td>2016</td>
<td>3.1</td>
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<td>2017</td>
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<td>2018</td>
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<tr>
<td>2019</td>
<td>6.2</td>
</tr>
<tr>
<td>2020</td>
<td>8.3</td>
</tr>
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</table>

Note: The consumer health wearables segment mainly includes unregulated wellness, fitness, and sports wearables with defined health use case(s).

Source: Frost & Sullivan

Medical and Clinical-Grade Wearables

**Cardio and Multi-Parameter Monitoring**
- Vitaliti
- HealthPatch MD
- VitalConnect
- Cura
- Zeon
- Sotera

**Pain Management**
- ViSi Mobile
- Move
dorsaVi
- valedo
- PulseRelief

**Brain Health & Neuro Monitoring**
- Quell
- Thync
- Muse
- Halo
- Evena

**Respiratory/ Sleep Monitoring**
- GoSafe
- Tempo
- Sleep
- Wearable
- SUNSPRITE

**Mother and Infant Care**
- iSono
- OWLET
- Cyrcadia
- Smart Diaper
- PregSense
- Mimo
- Nuna
- Mimo
- Sproutlings

**Other Wearables**
- Balance
- BioSensics
- Tempo
- GoSafe
- Simple
- SENTIMOTO
- TZOA
- Enviro-Tracker

Source: Frost & Sullivan
Artificial Intelligence Systems Automate Decision Support
Enabling Insights as-a-Service Business Models


Note: All figures are rounded. The base year is 2015. Source: Frost & Sullivan
Business Model Innovation Case Studies
Medtronic’s Long Term Strategy in Diabetes
Integrating Devices, Monitoring, & Machine Learning

**Near Term**
- Minimally-invasive Insulin Delivery Device
- Optional Sensor for CGM

**Mid Term**
- Connected devices and biometrics
- Disease-relevant data
- Actionable insights

**Long Term**
- Machine Learning
- Smartphone Control
- Next-gen Delivery Platform

Foundational Device and Sensor-augmented Pump

Image source: wikimedia.org, Minimed_515_2009

Additional Data Sources and Differential Analytics

Image source: medtronicdiabetes.com

Platform-based Intelligence Solutions

Image source: medtronicdiabetes.com

Sensor-augmented Pump

Threshold/Predictive Suspend

Hybrid Closed Loop

Artificial Pancreas

Source: medtronicdiabetes.com, Investor and analyst briefing, Frost & Sullivan
Till Q2 FY16, Medtronic’s Hospital Solutions business has completed 66 long-term CLMS and ORMS agreements with hospital systems, representing over $1.5 Billion in revenue over an average span of 6 years.

Source: Medtronic; Frost & Sullivan
Smith & Nephew Establishes Syncera eCommerce Enables Rep Free Sales Models

Key Components of the Rep Free Solution

1. Medical Device Procurement (Smith & Nephew - Total Knee and Hip Replacement Systems)
2. Hospital Staff Training (Syncera Virtual Backtable - Rapid Surgical Staff Learning)
3. Process Automation (Syncera TrayTouch - Advanced Tray Analytics for OR)

The Syncera solution

Value
1. Hip/Knee implant solutions for progressive customers

Clinically proven
2. Products from Smith & Nephew addressing the vast majority of primary joint procedures

Automation
3. Customer interfaces using innovative technology to reduce cost while improving efficiency

Full support
4. High levels of service and support

Attractive economics
5. Transparent prices driving substantial benefit for providers

Source: Smith & Nephew
OPM—Mass Customization
Leveraging 3D Printing to Personalize Medical Implants

OPM’s OEM Services for Medical Device Implants

**Surgeon**
Share patient’s imaging (MRI or CT scan) for custom solutions

Collaboratively design desired implant using OsteoFab® proprietary 3D-printing process

Shipped within weeks to surgeon

OPM’s Turnkey Contract Manufacturing Services

**OEM Client’s Engineering Team**
Selects approved design files from OPM’s OsteoFab® Platform

Determines manufacturability and provides a price quotation for your review

Shipped within 5 days of receipt of STL file

Image source: Thinkstock, press kit. Source: OPM; Frost & Sullivan

Range of OPM’s Custom-made 3D Implants

- Cranial
- Facial
- Shoulder Reconstruction
- Rib Replacement
- Acetabular Cup
- Small Bones Hand
- Spine
- Spacer for Knee Infection
- Ankle Reconstruction
- Small Bones Foot
- Osteotomy Wedge
Apixio—Insights as a Service
Using Machine Learning to Enable Predictive & Prescriptive Care

Data Acquisition & Processing

Clinical documents (Scanned/Faxed)
Clinical documents (EHR)
Medical/Rx claims

Adaptive and Learning-based Analytics

Quality Profiler and Patient Attribution Extraction
Patient Care Profiles
1

Patient Registry or Certified Engine

Use Case by Applications

Quality Measurement Use Cases

Pay for Performance
Larger Bonuses
Accurate Score
MA Star Ratings
Accurate Score
Better Payment
ACO & CMS Value-based Payment
Accurate Score
Better Payment
Population Health Mgmt
Accurate Alerting
Higher Compliance

Computable EBM Use Cases

Utilization Mgmt
Retrospective/Prospective Analysis
Care Mgmt. Workflows
Prospective Analysis
Provider Performance
Retrospective Analysis
Decision Support
Prospective Analysis

Monetization Model

• Subscription based
• Pay as you go
• Performance based

Source: Apixio Inc.; Frost & Sullivan
Healint – Innovation Happening Across the Globe
Global Platform for Patient Monitoring, Research and Clinical Data (Singapore)

Operating Model

1. Chronic Disease Management
   - Monitoring Devices

2. B2C
   - Inputs - Vitals signs
   - Healint app available on Apple Store

3. B2B
   - Inputs - Data
   - Population study
   - Healthcare Provider
   - Academic

4. Research and Development Institutes
   - Active input by physician
   - Inputs - Data

Actionable Insights

Source: Healint; Frost & Sullivan
Digital Woundcare Opportunities
Integrating Wound Management
Coordinated Care Facilitation the Key to Service Based Solutions

**Current Wound Treatment Paradigm**

**Inefficient:**
- Standardized Protocols
- Clinical Coordination
- Understanding of True Patient Impact

**Integrated Wound Management**

**Prevention**
- Patient Engagement
- Prevent Recurrence

**Diagnosis/Detection**
- Right treatment
- Right Patient, Right Time

**Treatment**
- Wound Bed Preparation
- Healing

**Care Co-ordination/Monitoring**
- Efficient Communication
- Patient Transition

**Data Driven Healthcare**
- Outcomes Tracking
- Best Practices

Source: Frost & Sullivan
Innovation Opportunities
Technology Enabled Solutions to Optimize the Clinical Workflow

Diagnosis & Detection
- Deep Tissue Injury Detection
- Risk Stratification Tools

Point of Care Diagnostics

Treatment
- Healing Technologies
- Next Generation Mechanical/Energy Devices

Co-ordination
- Clinical Algorithms
- Outcomes Tracking

Care
- Data-driven Best Practices

Data Driven Healthcare

Innovation Opportunities

Source: Frost & Sullivan; Image Source: http://imageresource.gilcommunity.com/
Digital Health in Wound Diagnostics
Innovative Point of Care Tools Help Track Wound Healing
Digital Health Support in Wound Care Workflow
Digital Tools Help Connect a Fragmented Clinical Environment

+ WoundDesk

WoundRight

WoundRounds

TISSUE ANALYTICS

parable

pixalere
Conclusion
6 Common Points of Failure in Digital Health Solution

- Over Engineered – Unnecessary Device Complexity
- Lack of Interoperability
- Security Vulnerabilities
- Unreliable/Inaccurate Data
- Targeting the Wrong Customers
- Business Model Flaws

Source: Frost & Sullivan Analysis
For Additional Information

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Appendix-
Supplementary Analysis & Case Studies
Making the Transition from Reactionary to Predictive & Proactive Care Intervention

Artificial intelligence systems enable the conversion of information into insights.

These tools can draw correlations and connections between seemingly unrelated data sets.

Data Collection

Analysis

Comprehension

Information Accessibility Automated Support Decision Support

Outputs are curated and adapted to a variety of use case scenarios supporting:
- Automated tasks
- Real time decision support
- Long term planning

Capture Storage Security

Most data today in healthcare is unstructured and difficult to share. Outputs and insights can only be as valuable as the information being integrated.

Neural Networks Fuzzy Logic Expert Systems

Information is analyzed in a manner similar to human brain function towards pattern recognition and learning. Reasoning is applied to ‘fuzzy’ or incomplete information, and expert systems provide recommendations for decision support.
Precision Medicine Involves More than Just Genomics

**Precision Medicine**

- Omics/Dx Factors
- Exogenous Factors
- Clinical Factors
- Real-Time Monitoring Factors

**Patient**

**Functions**

- **Reduce** adverse drug reaction (ADRs)
- **Reduce** Ineffective prescriptions and treatments
- More **accurate** and **rapid** determination of response to therapy
- **Patient-empowerment**
- Enhanced data for **future** scientific discoveries

**Benefits**

- More **effective** and **safer** therapeutics
- More **precise predictions** of diseases
- **Earlier** disease detection
- Shift to more **patient-centric care**
- Increased **value-based care**
- New **monetization opportunities**

Source: Frost & Sullivan
Validic API—Interoperability
Bridging the interoperability gap between healthcare companies and digital health technologies

Cloud-based Technology Platform:
Standardizes and normalizes the data in an easily digestible format

Clinical, Fitness, and Wellness Data from Non-hospital Settings
- Health Apps
- Implants
- Home Medical Devices
- Peripherals
- Wearables
- On-body/In-home/RPM
- Activity Monitoring
- Other mHealth Solutions

Pushes Scattered and Unstandardized Data

Pulls Aggregated and Standardized Relevant Health Data

Source: Validic; Frost & Sullivan
Till Q2 FY16, Medtronic’s Hospital Solutions business has completed 66 long-term CLMS and ORMS agreements with hospital systems, representing over $1.5 Billion in revenue over an average span of 6 years.

Source: Medtronic; Frost & Sullivan
physiQ - Personalized Predictive Analytics Solution

DaaS Business Model - Transform and personalize multivariate data set from wearables/sensors

1. Consumer Device + physiQ Predictive Analytics Platform Solution
   - B2B2C

2. Cloud-based Personalized Predictive Analytics Platform
   - FDA 510k-cleared

3. Healthcare Providers and Payers
   - B2B

- Partnership with OEMs/Software Providers

- Consumer wearables OEMs

- Clinical Wearables OEMs

- Physician remotely access personalized health index and provide personalized consultation/medication
- Wellness professional leverages fitness index to personalize activity and diet

Marketing Channels
- Direct
- Indirect

Source: physiQ; Frost & Sullivan