Understanding Interoperability with the IHE Profiles

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IHE Patient Care Devices, Continua, IEEE 11073 and HL7

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Presentation Objectives

1. Aspects of Interoperability
2. IHE and IHE Patient Care Devices
3. Semantic Interoperability and Conformance Testing
4. Continua Health Alliance (reference)
5. Convergence
Section One:
Aspects of Interoperability
Introduction

• As hospitals deploy EMRs into their most critical care areas, the need to acquire data directly from Medical Devices becomes increasingly evident.
  – Device data capture is “real-time”
    • Data is up-to-date
    • Clinical Decision Support algorithms can run on more timely data
  – Device data capture is “automatic”
    • Reduce nursing workload
  – Device data capture is “accurate”
    • Least error-prone method

1 Healthcare IT News - Michelle McNickle based on an interview with Shahid Shah
Medical Device Data and the EHR

• Simple question ...
  – How do we get Medical Device data into the EHR?

• Simple answer...
  – Provide interoperability between Medical Devices and the EHR ...

• Actually, not so simple...
What is Interoperability?

• HIMSS defines Interoperability as ...
  – *Interoperability means the ability of health information systems to work together within and across organizational boundaries in order to advance the effective delivery of healthcare for individuals and communities.*

• Not much about medical devices ...

• High-level definition, primarily focused on HIEs and less so regarding interoperability within a ward or at the bedside where medical devices are used
What is Interoperability?

• AAMI has recently offered its definition, with a greater focus on medical devices ...
  
  — Medical device interoperability is the ability of medical devices, clinical systems, or their components to communicate in order to safely fulfill an intended purpose.

• Includes concepts of safety and intended purpose

• Still under development and review
## Essential Aspects of Interoperability

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Standards (not exhaustive)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workflow / Interaction</td>
<td>IHE, DICOM, HL7, Continua, CIMIT ...</td>
</tr>
<tr>
<td>supporting one or more use cases</td>
<td></td>
</tr>
<tr>
<td>Messaging / Data Flow</td>
<td>SNOMED-CT, LOINC, IEEE 11073, ...</td>
</tr>
<tr>
<td>• Vocabulary (semantics)</td>
<td>HL7, IEEE 11073, DICOM, ...</td>
</tr>
<tr>
<td>• Format (syntax)</td>
<td>XML, HL7 V2 ER, text, binary, ...</td>
</tr>
<tr>
<td>• Encoding</td>
<td></td>
</tr>
<tr>
<td>Message/Stream Transport and Physical Layers</td>
<td>RS-232, Ethernet, 802.11, Bluetooth, USB, TCP/IP, HL7 MLLP, MIME, ...</td>
</tr>
</tbody>
</table>
We have Interoperability ... right ???

• Are current solutions that meet these definitions adequate?
  – Most, if not all, EMRs can communicate with devices
  – We have a growing contingent of vendors (Capsule, Nuvon, iSirona, Cerner, etc.) providing device integration middleware and services.
  – Patient monitoring vendors have created interoperable systems incorporating many 3rd party devices.
  – Clinicians have developed many demonstrations and applications showing device interoperability.

• These all meet the definition of Interoperability.
• So, maybe we already have Interoperability...
We have Interoperability – but at a cost

• **Expensive** device “middleware” and custom integration
• Potential **safety issues** due to extensive field integration and on-site customization effort
• **Limited choice** of devices due to lack of established IT interfaces
• **Inability to provide efficient care** in certain clinical scenarios due to the lack of required data
• **Continuous support issues** as device or system software is updated and interfaces are lost and the overall **complexity** of maintaining each link in the communication chain
• The complexity of device interfacing may **hinder research** that could lead to improved patient care in the future
Is this the best we can do?

• When we say systems are Interoperable, does that mean that as long as there is some way of getting “stuff” from one system to another, we are happy?
• Or, do we expect that we only need to connect these systems with each other and stand back, satisfied that the job is done?
• Clearly we should be focused on achieving the second approach ... sometimes referred to as “Plug and Play Interoperability”
How can we Improve Interoperability?

- Use **standards** to provide more economically effective solutions by amortizing the cost of design over many implementations.
- **Profile standards** to reduce optionality and simplify implementation and testing.
- Provide **computable definitions** of message syntax and semantics.
- Use **rigorous conformance** and certification testing.
- Use regulatory pathways to encourage use of standards.
- Use other incentives to promote acceptance ...
- **There are several organizations that are working towards achieving this in the medical device space ...**
- **This presentation will focus on IHE PCD and Continua ...**
Section Two:
IHE PCD and Interoperability
On the Road to Interoperability: Standards to Profiles to Implementations

Base Standards

- OASIS
- IETF
- ISO
- W3C
- DICOM
- CEN
- IEEE
- HITRUST
- ASTM
- CDISC
- LOINC
- HL7
- IHTSDO

Profile Development

- IHE

Interoperable Implementations

Specific Extensions

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ACCE AAMI HIMSS
IHE Development Process

1. **IHE Profiles Drafted & Revised**
   - Published For Public Comment
   - IHE Technical Framework Developed
   - Profile Selection by Committees
   - IHE Call for Proposals Opens
   - 1-5 mos.

2. **Trial Implementation Posted**
   - 6-13 mos.

3. **Test at IHE Connectathons**
   - Published in IHE’s Product Registry
   - 14-18 mos.

4. **Demonstrate at a HIMSS Interoperability Showcase**
   - Install Interoperable products in Clinical Settings worldwide

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**IHE Improves, Safety, Quality and Efficiency in Clinical Settings.**
Role of IHE PCD

• IHE PCD was formed in 2005 to address issues related to integration of Point-of-Care medical devices:
  – with each other and
  – with enterprise systems

• IHE PCD wants to “raise the bar” from the current state of expensive integration projects to “out of the box” interoperable solutions.
Profiles Simplify Development!

Standards

IHE PCD Technical Frameworks
PCD Domain Profiles

Developed
The DEC profile allows a consuming system (DOC) to receive patient clinical information including vitals, demographics, settings, and location from a reporting device/system (DOR).

The Subscribe to Patient Data (SPD) option allows the consumer to filter the data by:

- Medical Record #
- Device Class
- Update Interval

- Start & End Times
- Parameter Class
- Patient Location

Diagram:

- Device Observation Reporter (DOR)
- Device Observation Filter (DOF)
- Device Observation Consumer (DOC)
- PCD-01
- PCD-02

Connections:

- EMR
- CIS
- CDSS
- Research
**IHE PCD Device to Enterprise**

### Messaging

| HL7 V2.6 constrained by IHE DEC PCD-01 and RTM |

### Semantics

| IEEE 11073-10101 base nomenclature, |
| –10201 Domain Information Model (DIM) |
| –10103 Implanted Device Cardiac (IDC) |
| and IHE PCD Rosetta Extensions (RTM) |

### Transport

**Message Transport**

| HL7 MLLP |
| IHE HL7 V2 Msg Transport |
| HL7 Minimum Lower Layer Protocol (MLLP) over TCP/IP |
| (behind the firewall) |
Home health – Key connection Standardized

IHE and CONTINUA have agreed to support the single common IHE DEC profile for feeding home device data and clinical device data into health records.

With permission, Continua Alliance
Continua WAN and IHE DEC

**HL7 V2.6 constrained by**

**IHE DEC PCD-01**

<table>
<thead>
<tr>
<th>IEEE 11073-10101 base terms,</th>
</tr>
</thead>
<tbody>
<tr>
<td>–20601 Base Personal Health Device Standard</td>
</tr>
<tr>
<td>–104xx PHD device specializations (terms)</td>
</tr>
<tr>
<td>and Continua Design Guidelines 2012 (with semantic co-constraints for WAN)</td>
</tr>
</tbody>
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</tbody>
</table>

### Message Transport

**Web Services WS-I BP**

IHE IT Infrastructure TF Vol 2 Appendix V Rev 6.0

*WS-I BP over SOAP 1.2*

*Plus WSI-BSP, TLS and IHE ATNA*

(beyond the firewall)

**HL7 MLLP**

IHE HL7 V2 Msg Transport

*HL7 Minimum Lower Layer Protocol (MLLP) over TCP/IP*

(behind the firewall)
[WCM] Waveform Content Module

Continuous Waveform Data

Alarm Evidentiary Data

Waveform Group

Waveform Attributes

Waveform Events

Waveform Data

Waveform Filter Descr.

Waveform Data Attr.

Waveform

PCD-01

PCD-04

In-Hospital Access

Mobile Access

Remote Access

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Alarm Communication Management

HL7 Messages per ACM and WCM profiles

Parameters, waveforms, etc. as evidentiary data items

Device Specific graphics

Alarm Reporter (AR)

Report Alarm PCD-04

← PCD-05

Report Alarm Status

Alarm Manager (AM)

Disseminate Alarm PCD-06

← PCD-07

Disseminate Alarm Status

Alarm Communicator (AC)

Alarm Information

Source, Phase, State, Priority
Patient Location
Instance
Alarm text
Callback
Timestamp
Evidentiary data

Dissemination Status

Instance
Accepted by AC
Undeliverable
Delivered
Read
Accepted
Rejected
Cancelled
Callback start/stop

Alarm Source

[ACM]

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Point of Care Infusion Verification

Physician's Order

Nurse Review

Pharmacist Review

Medication Administered

- Right Patient
- Right Medication
- Right Dose
- Right Time
- Right Route
- Right Device

BCMA to Pump (PCD-03)
Pump may provide data to EMR (PCD-01)
Infusion Pump Event Communication enables reporting of clinical and operational events from an infusion pump to a Bedside Computer-assisted Medication Administration (BCMA) system or EMR. Clinicians can then view and validate this information for infusion documentation.

**BCMA/EMR**

Prior to medication administration, nurse confirms the 6 Rights of administration using BCMA/EMR:
- Right Patient
- Right Medication
- Right Dose
- Right Time
- Right Route
- Right Device

Infusion-related events are displayed, validated, and/or recorded by the clinician using the BCMA/EMR

Infusion order sent from BCMA/EMR to Pump (PCD-03)

Pump provides information on infusion-related events to BCMA/EMR (PCD-10) such as:
- Delivery Start
- Delivery Stop
- Delivery Complete
IDCO profile defines sending of pacemaker and Implantable Cardiology Defibrillator data

Collect device data from:
- Device implant
- In-clinic visits
- Remote transmissions from patient’s home

Includes data for:
- Current device state
- Event/episode information
- Device-collected electrocardiograms

Device Implant Procedure

In-clinic Follow-up

Patient Home Monitoring

Forward raw data to company data processor systems

Company Proprietary Formats

Company Processors

IDCO data transfer to EHR

Process/convert data into XML format & PDF reports

Clinician views data in EHR

Hospital, Other EHRs
PCD Domain Profiles

Under Development
[PCIM]  
Point-of-Care Identity Management

**Unique identification of patients and devices at the enterprise level? Covered!**

**Identity capture and notification at the patient-centric point-of-care?**

**Patient & device association and release?**

**Mobile clinical context management?**

The emerging Point-of-Care Identity Management (PCIM) profile aims to provide those capabilities needed to address these questions and support...

- Unique Device Identification & Notification
- Patient & Clinician Identification Notification
- Patient + Device Association
- **ALL** IHE device data exchanges
- Association Life Cycle Management
- Mobile & Dynamic Context Management
- ID Capture Technology Neutral:
  - Bar Code
  - RF-ID
  - Ultrasound
  - RTLS
  - ...
Asynchronous Data Query

Supports retrospective query of PCD data from databases. Supports Use Cases such as Clinical Decision Support, back-filling of EMR databases, etc.
Medical Equipment Management

Location Services
- Current location
- Previous locations (Trending)
- Boundary controls (Alarm when device leaves area)

Patch Management
- Pending patches
- Patch history

Battery Management
- On A/C or D/C?
- Charge level (% of full)/Est. operating time left.
- Charging / Discharging history
- Battery type and installation date
- Est. battery life

Operational Status and Monitoring
- Is the device currently in use
- Usage history
- Alarms – which are active, what the trigger levels, how long has the alarm been on
- Day/time of last self check and its result
- Event log recording
- Preventative Maintenance
  - Last PM
  - Next scheduled PM
  - Last repair time/date

Device Configuration Management
- Recall Management
  - Unique device identification
  - Hardware configuration (serial numbers, etc)
  - Software configuration (revision numbers, etc)
- Device Reconfiguration
  - Use profiles (NICU vs. CICU)

Risk Management
- Risk analysis
- Risk evaluation
- Verification of risk control measures
- Residual risks

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HIPAA
HITECH
FDA:
  • 21 CFR 801, 803, 807, 812, 814, 820
  • MDDS
IEC 80001
IHE PCD
MDS²

Security

Cyber Protection
Configuration Management
Asset Discovery

CE/IT Management
Lifecycle Mgmt.
ePHI Breach Risk

Privacy

Network Access Control
Access Control
Key Management

Medical Device

Encryption

Authentication

ACCE AAMI HiMSS

Medical Device Security & Mgmt.

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Section Three:
Semantic Interoperability and NIST Conformance Testing
Semantic Interoperability

Objective:

• Communicate medical device data using a single unified nomenclature and semantic model that can be rigorously defined and enforced to facilitate safe and effective plug-and-play interoperability.
[RTM]
Rosetta Terminology Management

ISO/IEEE 11073 Semantic Standards

Vendor Semantics

Vendor A → RTM
Vendor B → RTM
Vendor C → RTM

Vendor Terms → Harmonized Terms

RTM 1500 rows → hRTM 590 terms

IHE PCD Technical Framework Content

HL7 V2 Messages
HL7 V3 CDA/CCD
11073 PnP Comm

- Open consensus process
- Observation identifiers and co-constraints
- New terms incorporated into standards
- hRTM used for conformance testing
IHE PCD Harmonized Rosetta (hRTM)

Specifies for each IEEE 11073 REFID observation identifier:

• the 11073 MDC and UCUM units-of-measure
  - includes dimensional analysis to ensure correct ‘units-math’
• enumerated values and measurement sites
• numeric codes, where appropriate

An extract from the hRTM is shown below:

<table>
<thead>
<tr>
<th>Group</th>
<th>REFID</th>
<th>DIM</th>
<th>UOM_MDC</th>
<th>UOM_UCUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVS_ECG_HR</td>
<td>MDC_ECG_HEART_RATE</td>
<td>T-1</td>
<td>MDC_DIM_BEAT_PER_MIN</td>
<td>{beat}/min {beats}/min 1/min /min</td>
</tr>
<tr>
<td>CVS_ECG_ST</td>
<td>MDC_ECG_AMPL_ST_I</td>
<td>ML2I-1T-3</td>
<td>MDC_DIM_MILLI_VOLT</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ML2I-1T-3</td>
<td>MDC_DIM_MICRO_VOLT</td>
<td>uV</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MDC_DIM_MILLI_M#</td>
<td>mm# (added by scripting rule)</td>
</tr>
<tr>
<td>GASMON_AA_ENFL</td>
<td>MDC_CONC_ENFL_ET</td>
<td>L3L-3</td>
<td>MDC_DIM_VOL_PERCENT</td>
<td>%{vol}</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LMT-2L-2</td>
<td>MDC_DIM_KILO_PASCAL</td>
<td>kPa</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LMT-2L-2</td>
<td>MDC_DIM_MMHG</td>
<td>mm[Hg]</td>
</tr>
</tbody>
</table>

IHE and NIST Collaboration

- IHE and NIST have had an active collaboration for the past seven years, with a strong focus on the IHE PCD profiles.
- NIST supports IHE PCD HL7 V2 message conformance testing, including syntax and semantics, with the latter now supported by the on-line RTMMS distributed data base that replaces the RTM and hRTM.
- NIST has established a framework for IHE PCD covering increasing complexity over the next five years, including support for virtual and face-to-face connectathons as well as year round testing.
- Other collaboration and development, beyond IHE PCD:
  - ISO/IEEE 11073 Standard (X73): Medical Device Communication
  - ISO/IEEE 11073 Personal Health Devices (X73_PHD)

Visit [http://www.nist.gov/medicaldevices](http://www.nist.gov/medicaldevices)
IHE Connectathon – in the dungeon...
PCD – HIMSS Interoperability Showcase 2011
How to Participate
PCD Planning Committee

Planning Committee
• Recruitment
• Education
  • Presentations
  • White Papers
• Review IHE Profile Proposals
• Identifies committee priorities and problems
• Meets every 2 weeks alternating with TC

Contact Information
• Project Mgr: Manny Furst
  – pcd@accenet.org
• Co-Chair: Ken Fuchs
  – Mindray North America
• Co-Chair: Steve Merritt
  – Baystate Health
• Google Group
  – ihepcdplan@googlegroups.com
• Committee’s Wiki
PCD Technical Committee

Technical Committee
• Recruitment
• Development of IHE Profiles
• Maintenance of IHE Technical Frameworks
• Development of test scripts
• Work with NIST on automated testing
• Meets every 2 weeks alternating with PC

Contact Information
• Project Mgr: Manny Furst
  – pcd@accenet.org
• Co-Chair: John Garguilo
  – NIST
• Co-Chair: John Rhoads
  – Philips Healthcare
• Google Group email
  – ihepcdtech@googlegroups.com
• Committee’s Wiki
Overview of IHE-PCD

Value Propositions for medical device interoperability

Advice on how to specify IHE in technology assessment

Tools to find IHE-PCD compliant products

Guidance on installation testing to confirm that IHE capabilities are functioning properly

Issues to consider when installing and configuring IHE-compliant system

Identifying and addressing potential problems in order to maximize your benefit despite existing “legacy” systems

RFP Guidance

How can we help?
- Standards-based approaches reduce integration headaches
- Easily identify which IHE profiles support your clinical needs
- Reduce ‘wiggle room’ for suppliers by clearly defining requirements

Right tune, wrong words?
- We help you spell out terminology support, from
  - T0: None: ad-hoc value sets for each client site
  - T1: Vendor-specific codes and value sets, consistent across all clients and sites
  - T2: Mix of vendor-specific and standard codes
  - T3: Standard codes only from certain standards
  - T4: IHE PCD Rosetta Terminology Mapping

How do I get it?
- Visit www.ihe.net/pcd/

Look up specific RFP requirements by clinical function

Having trouble making heads or tails of this?

<table>
<thead>
<tr>
<th>I want this vendor system (Sender)</th>
<th>To send this information (Requirements)</th>
<th>To another vendor system (Receiver)</th>
<th>What is my RFP language for the sending system?</th>
<th>What is my RFP language for the receiving system?</th>
<th>What is the related IHE-PCD transaction?</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPOC or Pharmacy</td>
<td>Drug ID and dosing/programming information</td>
<td>Pump server</td>
<td>Shell Support PIY as the IOR</td>
<td>Shell Support PIY as the IOR</td>
<td>PCD-03 as specified by both IOR and ICD</td>
</tr>
<tr>
<td>CPOE, BPOC or Pharmacy</td>
<td>Start Order infusion</td>
<td>Medication Administration Record (eMAR)</td>
<td>Shall Support PIY as the IOR</td>
<td>Shall Support PIY as the IOR</td>
<td>PCD-03 as specified by both IOR and ICD</td>
</tr>
<tr>
<td>Pump server</td>
<td>Infusion documentation</td>
<td>Medication Administration Record (eMAR)</td>
<td>Shall Support PIY as the IOR</td>
<td>Shall Support PIY as the IOR</td>
<td>PCD-03 as specified by both IOR and ICD</td>
</tr>
<tr>
<td>Pump server</td>
<td>Alarm: something’s wrong with this pump</td>
<td>Secondary alarm manager</td>
<td>Shall Support ACM as the AM</td>
<td>Shall Support ACM as the AM</td>
<td>PCD-04 as specified by both AR and AM</td>
</tr>
<tr>
<td>Secondary alarm manager</td>
<td>Alarm: status (e.g., accepted by a nurse)</td>
<td>Pump server</td>
<td>Shall Support ACM as the AM</td>
<td>Shall Support ACM as the AM</td>
<td>PCD-05 as specified by both AR and AM</td>
</tr>
<tr>
<td>HIS</td>
<td>Patient identification Info</td>
<td>Pump Server</td>
<td>Shall Support ITH-030 as the PDS</td>
<td>Shall Support ITH-030 as the PDC</td>
<td>ITH-030</td>
</tr>
</tbody>
</table>
Vendor support for IHE PCD

- Accent on Integration
- Amcom
- Biotronik
- B Braun
- Carefusion
- Cerner
- Epic
- GE Healthcare
- Hospira
- iMDSoft
- iSirona
- Mindray
- Nuvon
- OZ Systems
- Philips Emergin
- Philips Healthcare
- ScottCare
- St. Jude Medical
- Surgical Info. Systems
- Vocera
- Welch Allyn
Section Four:
Continua Health Alliance -
Personal and Home Health Devices
End-to-End Connectivity Framework

Devices
aka Agents

Aggregation
Manager

Telehealth
Service
Center

Health
Records

PAN
Personal
Area
Network

LAN
Local
Area
Network

WAN
Wide
Area
Network

HRN
Health
Reporting
Network

HITSP RMON
IS 77

SDE #1

SDE #2

SDEs #3+

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IEEE 11073 Personal Health Devices

• Supports three domains –
  – Disease Management
    • Agent examples: Pulse oximeter, Heart rate monitor, Blood pressure monitor, Thermometer, Weighing scale, Glucose meter, ECG 1 – 3 lead, INR, Insulin pump, Body composition analyzer, Peak flow
  – Health and Fitness
    • Agent examples: Heart rate monitor, Weighing scale, Thermometer, Cardiovascular fitness and activity monitor, Strength fitness equipment, Physical activity monitor
  – Independent Living (Aging Independently)
    • Agent examples: Disease management devices plus Independent living activity hub, Medication monitor
Section Five:

Convergence over the WAN – personal and clinical medical device data
Why should they be different?

- Device
- Intermediary

**Device**

**Intermediary**

**SDE #1**

**Personal or Home Setting**

**EHR or Care Coordination Applications**

**SDE #2**: IHE DEC over WS*

**SDE #3**+

**Hospital Setting**

IHE DEC: *Same protocol used in two settings...*
Two great organizations ...  
... **collaborating rather than competing**

Do the same thing the same way
  – a temperature is a temperature, no matter where it is taken
  – *so why not send the data the same way!*

Share best practices ...
  – learn from each domain, *clinic to personal* and *personal to clinic*
  – use the same protocols, documentation and conformance tooling
  – achieve a critical mass, *and others will join ...*

... to the benefit of the clinicians and patients we serve.
  – cross-diffusion of devices used in personal, home or clinic settings
  – facilitate use of more advanced devices at home
Clinical Devices Connectivity Procurement

**Departmental Devices and Mgmt Systems**
- Acute care
- Cardiology
- Surgery
- ER, others …

**Hospital Device Gateway(s)**
- IHE DEC Profiles: PCD+RTM, SPD, PIM, ACM, PIV, WCM, IDCO...
- Internal Hospital Network

**Hospital Health Records**
- Health Information Exchange
- IHE Content Profiles, XDS, XDR

**Remote EHRs**

**Note:** IHE Profiles shown above were demonstrated at HIMSS12 as trial implementations; The IHE DEC PCD-01 Technical Framework “Final Text” was published in Q3 2011.
Personal Devices Connectivity Procurement

Note: The PAN, LAN, WAN and HRN Interfaces are specified in the Continua Design Guidelines 2012. Continua has a comprehensive certification program for all supported interfaces.
Concluding Remarks

• Want to interface clinical devices to your EHR?
  ➔ IHE Patient Care Device Profiles

• Want to interface personal devices to your EHR or Care Coordination System?
  ➔ Continua Design Guidelines

• Want to share personal device monitoring data between EHRs, PHRs and Care Coordination Systems?
  ➔ IHE XDS/XDR/XDM plus CDA/PHM

Consistent specifications, implemented, tested and demonstrated at the HIMSS Interoperability Showcase.
For further information

**Integrating the Healthcare Enterprise**
IHE Web: [www.ihe.net](http://www.ihe.net)  
PCD Web: [www.ihe.net/pcd](http://www.ihe.net/pcd) and [www.accenet.org/ihe](http://www.accenet.org/ihe)  

**Continua Health Alliance**
Web: [http://www.continuaalliance.org](http://www.continuaalliance.org)  

**National Institute of Standards and Technology**
Web: [http://www.nist.gov](http://www.nist.gov)  
Medical Devices: [http://www.nist.gov/medicaldevices](http://www.nist.gov/medicaldevices)
Questions?
Thank you!

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IHE Patient Care Devices and Continua Health Alliance
IEEE 11073 and HL7 Health Care Devices SIG
IHE PCD Rosetta Terminology Mapping Working Group Chair