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*A Metabolic Syndrome Health Check
EHR based on openEHR*

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Research Background

- EHR* is a promising technology to improve quality, efficiency, and reduce the cost of care.
- However, adoption rate of EHR* is low due to the lack of accepted standard for EHR.
- Current problems in healthcare industry are:
 1. Lack of standard;
 2. Lack of interoperability: difficult to share information and to exchange patient data between hospitals ;
 3. Lack of flexibility: because of the lack of clear layer separation between clinical domain expertise and technical domain expertise. It is difficult to change or add new features.

*(EHR) Electrical Health Record

Research Objective

- Study the existing open source initiative EHR architecture, called openEHR¹ which claims to offer open access to:
 1. documents
 2. software source (including schemas, interfaces)
 3. executable software
 4. and knowledge products, such as terminologies
- Use openEHR architecture to build an EHR for metabolic syndrome check² to examine:
 1. Interoperability
 2. Flexibility
 3. Future standard possibility
- Review the relationship between openEHR and other standards including ISO³, CEN⁴ and HL7⁵

1. openEHR : www.openehr.org
2. (Metabolic Syndrome check) **特定健康診査**
3. (ISO) International Organization for Standardization
4. (CEN) Committee European Normalization
5. (HL7) Health Level Seven

Metabolic Syndrome EHR Prototype

- In April 2008, MHLW¹ of Japan started the metabolic syndrome check² for age between 40 to 74 years old in Japan.
 - To achieve the research objective, a prototype was created for Metabolic Syndrome test result, for example, height, weight, abdominal circumference, lipid test, liver function test and Body Mass Index (BMI).
 - Currently, Metabolic Syndrome EHR Prototype is implemented on a PC within a secure intranet-based network environment, thus allowing metabolic syndrome test result to be shared locally.

1. (MHLW) Ministry of Health, Labour and Welfare
2. (Metabolic Syndrome check) **特定健康診査**

Metabolic Syndrome EHR Prototype

Metabolic Syndrome Record

First Name Last Name

Date of Checkup

Questionnaire. Please tick if you experience the following disease.

Question	Comments
<input checked="" type="checkbox"/> Taking blood Pressure Medication?	High blood pressure needs to be controlled through daily monitoring.
<input type="checkbox"/> Insulin injection or Blood sugar medication?	
<input type="checkbox"/> Taking cholesterol medication?	
<input type="checkbox"/> Have cerebrovascular?	
<input checked="" type="checkbox"/> Have renal failure?	
<input type="checkbox"/> Have heart Disease?	
<input type="checkbox"/> Have anemia?	
<input checked="" type="checkbox"/> Have high blood pressure?	

Body Measurement

Height cm BMI kg/m²

Body weight kg Waist circumference cm

Blood pressure

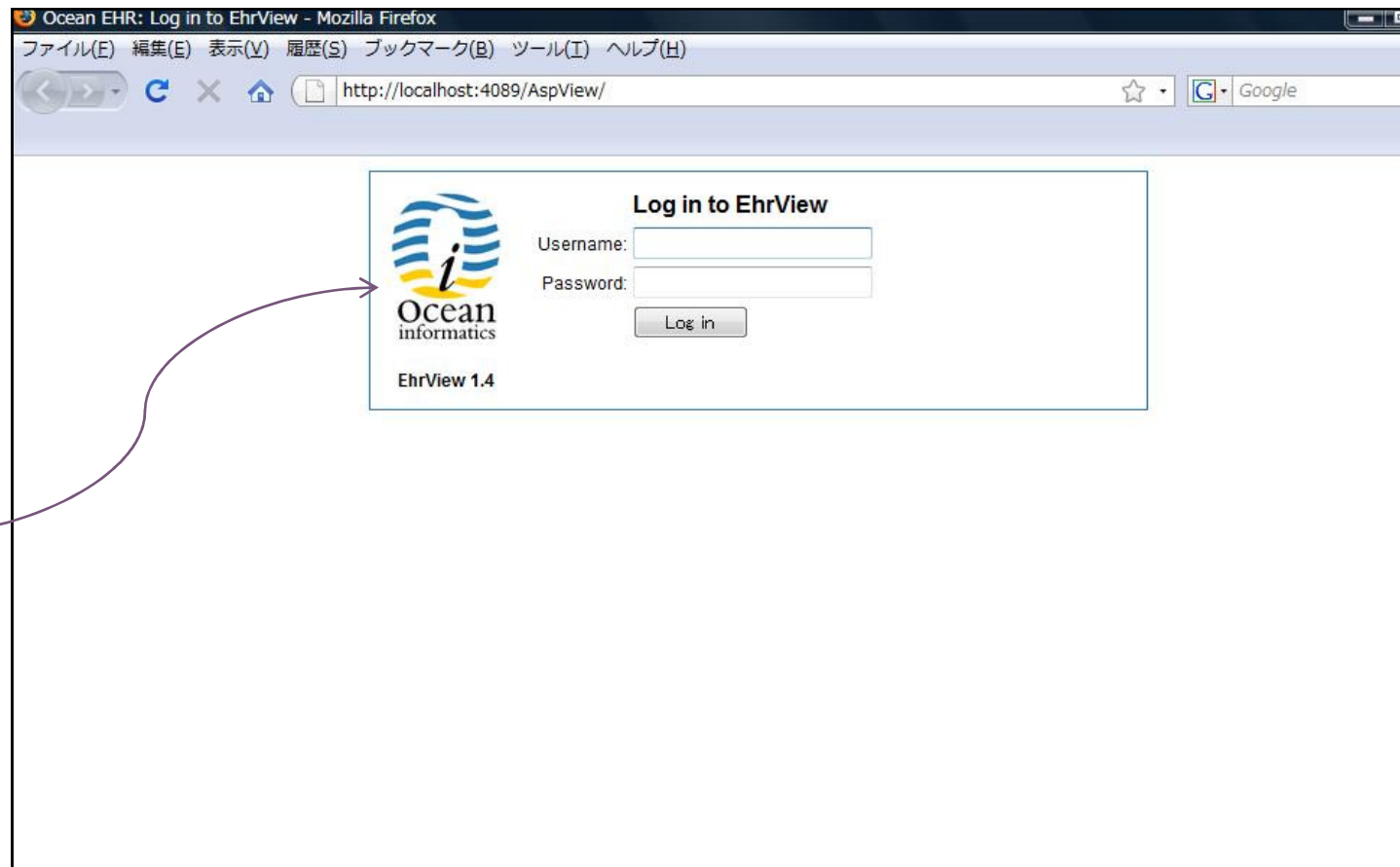
Systolic mmHg Diastolic mmHg

Lipid studies	Liver Function Tests
HDL-Cholesterol <input type="text" value="95"/> mg/dl	AST(GOT) <input type="text" value="21"/> IU/l
LDL-Cholesterol <input type="text" value="151"/> mg/dl	ALT(GPT) <input type="text" value="16"/> IU/l
Total Cholesterol <input type="text" value="262"/> mg/dl	Gamm GT <input type="text" value="18"/> IU/l

Medical history

Laboratory test

Use Ocean EhrView to view test result(1)



**Login with
Username
Password**

Evaluation(1)

- Using the metabolic syndrome EHR prototype, the following features were confirmed regarding the openEHR architecture:
 1. Separation of clinical domain and technical domain:
 - I, a software engineer, could develop, in two months, the metabolic syndrome EHR prototype using archetypes, developed by medical experts and a tool (template designer) provided in the openEHR software repository.
 2. Flexibility to change
 - In creating the above prototype, I could easily add, and sometimes, delete archetypes in the EHR template.
 - Archetypes would be able to expand to accommodate new findings of the medical discipline.
 - Medical experts can change or create new archetypes using the software tool, Archetype Editor.
 3. Interoperability
 - I could not confirm the interoperability by myself, but I am following closely the developments of interoperability discussions currently taking place among experts of openEHR, HL7 and CEN to confirm this.
 4. Openness
 - I found that some openEHR software tools and repository are completely open, while some others require a license.
 - Having obtained an academic license, Kano Lab students including myself are able to access openEHR software tools and repository from our lab in GITS.

Evaluation(2)

- User Evaluation:
 - Results of survey questionnaire from 62 people mostly my friends and acquaintance in Japan with average age of 28.
 1. They replied that the EHR prototype is easy to use, and, therefore, they are willing to use it.
 2. Respondents are either using the prototype EHR on their own PC, or were shown demonstration on my computer. They expressed the hope that they would like to use it, but they expressed preference to use it over the internet.
 3. User's feedback shows they are ready to use EHR and the only concern is security. The openEHR software does not provide security measures. The responsibility lies in each software implementer.

Evaluation(3)

- Interview with an expert; a practicing nurse, a healthcare consultant and a doctor course student at a medical university.
 1. She was impressed with the flexibility in the openEHR architecture provided by the separation of medical domain specialists from software engineers.
 2. She was also impressed by the openness and potential interoperability of openEHR architecture.
 3. She said that there were already several proprietary implementations of metabolic syndrome test results. They were not interoperable and this would create a big problem in the future.

Conclusion

- openEHR provides an open environment to users:
 1. Everyone can have accessibility to openEHR specification.
 2. openEHR reference model can be used as a structure to build any EHR application.
 3. Flexibility to accommodate changes are confirmed.
 4. It offers a non-medical background user an opportunity to provide an EHR for various diseases in the world.
- Future improvements are required for an openEHR approach in the following:
 1. Web-based design with full security measures.
 2. To implement Japanese language version.

THE END

THANK YOU VERY MUCH

REFERENCE:

- openEHR <<http://www.openehr.org/home.html>>
- Ocean Informatics ,Australia <<http://oceaninformatics.biz>>
- Japan Medical Association <<http://ww.med.or.jp>>
- **特定健診・特定保健指導** <<http://www.med.or.jp/chiiki/kenshin/index.html>>
- Health Level Seven (HL7) <<http://www.hl7.org>>
- Comité Européen de Normalisation (CEN) <<http://www.cenorm.be>>
- Metabolic syndrome check : Japan Ministry of Health, Labour and Welfare <<http://www.mhlw.go.jp/bunya/shakaihoshou/iryouseido01/info02a.html>>
- T. Beale, S. Heard, 2007, openEHR : Architecture Overview <<http://www.openehr.org/releases/1.0.1/architecture/overview.pdf>>
- Ocean Informatics clinical tools : Archetypes Editor software <<https://wiki.oceaninformatics.com/confluence/display/TTL/Archetype+Editor+Releases>>
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