Human Resource Assignment and Role Representation Mechanism with the “Cascading Staff-Group Authoring” and “Relation/Situation” Model

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Medinfo'2001 on Sept-05 in London

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Account and attributes, Access Log

- Security and confidentiality
- Workflow control in a system
- Human resource management

(extracted form and edited: CEN ENV 13606-3:2000)
Strategy

- Represent reason/role/party with plural methods
- Satisfy time-to-time needs
- Suppress the increase of system admin cost
  - Each should be simple and economical
  - Each should be independent
  - Trusted users are allowed same latitude for a part of “system administration works”
- The “Pt-Dr Relation and Clinical Situation” model
- The “Cascading Staff-Group Authoring” mechanism
- Access control matrix
“Party” model and “Care Group” class

- Boss
- Chief
- care group inside dept
- dept. A
- care group intra-dept
- dept. B
- dept. C

Department
Healthcare Party
Who
Care group
Cost/Profit distribution policy

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Cascading Staff-Group Authoring

(designed in 1995, implemented in 1999)

director

system admin

group chief

certifier

group chief

staff

department A

department B

request
authorize

certify

recruit

Tier 1

Tier 2

Tier 3
Operation for group authoring
Login sequence

console

account passwd

system modules

identify / certify

capacity / role reason / purpose

focusing targeting

database

staff DB

ACM

Care Group

Relation Situation

Patient IDX

log / journal

Who

When

Where

Which Party

Why

Whom

(Whose)

What items

What media

Do what

Access now!

EHR platform

Retrieve Entry

Patient DB

Patient IDX

Care Group

Relation Situation

ACM

Who

When

Where

Which Party

Why

Whom

(Whose)

What items

What media

Do what
Operation for positioning / declaration
Electronic healthcare record system

- **Client:**
  - 300

- **Staff:**
  - 1200

- **Outpatient:**
  - 1600<

- **Work time:**
  - Full day
Peer watch and Pt’s assessment
Examples of staff groups

- Groups are actually used for
  - Care team (certain disease/treatment) 30
  - Certain role (pre-examination) 3
  - Data entry on behalf of (professor) 9
  - Facility sharing 4

- number of group certifying person 13
- average of group number in a dept 3.5
- average of group member 9.8
## Example of analysis

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Member:</td>
<td>21</td>
<td>33</td>
</tr>
<tr>
<td>staff:</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>post graduate:</td>
<td>14</td>
<td>28</td>
</tr>
<tr>
<td>education impact:</td>
<td>2.0</td>
<td>5.6</td>
</tr>
<tr>
<td>Patient</td>
<td>246</td>
<td>251</td>
</tr>
<tr>
<td>Encounter</td>
<td>744</td>
<td>837</td>
</tr>
<tr>
<td><strong>System Time</strong></td>
<td>185,824</td>
<td>291,183</td>
</tr>
<tr>
<td>Time per encounter</td>
<td>249.8</td>
<td>347.9</td>
</tr>
<tr>
<td>Time per member</td>
<td>8848.8</td>
<td>8823.7</td>
</tr>
<tr>
<td><strong>Money Income</strong></td>
<td>1,358,240</td>
<td>1,435,460</td>
</tr>
<tr>
<td>Income per patient</td>
<td>5521.3</td>
<td>5718.9</td>
</tr>
<tr>
<td>Income per member</td>
<td>262.9</td>
<td>173.3</td>
</tr>
<tr>
<td>Income per patient per staff</td>
<td>788.8</td>
<td>1143.8</td>
</tr>
</tbody>
</table>
Benefit of the three tier model

Tier 1: slow over-loaded
Tier 2: buffering
Tier 3: fast and busy time-to-time needs

Tier 1 -> Tier 2: certify
Tier 2 -> Tier 3: certify
Tier 1 -> Tier 3: certify
Tier 1 -> Tier 2: request
Tier 2 -> Tier 3: authorize
Tier 1 -> Tier 3: authorize

dept. A
dept. B
Aspects of the role representation

- Classification by ‘firmness’

<table>
<thead>
<tr>
<th>life time</th>
<th>dominance of authority</th>
<th>method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long</td>
<td>Authorities endorse</td>
<td>ACM</td>
</tr>
<tr>
<td>Intermediate</td>
<td>Dominating party certifies</td>
<td>Group Authoring</td>
</tr>
<tr>
<td>Short</td>
<td>None (declaration )</td>
<td>Relation / Situation</td>
</tr>
</tbody>
</table>
Next step

- Workflow control
  - with knowledge-base

- Audit analysis tools
  - consistency in “behavior” and “reason and role”

- Reflection of patient’s consent
  - when disclosing clinical data to medical staff
Summary

- The authors designed and implemented
  - “Patient-Doctor Relation and Clinical Situation” model
  - “Cascading Staff-Group Authoring” mechanism
    - “Care Group” class in “Healthcare Party” model
    - “Three Tier Cascading” model

- They provide
  - A flexible accessibility
  - Based on the clarified reason, role and party
    - without security breach
    - without the increase of system administration cost
Limitation of Access control matrix

X-axis: Access right parameters (static)
Y-axis: Login module
Z-axis: EHR platform
Alpha-axis: Access control matrix

<table>
<thead>
<tr>
<th></th>
<th>demographic.</th>
<th>clinical data items</th>
</tr>
</thead>
<tbody>
<tr>
<td>doctor</td>
<td>X X X</td>
<td>X X X X X X X X X X X</td>
</tr>
<tr>
<td>nurse</td>
<td>X X X</td>
<td>X X X X X X X X X X X</td>
</tr>
<tr>
<td>technician</td>
<td>X X</td>
<td>X X X X X X X X X X X</td>
</tr>
<tr>
<td>clerk</td>
<td>X X X</td>
<td>X X X X X X X X X X X</td>
</tr>
</tbody>
</table>

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The “Relation and Situation” model
(designed in 1995, implemented in 1998)

- Declare the reason before opening EHR
  - based on “relation/situation” at the point-of-care
  - involving reason/purpose and some kinds of role

(extracted form and edited: CEN ENV 13606-3:2000)
Differences from PKI

- Public Key Infrastructure
  - Supports secure “identification”
  - Has some ability of representation of roles but administration cost is considerable
  - Has No compliance to time-to-time changes

- Our Solution
  - Represents almost all factors of role and reason with easy manipulation
  - Follows time-to-time changes
### Example of performance analysis

<table>
<thead>
<tr>
<th>Rel / Sit</th>
<th>patient</th>
<th>income</th>
<th>in / pt</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group A</strong></td>
<td>246</td>
<td>135,824</td>
<td>552.1</td>
</tr>
<tr>
<td>member : 21</td>
<td></td>
<td></td>
<td>26.3</td>
</tr>
<tr>
<td>staff : 7</td>
<td></td>
<td></td>
<td>78.9</td>
</tr>
<tr>
<td>pre-exam</td>
<td>141</td>
<td>65,356</td>
<td></td>
</tr>
<tr>
<td>in charge</td>
<td>105</td>
<td>70,468</td>
<td></td>
</tr>
<tr>
<td><strong>Group B</strong></td>
<td>251</td>
<td>143,546</td>
<td>571.9</td>
</tr>
<tr>
<td>member : 33</td>
<td></td>
<td></td>
<td>17.3</td>
</tr>
<tr>
<td>staff : 5</td>
<td></td>
<td></td>
<td>114.4</td>
</tr>
<tr>
<td>pre-exam</td>
<td>249</td>
<td>143,203</td>
<td></td>
</tr>
<tr>
<td>in charge</td>
<td>2</td>
<td>343</td>
<td></td>
</tr>
</tbody>
</table>