Using the Nortel Agile Communication Environment and Web Services to Improve Communication Efficiency in the ED

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Opportunities in Health Informatics

- Proliferation of clinical information systems
- Move towards evidence-based medicine
- Analysis of clinical data for disease patterns or treatment characteristics
- Diversified clinical decision support systems (CDSS)
Clinical Decision Support Systems

- Point of care support
- Predictions, reminders, alerts
- Computerized clinical practice guidelines
- Expert- and data-driven “intelligent” assistants
MET-A³ Support Framework

- Architecture for anytime and anywhere CDSS
- Distributed design and architecture
- Available at the point of care (when and where necessary)
- Aligned with clinical workflow
- Diversified system components need to be integrated to combine information to provide the most up-to-date patient data
MET Support Functionality

- Clinical support at the point of care
- Providing triage support
  - Using up-to-date patient information, predict the severity of an asthma exacerbation as soon as possible after the arrival of a patient at the ED
- Providing clinical evidence
  - Using up-to-date patient information, retrieve medical evidence for an online repository to support applying a treatment to particular patient for the specified disease
Triage Support

- Employs a prediction model developed from prospectively collected data
- Data mining and machine learning analysis to find most appropriate prediction model
- Provides evaluation for a specific patient based on patient data (history, signs, symptoms, tests)
- Intended to be used early in patient management process (as soon as possible after arrival)
Clinical Evidence

- Automatically leverages real-time patient data to investigate the application of a specified treatment to the particular patient
- Uses computerized clinical practice guidelines as a proxy to drive the evidence-based literature search
- Online medical literature is vast, textual content is highly specialized and poorly described by standard medical nomenclatures
Clinical Evidence

- Processes medical literature offline and applies enhanced indices to emphasize patient-specific aspects
- Removes the burden of query formulation by automatically instantiating a query with presentation and patient-based data
- Online evidence is presented in an abstracted manner for enhanced and appropriate visualization at the point of care
SOA Model for Enhanced ED Communication

- Each HIS is modeled as a service provider (SOAP server) with an exposed web services interface for each information provider role.
- The client application or CDSS (SOAP client) is modeled as a service requestor that can invoke provided services and utilize returned results.
- A service’s registry is implemented using UDDI to map services to providers to ensure location transparency.
Parlay (part of Open Service Architecture) is a network API that can be used by application developers to make use of specified resources within a public network. Parlay X is a subset of Parlay and allows application developers access to the Parlay gateways, using web services. Parlay X applications may be written in any language as long as it can make the proper web services invocations. The Nortel Agile Communication Environment complies with the Parlay X v2.1 specification thereby providing an interface to telephony systems and allowing developers to create telephony applications with little or no knowledge of the underlying network. Such web services can be used by any physical telephony device (e.g. cell or desk phones) but they may also be implemented by soft clients on any computing device.
Nortel Agile Communication Environment & SOA

- Provides a methodology for accessing integrated patient information from one dedicated source
- Multiple facets of patient data may be combined to produce the most up-to-date and complete picture
- Combined information can be leveraged to provide “point of care” support
- Facilitates improved communications-enabled applications in support of clinical workflow in the ED environment
Nortel Agile Communication Environment

- **Smart Pager**
  - Automatically sends reminders and alerts to caregivers given any change in the patient state as reflected by changes in information stored in any relevant HIS

- **Consult Enhancer**
  - Offers support for ED personnel outside of the ED environment - the application supports specialists (e.g. surgeons) who may be required to come to the ED to perform a consult
Currently the most common method of communicating information between hospital staff is a hospital pager

We propose a “Smart Pager” implemented using SOA and Nortel Agile Communication Environment

“Smart Pager” system is composed of two components

- Server – communicates with and monitors HIS
- Client – receives information from server about potentially interesting events and informs the user
Smart Pager: Sample Scenario

Physician in the ED sets the presence on their device.

Patient presents to the ED suffering from a severe asthma exacerbation.

Triage nurse invokes the presence web service on her computer and uses the patient tracking system to find a list of currently available physicians.

Patient is assigned to a physician who assesses them, proposes a first round of treatment and orders a set of laboratory tests.

Severity of the exacerbation dictates the patient requires constant monitoring.

Such functionality can be provided using the Short Messaging and Multimedia Messaging services.

Information sent is scaled to the capabilities of device the physician is carrying.

For example if the physician is carrying a PDA and LIS is updated the Short Messaging web service may be invoked to either inform the physician that test results are available or the most pertinent information from test results is sent.

If the physician is carrying a more powerful device with a greater display capacity (e.g. tablet PC), the Multimedia Messaging web service may be invoked to send the entire test results in a tabular or graphical representation.
Smart Pager: Sample Scenario

1. Nortel API
2. Smart Pager Services
   - monitorLISforUpdates()
   - retrieveUser(patient)
   - sendMessage(user, result)
3. Multimedia Messaging Web Service
4. Nortel Interface
5. Nortel Gateway
6. Nortel SCS

Laboratory Information System (LIS)

Patient Tracking System (PTS)
Smart Pager Benefits

- Smart Pager can automatically send reminders and alerts to caregivers given any change to the patient state as reflected by changes in the information in any relevant HIS.
- Smart Pager would also allow reaching the physician if needed (Third Party Call).
- Smart Pager server may also be combined with a patient tracking system to record physician status which would indicate their availability (Presence).
Consult Enhancer

- At present when an urgent patient case which requires intervention from a specialist outside of the ED, the specialist is paged using a standard hospital pager
- This device cannot provides any information about the patient or case - rather it just informs the specialist that they are required in the ED
Consult Enhancer

- We propose “Consult Enhancer” implemented using SOA and Nortel Agile Communication Environment that makes the consultation process more sophisticated

- Consult Enhancer is composed of two components
  - Server – offers different services installed in ED
  - Client – gives access to these services to specialists located outside of the ED
Consult Enhancer: Sample Scenario

A patient requiring specialist treatment arrives at the ED.

A soft client installed on a stationary or portable computer at the triage nurse's desk is used to contact the required specialist.

Depending on the device the specialist has registered their presence information with, the nurse may send more or less detailed information.

For example if the specialist has registered their presence using a mobile phone the nurse may invoke the Short Messaging service to send a brief description of the patient.

If the specialist is using a more powerful device such as a laptop the nurse may invoke the Multimedia Messaging web service to send full patient history, recent test results or imagery.

Upon receiving a message the specialist may use the client installed on their device to contact ED triage nurse to further discuss the patient.

The specialist may need to discuss further details with another specialist, for example they may need to consult the radiography department to discuss the patient's X-RAYs. A call between the specialist and the radiology department could be invoked using the Third Party Call web service.
Consult Enhancer: Sample Scenario

1. Third Party Call Web Service
2. Nortel Interface
3. Nortel API
4. Nortel Gateway

Client Application
Third Party Call (address1, address2)

Mobile Network

Specialist
Radiology Department

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Consult Enhancer Benefits

- Consult Enhancer allows contacting available offsite specialists (Presence)
- Consult Enhancer can send complete clinical information including laboratory results and images to offsite specialists (Multimedia Message)
- Consult Enhancer can be used to reach members of staff to discuss urgent cases (Third Party Call, Multimedia Conference)
Consult Enhancer Benefits

- Currently if the specialist wishes to discuss an urgent case with another member of staff they must have that person’s contact details at hand and cannot be automatically connected to that person.
- The Consult Enhancer provides a sophisticated communication mechanism to make more efficient use of ED staff resources.
Conclusions

- SOA allows disparate patient information to be integrated so that the most complete representation of a patient is available to ED staff
- Nortel Agile Communication Environment can be used to provide a mechanism that enables improved communication between ED caregivers
- Nortel Agile Communication Environment can also support enhanced communication between personnel located on and offsite
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