Empowering Mobile Healthcare Providers via a Patient Benefits Authorization Service

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Abstract
Moving rapidly between patient examining rooms, physicians have to examine, diagnose and decide on a course of treatment appropriate for each patient. However, if the patient’s health plan administrators subsequently deny coverage, the prescribed treatments would then have to be changed. There are a wide range of health insurance plans and varying cost curtailment procedures. Physicians are therefore ill-equipped to determine a course of treatment that addresses the patient’s needs and complies with the payer’s regulations. Benefits authorization applications on handheld devices using wireless communications can help mobile healthcare providers quickly determine patient medical benefits eligibility. Such facilities could improve the quality of care and physician patient communications, prevent denial of services by health plan administrators and consequent expenses to the patient. The authors originally developed a prototype desktop application as part of a secure telemedicine research project. They identify enhancements to this work to address interoperability issues and support the needs of mobile healthcare providers.

1. Introduction
Physicians are highly mobile healthcare professionals. In a typical day, they may treat between 20 to 40 patients in their clinic. In addition, they may have to attend to their patients admitted in hospitals. Moving rapidly between patient examining rooms, physicians have to examine, diagnose and decide on a course of treatment appropriate for each patient. The face-to-face encounter between physician and patient may be less than five or ten minutes.

Under today’s managed care health insurance plans many healthcare procedures require pre-certification and prior approval for referrals to specialists, admission to hospitals, diagnostic procedures and surgeries, and even for some medications. Since health benefits and pre-certification regulations vary widely among the many insurance agencies, healthcare providers are ill-equipped to decide on a course of action that would be in the patient’s best interests and also be in compliance with that health insurance agency’s cost curtailment procedures [1]. They may often have to submit justifications for recommended treatments and await approval from health plan administrators. When treatments are subsequently disallowed, physicians may have to develop alternate care strategies and inform patients about their modified course of treatment.

Pre-certification and authorization have become important tools in the eyes of managed care organizations to hold down healthcare expenditures [2]. Through the use of published (and oft revised) guidelines for various healthcare ailments and treatment protocols, the authorization process aims to screen-out unnecessary services caused by waste, fraud and oversight. A Congressional report indicates that fee-for-service utilization reviews such as pre-certification have resulted in a four-percent reduction in utilization compared to traditional indemnity practices [3].

In today’s healthcare organizations, billing and other administrative functions utilize computers but medical records in most clinics and many hospitals are still paper-based. Healthcare administrative staff routinely use fax machines and telephones to contact health insurance administrators to determine eligibility or pre-certify patients for referrals, surgeries, procedures and prescriptions.

Patient information systems integrated with workflow systems could help reduce delays and the hassles of obtaining approval for healthcare services and also eliminate errors in submission and routing of medical justifications and support information. Such systems, operating via a set of workflow rules and care protocols can provide 24-hour availability, immediate response for routine procedures and route more complex decisions for approval by the health insurance agency’s claims administrators.
2. Web-based Medication Approval Facility

In a prior research project\(^1\), the authors implemented information security measures to enable collaboration over public communication networks [4]. One of the applications was a web-based system to obtain authorizations for prescribing certain classes of pharmaceutical drugs [5]. Normally, using faxes, it took up to two days for healthcare providers to receive approval for medications from the patient’s health insurance agency. We set out to improve throughput, reduce delays and ensure confidentiality of communications and developed a Web-based workflow system for the medication authorization process. Workflow rules for the medication authorization process were implemented through Active Server Pages. Client-side and server-side scripts handled data validation issues such as completeness and correctness reducing inefficiencies inherent in the paper-based process.

Mutual authentication measures included the use of client and server digital certificates (X.509 v3). Communications confidentiality was achieved via Secure Socket Layer (SSL) encryption. To enable portability among point-of-care workstations, we utilized smartcards for healthcare providers containing the physician’s digital certificate and other access control keys. To reduce data input, we developed client-side integration to smart cards. Patient demographics and insurance information could be automatically extracted from the patient smartcard and included in the Web request form.

The process, typically, begins with the healthcare provider contacting the patient’s website and submitting a request for approval of medications. The agency web site hosts the rule-based workflow application which processes the requests and determines whether the request can be approved, denied, requires additional clarifications or must be handled by a claims administrator. Well-defined requests can be automatically processed. Certain requests may require additional justifications; the healthcare provider can be immediately notified to supply the necessary rationale. More complicated situations that require additional review or clarification are routed as tasks to the appropriate health plan claims administrator. In such cases, e-mail notifications alert the healthcare provider to use the embedded web link to determine the agency’s response to their request.

3. Deployment Issues

This application demonstrated that authorizations could be improved through the use of Internet-based systems. Our approach had been modeled on the assumption that each health insurance agency, having its own website, would request authorization of benefits as per its own guidelines. The data supplied and the workflow rules were insurance agency specific.

However, we recognized that there would be problems in deploying such a facility in routine use in clinics and hospitals:

1. Each healthcare facility has patients covered by many different healthcare payors (insurance agencies). Each clinic also has its own billing and patient insurance information system.

2. Each insurance agency has their own pre-certification and authorization forms, cost containment procedures, and workflow rules.

However, insurance agencies are willing to cooperate with clinics, on a case by case basis, to develop one paper form for that clinic which would have all the pre-certification information required by all the agencies whose patients are treated in that place.

4. Proposed Approach

We envisage a scenario where multiple healthcare provider organizations are able to connect to multiple insurance organizations. This would imply the use of a common data exchange format that is not organization specific. Healthcare providers would utilize client-side interfaces to local patient information repositories to supply relevant data for the benefits authorization transaction. Individual insurance organizations could extract relevant data upon receipt and process it as per their own business procedures.

We believe that an XML-based schema analogous to the common paper form can be implemented permitting clinics and hospitals to utilize one document format for all their agencies. There is growing acceptance of XML as a data interchange and integration technology in the healthcare arena (viz HL7). To be truly effective the schema should be used in conjunction with an interoperable workflow system, enabling integration at clinic and healthcare agency sites to local repositories, job automation and workflow practices.

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The Workflow Management Coalition\(^2\) (WFMC) published interoperability specifications for the implementation of distributed workflow systems [6]. These specifications have been adopted by the Object Management Group (OMG). The Software Workflow Access Protocol group\(^3\) (SWAP) [7] defined an HTTP-based interaction protocol between distributed workflow applications. WFMC has subsequently produced XML bindings (WF-XML) to facilitate interoperability among distributed workflow applications.

Wireless LANs, cellular phones and Personal Area Networks (PANs) such as BlueTooth used in conjunction with handheld computers, PDAs and the emerging smart phones, enable spontaneous interconnectivity for mobile users. The emergence of J2ME for these devices enables a host of applications for mobile users. A combination of Wired Equivalent Privacy (WEP) compliant wireless infrastructure and SSL may provide adequate security.

Figure 1 depicts the proposed application scenario. Our design leverages WfXML as a standard for vendor, platform, and organization neutral communications. We have defined schema based on WfXML -- Figure 2 depicts sample schema for two messages, Request and Response employed in benefits authorization transactions.

Our approach involves J2EE middleware agents at healthcare organizations which operate with J2ME client applications operating on wireless enabled mobile computing devices. Middleware agents/services running on the healthcare providers network provide information on the patient’s health insurance plans and determine whether authorization is required. If deemed necessary, with minimal input from the user, the authorization request is formulated by the J2EE servlet and submitted to the healthcare agency for approval. The results of the request can be subsequently displayed on the physician’s J2ME application. Figure 3 provides guidelines for implementing such a system.

5. Conclusion

Mobile computing devices and a host of wireless communication systems and protocols appear poised to empower mobile healthcare providers, and change the modes of healthcare delivery in the near future [8] [9].

An XML-based schema is proposed that in conjunction with interoperable workflow definitions will enable healthcare providers to quickly determine patient health benefits.

Detailed specifications and reference implementations of such a system are planned to empower mobile healthcare provider at the point-of-care and help in the delivery of quality healthcare.

References


\(^2\) http://www.aiim.org/wfmc/mainframe.htm
\(^3\) http://www.ics.uci.edu/~ietfswap/
Figure 1: Application Scenario
Request Message

```xml
<?xml version="1.0"?>
<WfMessage Version="1.0">
  <WfTransport/>
  <WfMessageHeader>
    <Request ResponseRequired="Yes"/>
    <Key>R_D_T.org/Wfengine?id=167352</Key>
  </WfMessageHeader>
  <WfMessageBody>
    <CreateProcessInstance.Request StartImmediately="true">
      <ObserverKey>MHS.com/wfx578</ObserverKey>
      <ContextData>
        <HealthBenefitsAuthorizationMessage>
          <MessageType>Request</MessageType>
          <HealthBenefitsCategory>Medication Approval</HealthBenefitsCategory>
          <CaseNumber New="yes"/>
          <PatientInformation>
            <Demographics>
              <Name>William Smith</Name>
              <Gender>Male</Gender>
              <DOB>…</DOB>
            </Demographics>
            <InsurerDetails>
              <InsurerName>Blue Cross Blue Shield</InsurerName>
              <Plan>F8752-23</Plan>
              <Group>AG4576298</Group>
              <MemberID>26549</MemberID>
            </InsurerDetails>
          </PatientInformation>
          <Clinical>
            <MedicationDetails>
              <MedicationName>…</MedicationName>
              <Class>…</Class>
              <Dosage>…</Dosage>
              <Duration>
                <From>…</From>
                <To>…</To>
              </Duration>
              <Justification>
                <Diagnosis>…</Diagnosis>
              </Justification>
            </MedicationDetails>
            <HealthCareProvider>
              My Health Systems
            </HealthCareProvider>
            <Physician>
              <Name>John Doe</Name>
              <Provider_ID>HSW5683</Provider_ID>
            </Physician>
          </Clinical>
        </HealthBenefitsAuthorizationMessage>
        </ContextData>
      </CreateProcessInstance.Request>
    </WfMessageBody>
  </WfMessage>
</WfMessage>
```

Response Message

```xml
<?xml version="1.0"?>
<WfMessage Version="1.0">
  <WfTransport/>
  <WfMessageHeader>
    <Response/>
    <Key>R_D_T.org/Wfengine?id=167352</Key>
  </WfMessageHeader>
  <WfMessageBody>
    <CreateProcessInstance.Response>
      <ProcessInstanceKey>R_D_T.org/WfcXML1673</ProcessInstanceKey>
      <ResultData>
        <HealthBenefitsAuthorizationMessage>
          <MessageType>Response</MessageType>
          <HealthBenefitsCategory>Medication Approval</HealthBenefitsCategory>
          <CaseNumber>MA12345</CaseNumber>
          <RequestOutcome>
            <Status>Denied</Status>
            <DenialCode>D987</DenialCode>
            <Rationale>…</Rationale>
          </RequestOutcome>
          <AuthorizationID>RDT2456</AuthorizationID>
          <Date>…</Date>
        </HealthBenefitsAuthorizationMessage>
      </ResultData>
      </CreateProcessInstance.Response>
    </WfMessageBody>
  </WfMessage>
</WfMessage>
```

Figure 2: Sample Schema
Applications (Java MIDlets) run on mobile clients compliant with technology such as J2ME, over wireless networks. These communicate with Healthcare provider sites and initiate processes for tasks by making requests. Corresponding responses are displayed.

Java Servlets authenticate mobile clients, take requests, initiate backend services for tasks and then interact synchronously & asynchronously with agencies, receive notifications. Send responses back to mobile users.

Java Servlets for accepting requests, authenticating clients, initiating backend services and responding to the client with results and notifications provided by the workflow modules.

Combination of Java Servlets/Applications & EJB for packing and parsing Wf-XML messages (JAXP), local workflow, Database access.

Communication using Wf-XML requests/responses

Figure 3: Implementation Guidelines