Electronic Patient Records and Electronic Health Records

Centre for Health Informatics

Prof John Chelsom

Runs: 3 hours
Tutor: Prof John Chelsom
Mode of attendance: Classroom

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Learning Objectives

- This session introduces Electronic Patient Records (EPR) and Electronic Health Records (EHR) and shows typical features and functionality of these systems.
- Specific learning objectives are to:

1. Define and differentiate EPR and EHR
2. Analyse the components of EHR/EPR systems
3. Assess the major features and functionality of an EHR system
4. Show what a web-based EHR system looks like in practice

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Electronic Patient Records and Electronic Health Records

- Definition and scope
- Walk through of (commercial) EHR system
- References and Further Reading

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Information Sources

- Sources are listed in the references at the end of these slides

Some definitions and descriptions have been taken from quoted resources.

Retrieved October 2010.

here consensus on definitions or descriptions
equired, these have been taken from Wikipedia.

trieved October 2010.

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EPR, EHR Definition and Scope

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Electronic Patient Record

In the UK we use the term Electronic Patient Record (EPR); in the US the most common term is Electronic Medical Record (EMR).

An electronic medical record (EMR) is a computerized medical record created in an organization that delivers care, such as a hospital and doctor's surgery[1].

Electronic medical records tend to be a part of a local stand-alone health information system that allows storage, retrieval and modification of records.

http://en.wikipedia.org/wiki/Electronic_medical_record

Patient record for a single care provider or organisation

GP, Hospital, Community Health, Mental Health, Dentist, etc

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Electronic Health Record, EHR

- A health record, stored electronically

- The complete (longitudinal) cradle-to-grave record
- Accessed in any care organisation/setting (c.f. EPR)
- By any legitimate member of the care team
- And by the patient themselves
- Gathering data from many different sources
- With functionality for adding new data to the record

- Should be implemented using open standards, service-oriented, web technology (in my opinion)

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Electronic Health Record

Still some confusion about terminology, especially between UK and US, as demonstrated by Wikipedia, October 2010.

An electronic health record (EHR) (also electronic patient record (EPR) or computerised patient record) is an evolving concept defined as a systematic collection of electronic health information about individual patients or population[2].

It is a record in digital format that is capable of being shared across different health care settings, by being embedded in network-connected enterprise-wide information systems.

Such records may include a whole range of data in comprehensive or summary form, including demographics, medical history, medication and allergies, immunization status, laboratory test results, radiology images, and billing information.

http://en.wikipedia.org/wiki/Electronic_health_record

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Proprietary EHR Products

- Top vendors of Electronic Medical Records (EMR) in the US

Company	Installations	Installation %
Meditech	1,185	26.6%
McKesson	630	14.1%
Cerner	560	12.6%
Siemens Medical	425	9.5%
CPSI	353	7.9%
Epic Systems	265	6.0%
Eclipsys	243	5.5%

- UK EPR vendors
  - Primary care – EMIS, InPractice, Isoft, TPP, HealthySoft
  - Secondary care – ISoft (Lorenzo), System C
  - Community – CSE (Rio)

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Personal Health Record

Personal Health Record (PHR) or Personal Electronic Health Record (PeHR)

Also associated in the US with the concept of Health Record Banking.

A personal health record or PHR is typically a health record that is initiated and maintained by an individual.

An ideal PHR would provide a complete and accurate summary of the health and medical history of an individual by gathering data from many sources and making this information accessible online to anyone who has the necessary electronic credentials to view the information.

http://en.wikipedia.org/wiki/Personal_health_record

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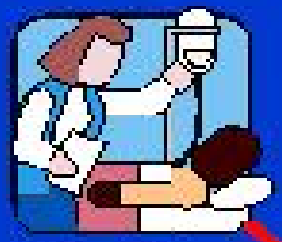
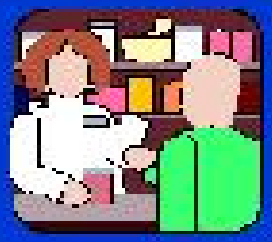
A Health Service Designed Around the Patient

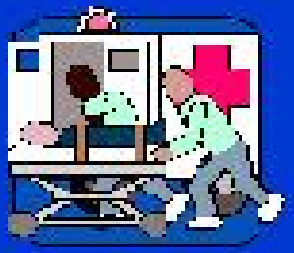


Attends as in-patient

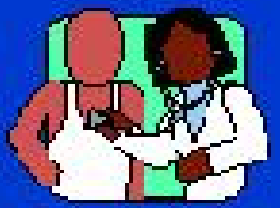


Goes to the pharmacy

Visits GP/practice nurse

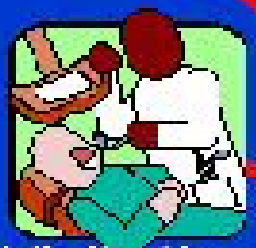


Attends A&E



Visits Out Patients

Calls NHS Direct



Visits the dentist

NHSnet

Is visited at home by GP, nurse, care worker, midwife etc

Uses NHS Direct online

Visits a walk-in centre

Calls OOH service

Uses the Home Health Care Gulde

NHS Executive

Shared Care (R)Evolution

- Clinical services have developed and specialized
  - Multi-agency; home care; diagnostic monitoring
- Disease / problem based care management
  - rather than episode based
  - care focused on complete problem resolution and management rather than individual visits or encounters
- Team based approach, across discipline and agency
  - The patient journey involves many inter-working teams
- Collaborative working around a shared programme of care delivery

Patient-centred – Cross Agency – Driven by evidence and protocols for best clinical practice.

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Problems Addressed by EHR

- Support for Cross-Agency, Shared Care
  - Modern healthcare is provided through a cross-agency care teams that centre their activities on the needs and preferences of patients, updating and sharing patient information around the clock.
- With access to a Patient-Centred Record
  - Existing health information systems do not match this requirement for cross-agency, patient centred shared care – they tend to be focused on single organisations, with the emphasis on administrative, rather than clinical data
- Using open interfaces and standards
  - Current EHR technology is difficult to deploy, locks-in to proprietary data formats, is hard to use and is not easy to adapt to the shared care, cross agency way of working
- Overlaying existing systems
  - Yet many existing systems will need to keep operating as they are for the foreseeable future – there is neither the budget, nor capacity for change, to transform health information systems overnight
- Following best practice, nationally
  - This operational environment is set against a backdrop of political drive for a move to national-scale systems, driven by patient choice, accessibility of information for care professionals, adherence to guideline for best practice and a high level of security and accountability.

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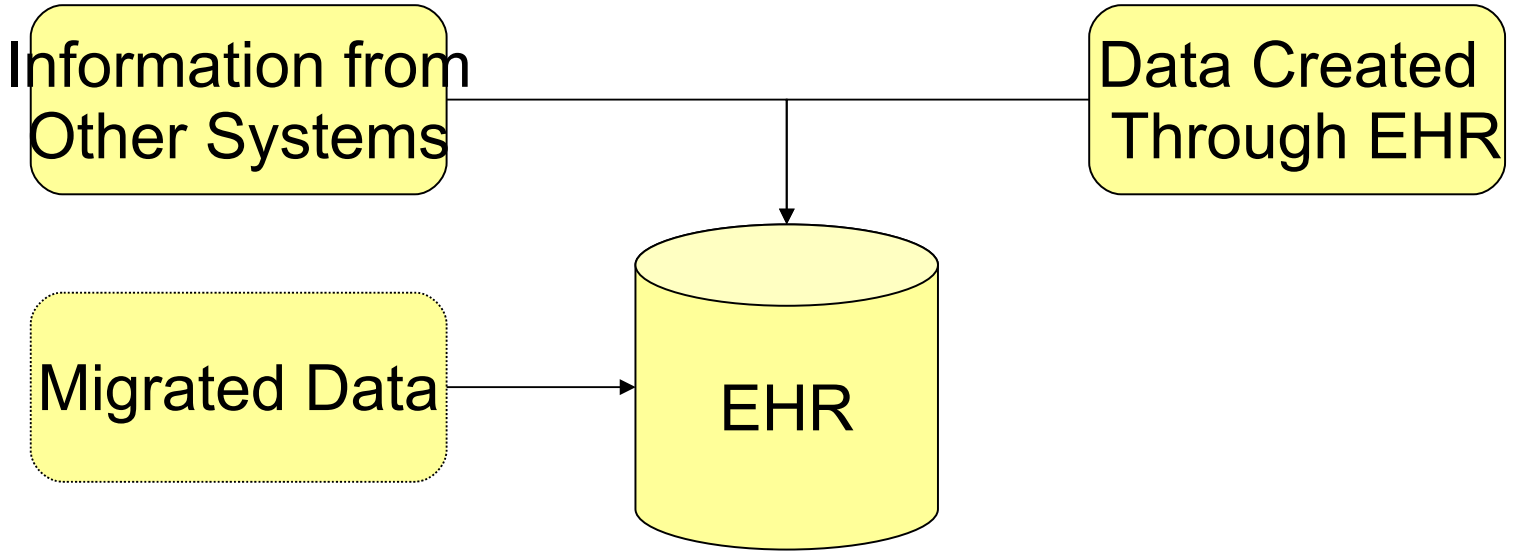
EHR Contents

- The Health Record in an EHR contains
  - Information gathered from other systems
  - Information created by functions in the EHR
  - (Data migrated from previous systems)



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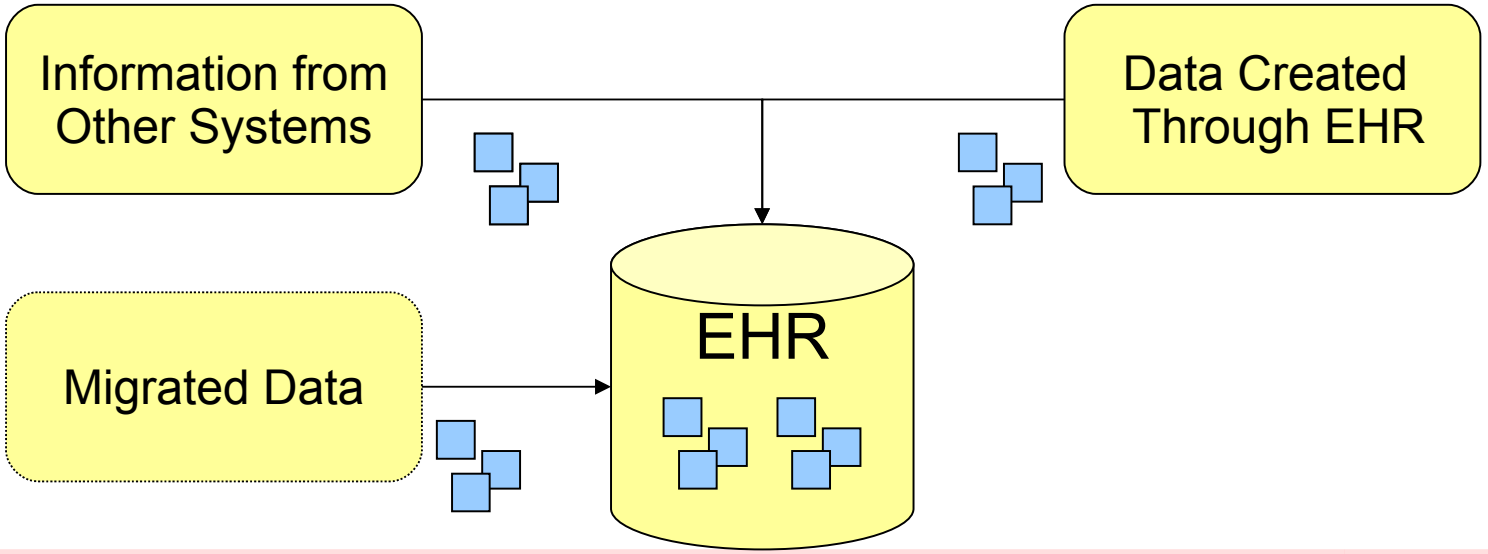
EHR Events

- The 'unit of storage' in an EHR system is often the health Event
  - HL7 CDA – Clinical Document
  - ISO-13696 – Composition
  - Discrete package of information from a particular care setting, time, encounter
  - Stored with its provenance (i.e. when, where, how it was created and by whom)
  - May be subject of Access Control Rules



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EHR Content and Functionality

- Clinical Documents
  - GP Encounter
  - Referral Letter
  - Clinic Note
  - Discharge Summary
  - Assessment
- Orders
  - Pathology
  - Radiology
- Results
- Prescriptions
- Medications
- Diagnostic Images (link to)
- Care Plans
- Care Pathways
- Appointments
- Billing information
- Patient Demographics

- Integration / messaging
- Access control
- Audit / Notification
- Secure communications

- Clinical Data Entry
- Summary views, reports
- Order Entry
- Results Reporting
- E-Prescribing
- Care Planning
- Care Pathways
- Booking, scheduling
- Financials
- Patient Administration
- Records Management

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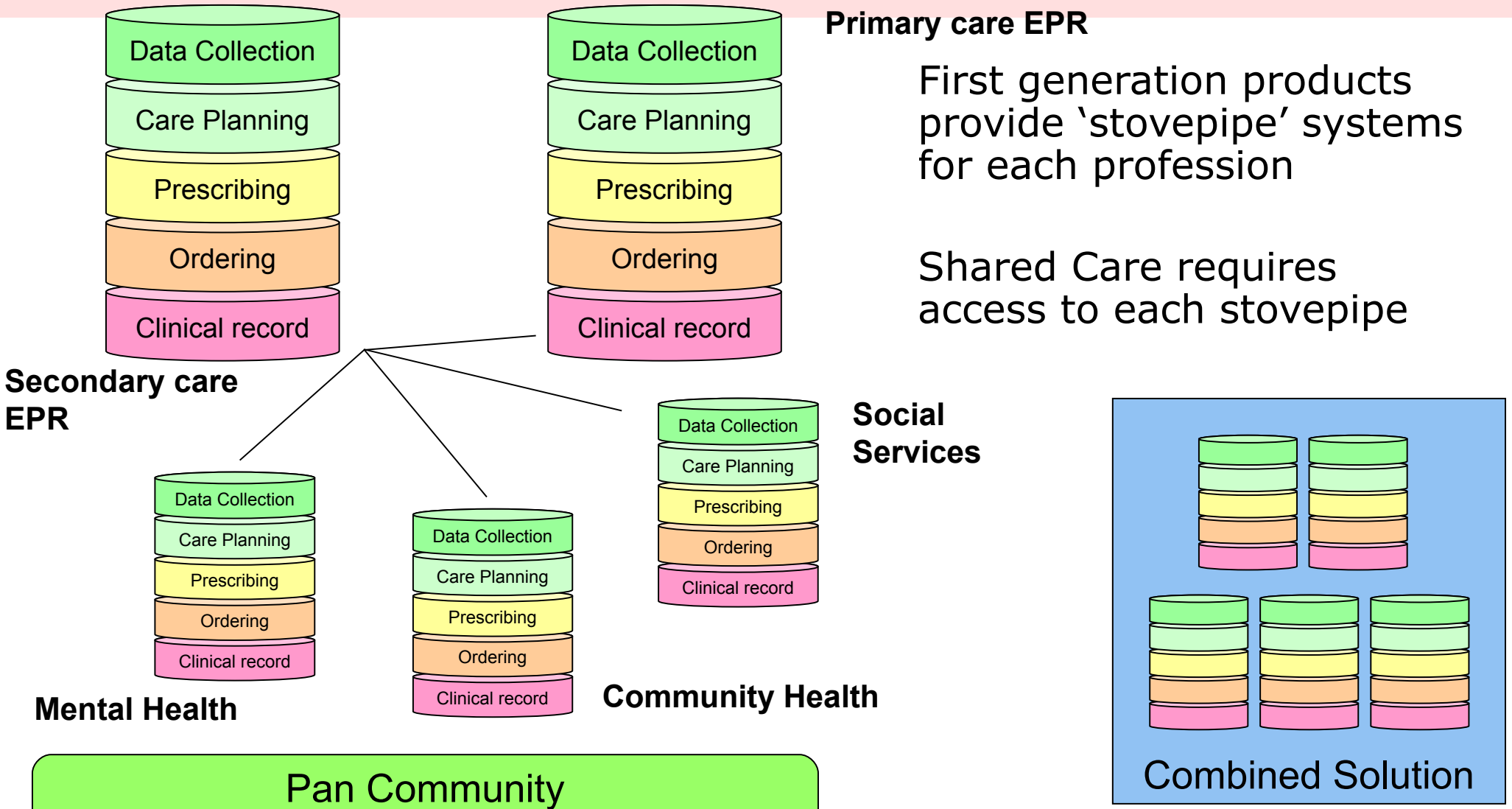
First Generation EHR Products



First generation products provide 'stovepipe' systems for each profession

Shared Care requires access to each stovepipe

First generation boxes into one commercial offer, but keeps stovepipes separate

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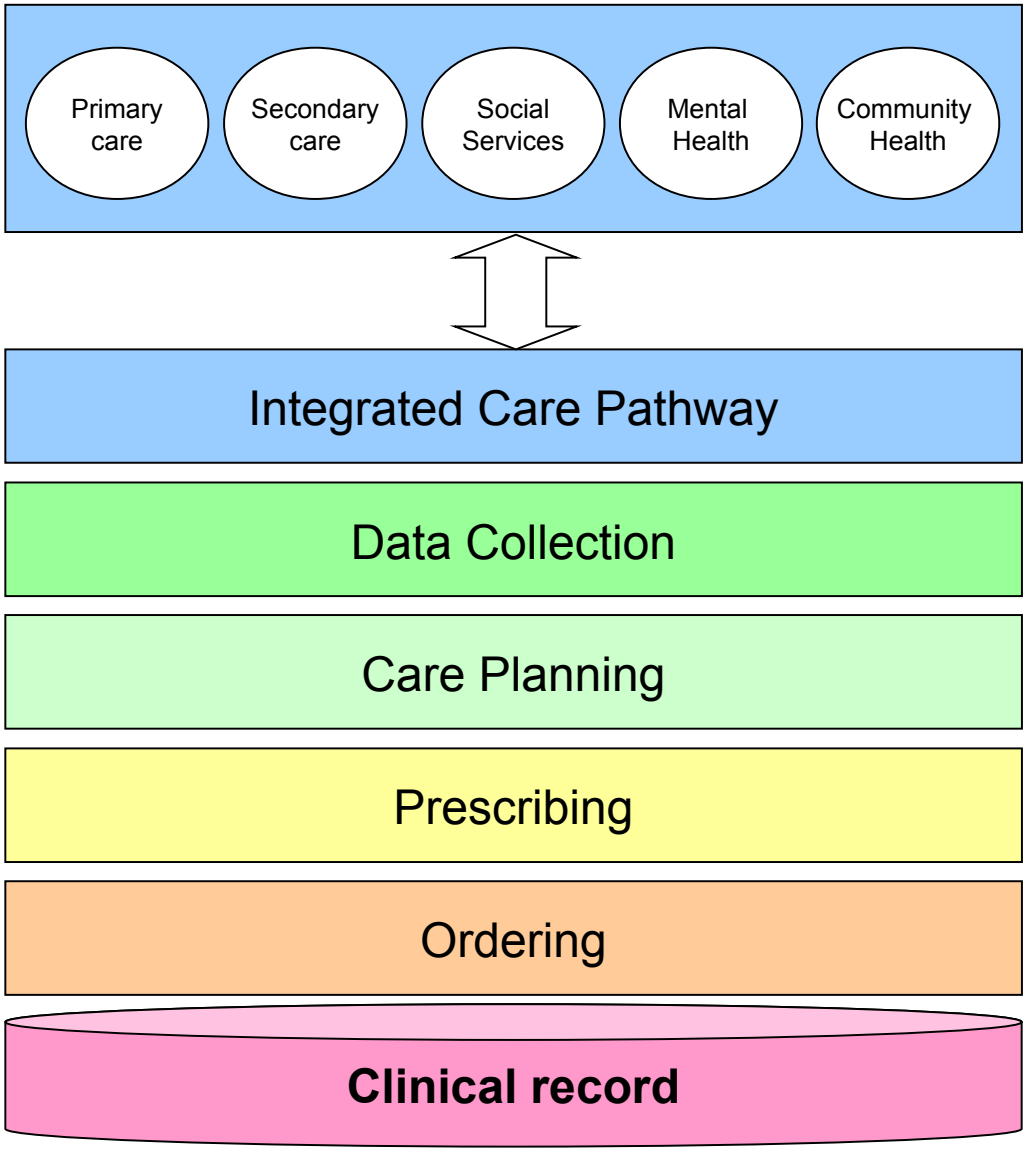
Next Generation EHR



- A patient-centred record
- An integrated care pathway
- Supporting all caring professions
- Using server-side web technology
- Covering the full 'patient journey'

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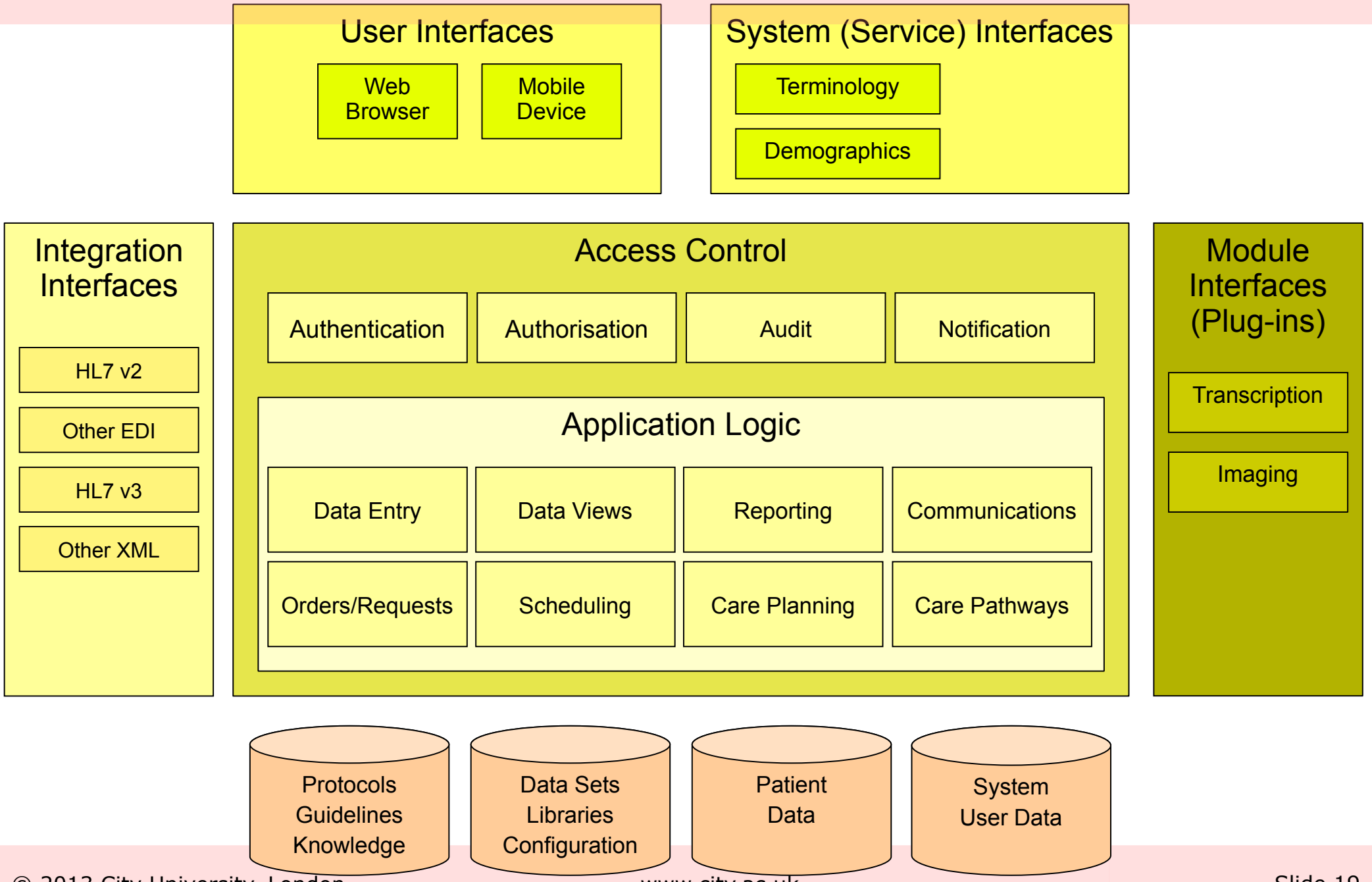
Detailed Architecture of EHR



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Technology Supporting Clinical Engagement

- Technology designed to support the move towards a patient-centred record, used across all caring professions
- Recognising that the existing clinical IT infrastructure must be changed, without interruption of the support for clinical services
- This is technology that supports the migration to new and improved systems, through a controlled migration programme, without 'rip and replace' or 'big bang' implementation

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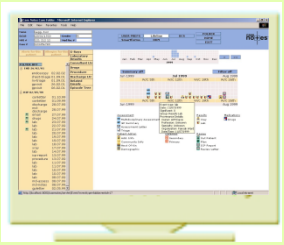
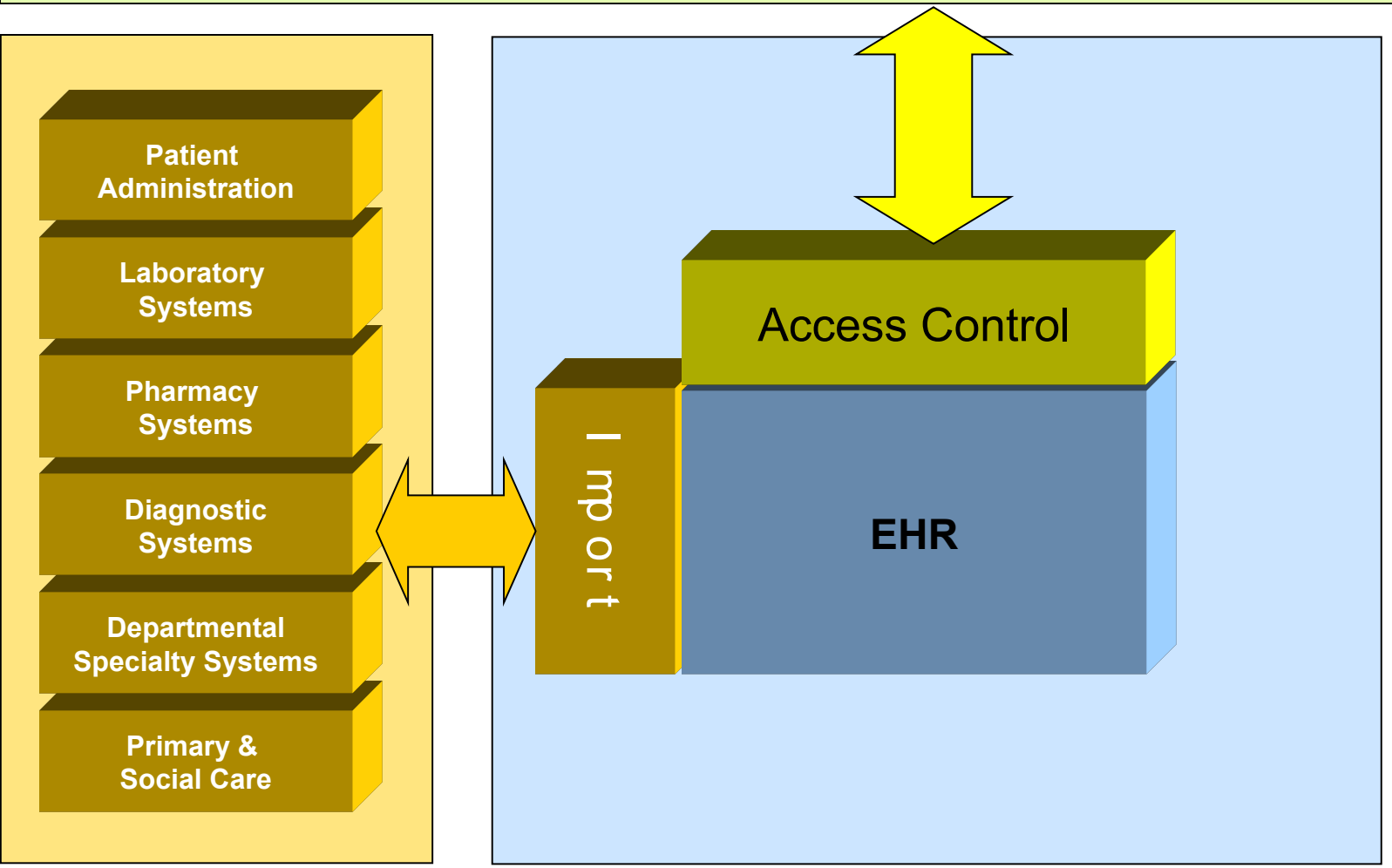
User Interface

Web Browser
Zero Footprint
Pure HTML with SSL security





This implements a Virtual Record system.

Not a good solution, in my opinion.

Integrate

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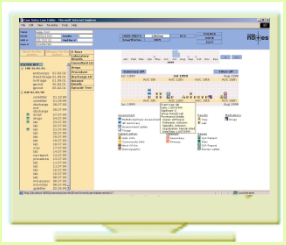
User Interface

- Web Browser
- Zero Footprint
- Pure HTML with SSL security



Patient Administration

Laboratory Systems

Pharmacy Systems

Diagnostic Systems

Departmental Specialty Systems

Primary & Social Care

Import

Access Control

EHR

Data Access

Most EHR systems have central storage of the full record.

Database

- SQL Server
- Oracle
- Other SQL

Content Management

Case-based Repository

Knowledge Bases

Manage

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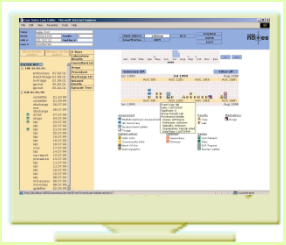
User Interface

- Web Browser
- Zero Footprint
- Pure HTML with SSL security



Patient Administration

Laboratory Systems

Pharmacy Systems

Diagnostic Systems

Departmental Specialty Systems

Primary & Social Care

Import

Access Control

EHR

Data Access

Modules

Integrated Care Pathways

Smart Forms

Care Planning and Assessment

e-Prescribing

Ordering and Results Reporting

Long Term Conditions

Database

- SQL Server
- Oracle
- Other SQL

Content Management

Case-based Repository

Knowledge Bases

Extend

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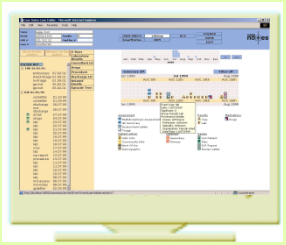
User Interface

- Web Browser
- Zero Footprint
- Pure HTML with SSL security



Laboratory Systems

Pharmacy Systems

Diagnostic Systems

Departmental Specialty Systems

Primary & Social Care

Import

Access Control

EHR

Data Access

Modules

Integrated Care Pathways

Smart Forms

Care Planning and Assessment

e-Prescribing

Ordering and Results Reporting

Patient Administration

Database

- SQL Server
- Oracle
- Other SQL

Content Management

Case-based Repository

Knowledge Bases

Consolidate

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Walk Through of (Commercial) EHR System

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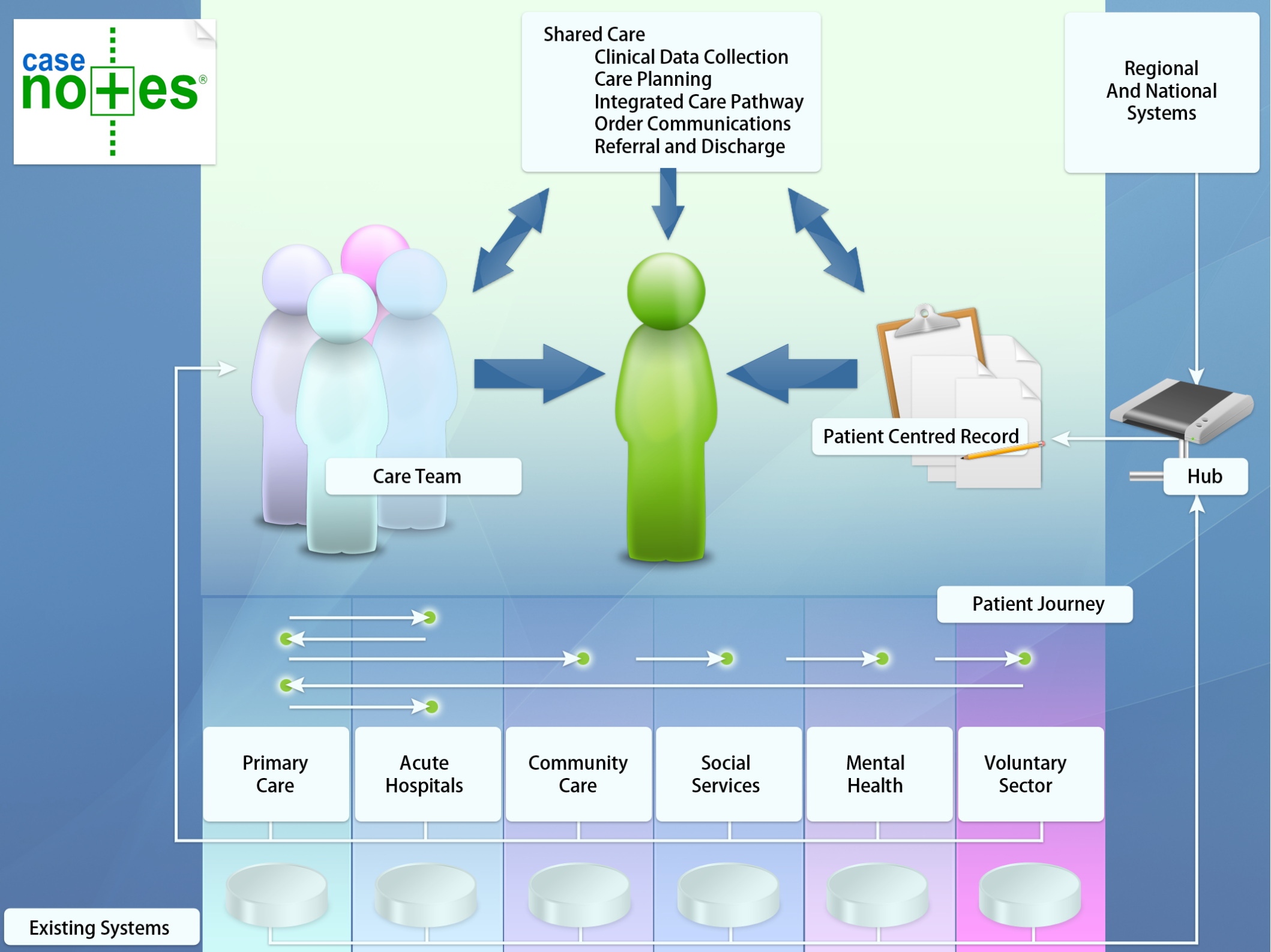
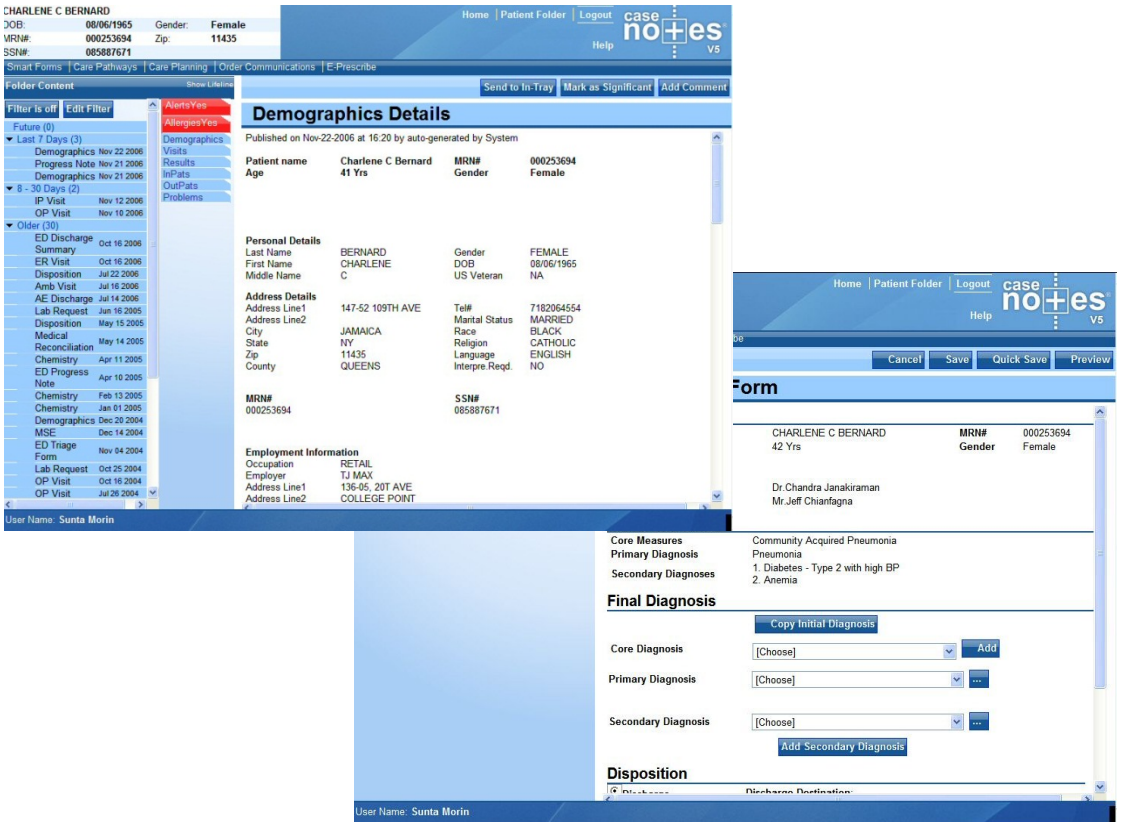

case notes®
Shared Care
Clinical Data Collection
Care Planning
Integrated Care Pathway
Order Communications
Referral and Discharge
Regional
And National
Systems
Care Team
Patient Centred Record
Hub
Patient Journey
Primary Care
Acute Hospitals
Community Care
Social Services
Mental Health
Voluntary Sector
Existing Systems

Case Notes EHR System

An Electronic Health Records System based upon a single, patient-centred record, with functional modules that support patient care across all the caring professions and a technology platform that eases migration from existing systems.



Developed from 1998 onwards

Used in NHS ERDIP pilots 1999 - 2002

Based of the NHS PSIS aka Summary Care Record 2004 onwards

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Login

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Home page - Administration

- Preference setting allows customisation of default views
- Clinical library management – access point for the Care Plan, Orders and Care Pathways libraries and builders
- Administration of reference data used in configuration and population of all Case Notes functions
- InTray provides a shared-care communication utility for clinical information
- Reference data

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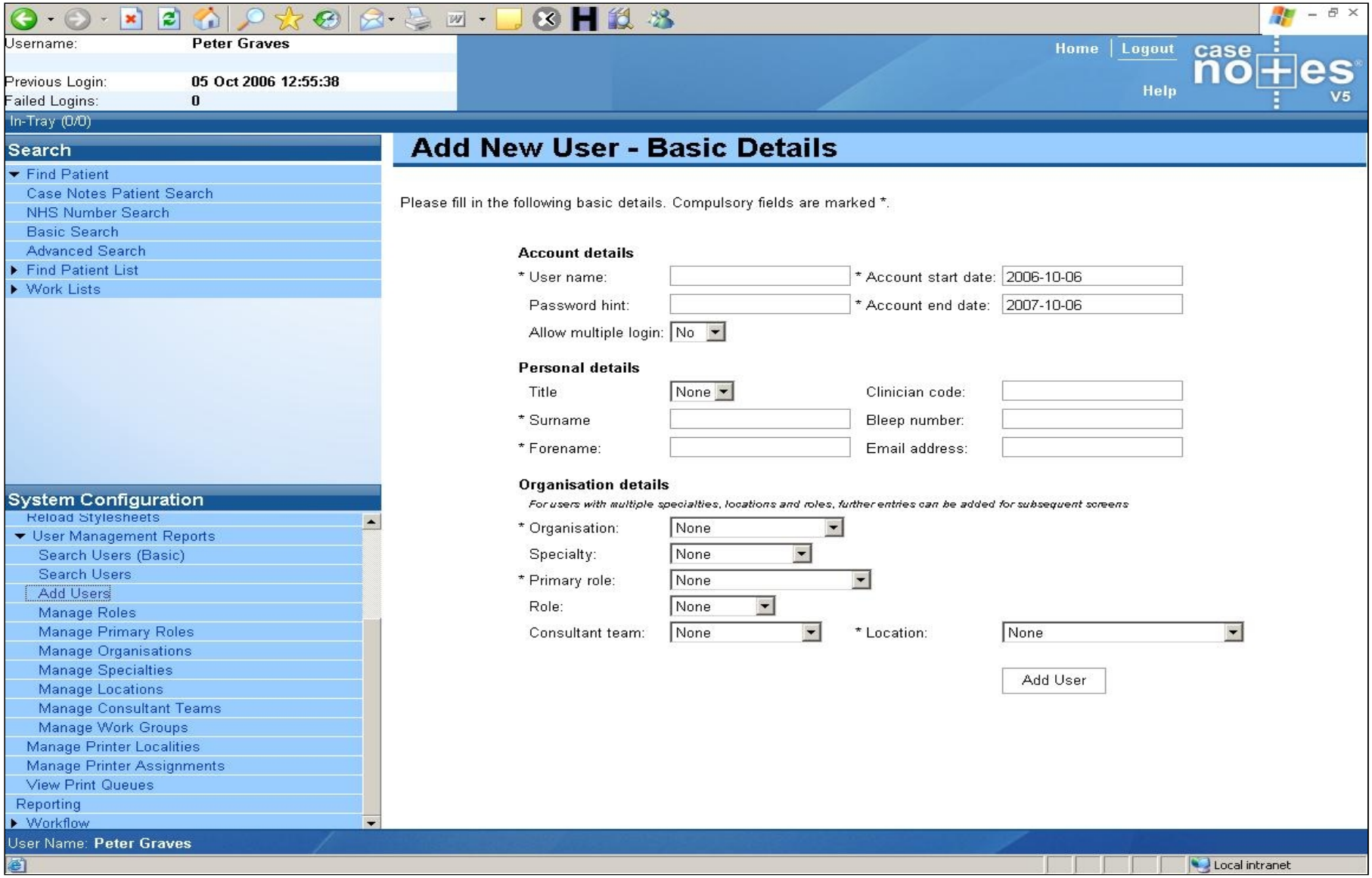
Home Page



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Security, Login, Access Control

- Overview
  - System administrator controls an internal register or uses an external service to maintain a directory of users.
  - Information includes roles, team membership and passwords.
  - The system authenticates the user at login and provides access. (1st-level Authentication may be by SmartCard)
  - The Access Control Framework, working with the Resource Permissions Manager, controls access to data, resources and modules.
  - It controls and tracks user and system access
  - Includes the access control of administrative and clinical user roles to organisational data, patient details, episodes and events within an individual health record
  - Audit feature records all activity with user identified

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Security, Login, Access Control

- Features
  - Role and Agent-based access manages users in care teams
  - Flexible configuration can match an organisation's exact requirements
  - Can model access such as 'Doctors can view Lab reports' or 'This assessment letter)
  - Works with Smart Card and Biometric recognition
  - Can link to other systems to provide single user login across systems
  - Security override permitted and recorded
  - Comprehensive audit data collection and report

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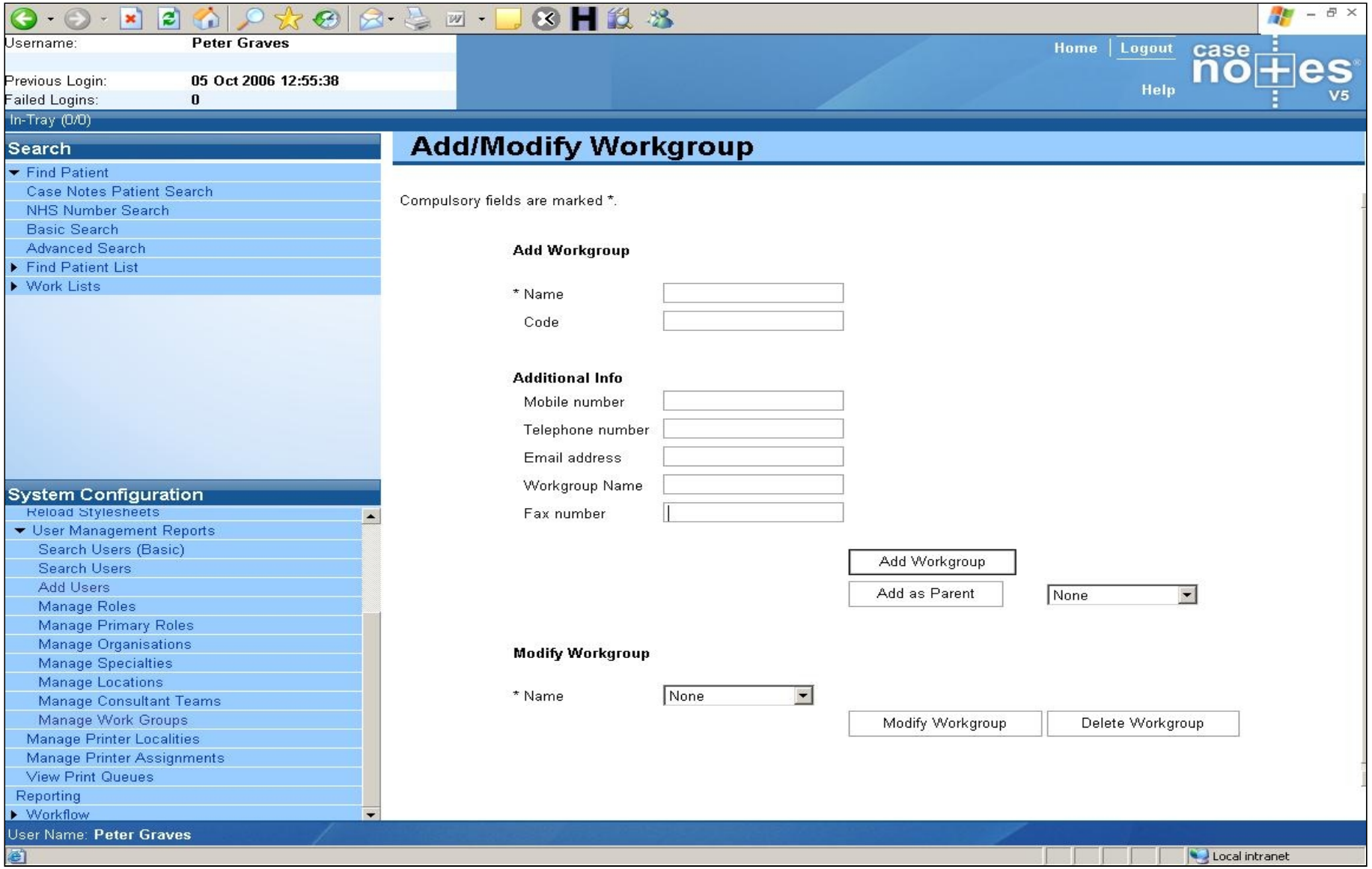
Managing Users and Roles



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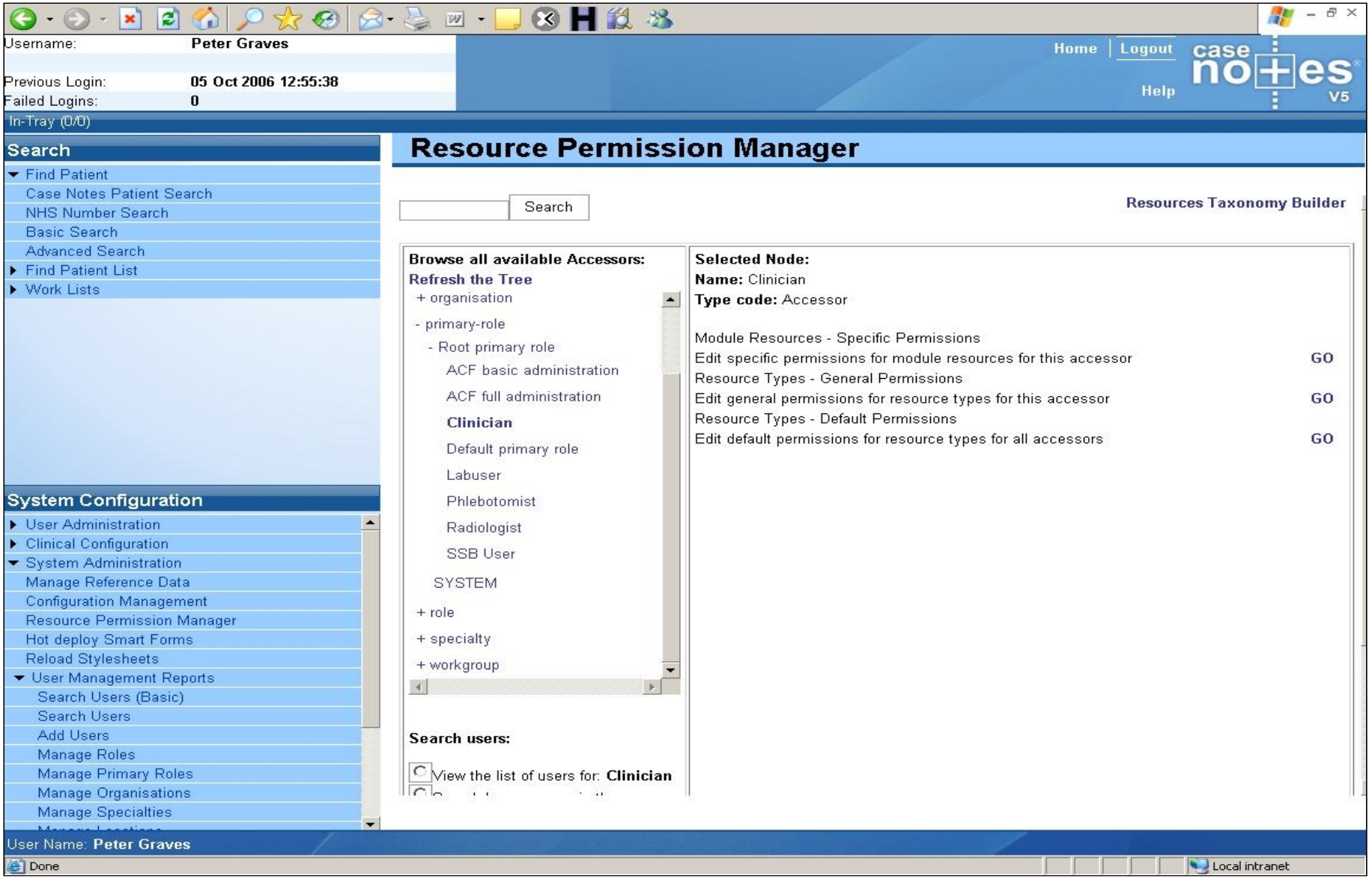
Managing Permissions



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Search, Merge/Unmerge, Registration

- Overview, Features, Benefits -
  - Home Page is the user's personal working environment.
  - Patient Search can be from external services, leading to better shared care and data quality
  - Depending on the system requirement, a patient can be registered on the local index, with or without an external service number
  - Soundex Search allows for similar-sounding names
  - Personal lists allow the user to rapidly search and manage their own list of patients
  - InTray provides a shared-care communication utility for clinical information

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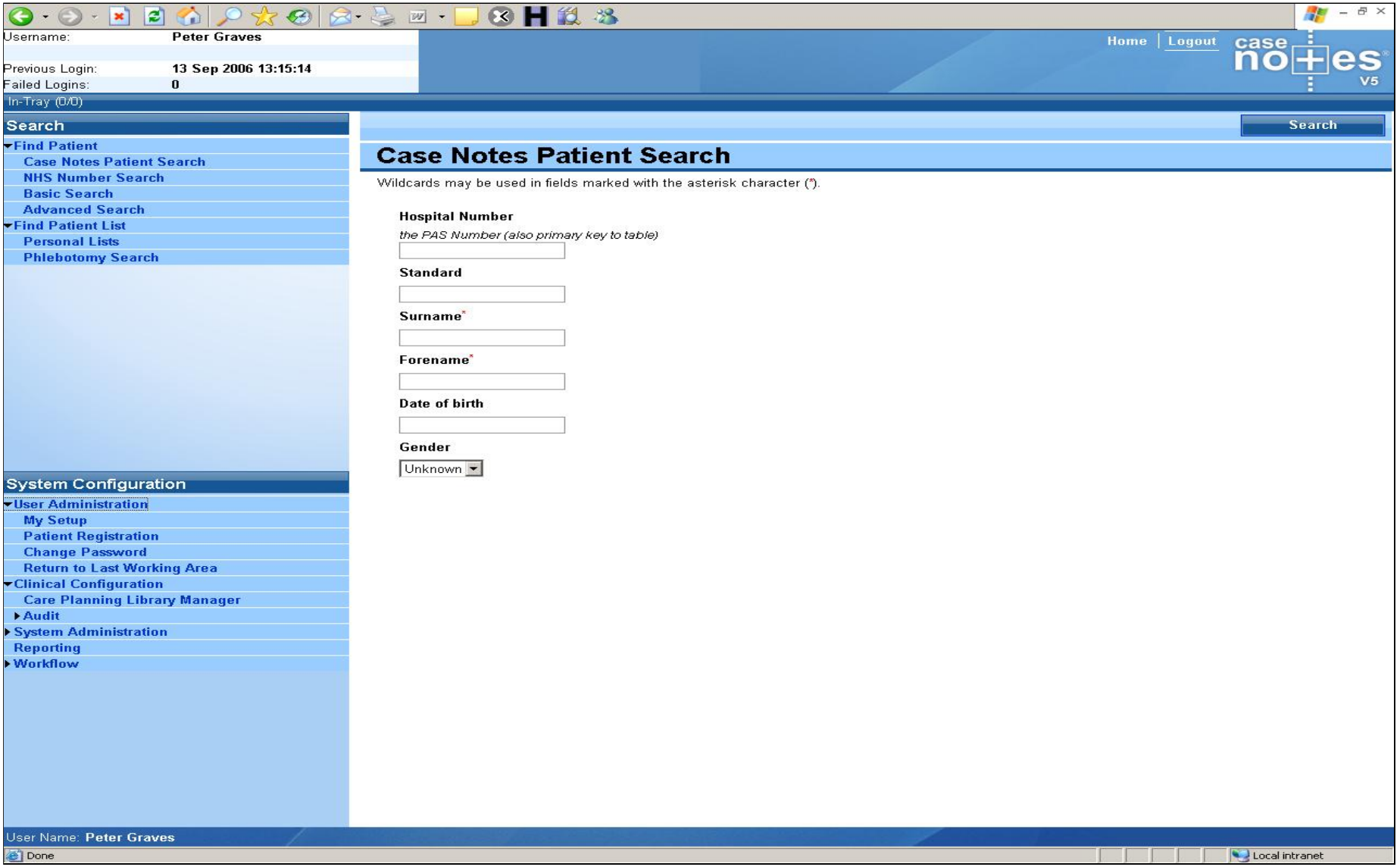
Search, Merge/Unmerge, Registration



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tient
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Configuration
dministration
Configuration
Administration
w

Search

Basic Search

Please complete all fields marked with the dagger character (†).

Wildcards may be used in fields marked with the asterisk character (*).

Given Name*

Ivor

Family Name†

Legg

PostCode

Gender†

Male

Date of birth†

18 Jun 1930 Select

Date of Death

Select

Can also search using wild cards like Iv% to get all patients with first names starting with ‘Iv’

Mandatory demographic information needed for search

Search

- Find Patient
  - Case Notes Patient Search
  - NHS Number Search
  - Basic Search
  - Advanced Search
- Find Patient List
- Work Lists

System Configuration

- User Administration
- Clinical Configuration
- System Administration
- Workflow

Patient Search Results

Case ID	Surname	Firstname	PAS Number	NHS Number	1st Address Line	Gender	Date of Birth
2000000000	Legg	Ivor		1234567890	The Clinic	Male	18 Jun 1930

New Search Refine Search Print Results

Patient identified demographic information

Patient Record and Views

- Overview
  - Case Notes provides a repository for all the patient records held on the system. It is patient-centred and it collects and manages all information about that patient and their care.
  - The Patient Folder view is the main point of access to the patient record and to clinical modules - Order-comms, Results, Care Pathways, Care Planning
  - All clinical activity is collected as ‘events’, which may be a clinical note, an assessment, a lab result, the publication of a care plan or many others. Tabs lead to key clinical information and summary views. The working area shows the event or summary.
  - The Patient Folder view shows as much clinical information as possible, in as simple and accessible form as possible, with minimal key-presses and without the need to access specific functions.

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Patient record and Views

- Features -
  - Events are shown as a vertical chronological list with week/month/year views and selected for viewing by a single click.
  - Or as a graphical ‘lifeline’ view with events shown as icons on a fixed time-scale.
  - Event Tree Filters allow the user to select which events will be shown, and are set specific to the patient.
  - Tab summary views show, current or latest events and lead to combined summary views.
  - Events may be sent to In-Tray
  - The working area shows the detail of the default or selected event.

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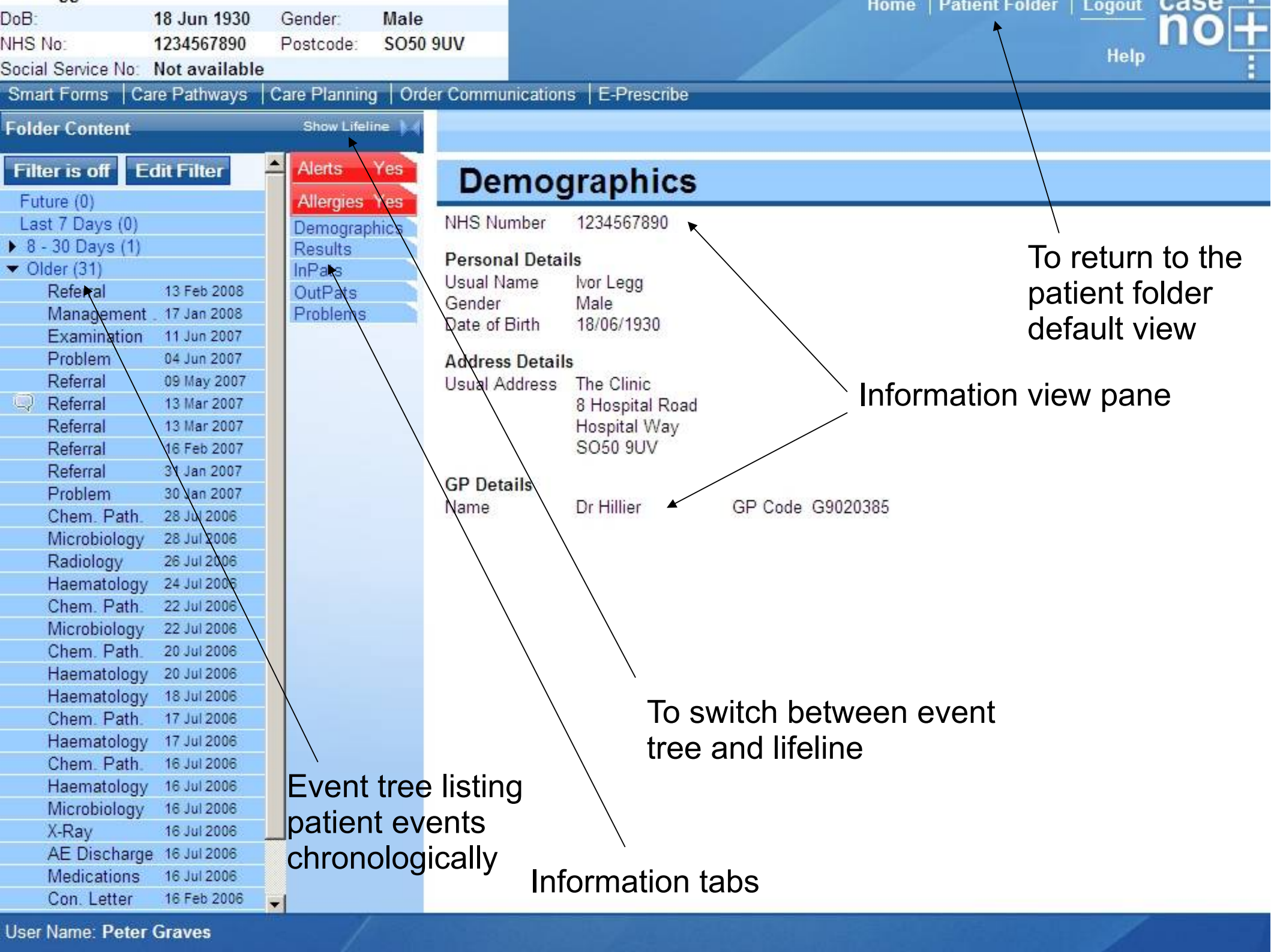
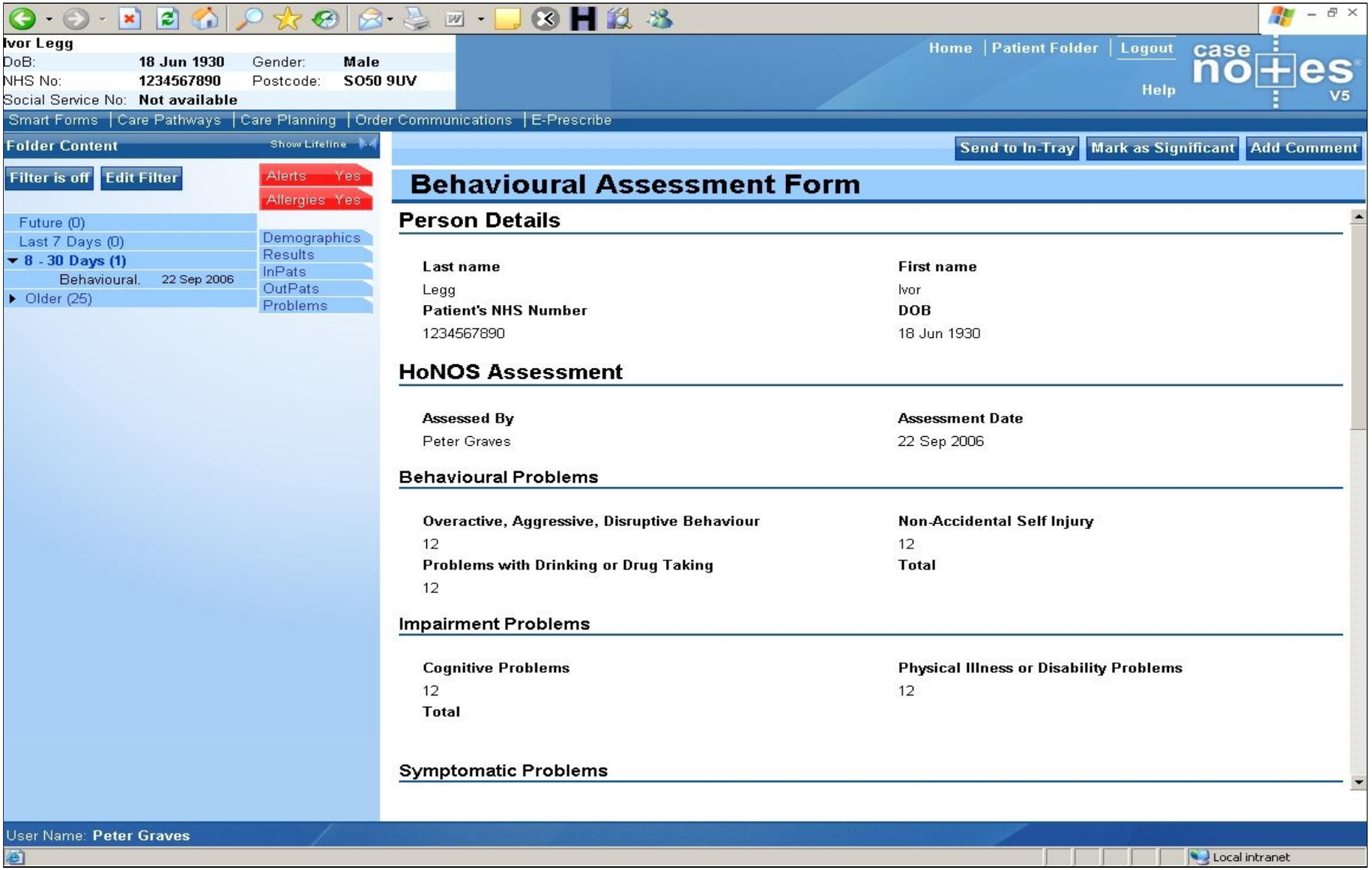

DoB: 18 Jun 1930 Gender: Male
NHS No: 1234567890 Postcode: SO50 9UV
Social Service No: Not available
Home | Patient Folder | Logout
Help
Smart Forms | Care Pathways | Care Planning | Order Communications | E-Prescribe
Folder Content
Show Lifeline
Filter is off
Edit Filter
Future (0)
Last 7 Days (0)
8 - 30 Days (1)
Older (31)
Referral 13 Feb 2008
Management 17 Jan 2008
Examination 11 Jun 2007
Problem 04 Jun 2007
Referral 09 May 2007
Referral 13 Mar 2007
Referral 13 Mar 2007
Referral 16 Feb 2007
Referral 31 Jan 2007
Problem 30 Jan 2007
Chem. Path. 28 Jul 2006
Microbiology 28 Jul 2006
Radiology 26 Jul 2006
Haematology 24 Jul 2006
Chem. Path. 22 Jul 2006
Microbiology 22 Jul 2006
Chem. Path. 20 Jul 2006
Haematology 20 Jul 2006
Haematology 18 Jul 2006
Chem. Path. 17 Jul 2006
Haematology 17 Jul 2006
Chem. Path. 16 Jul 2006
Haematology 16 Jul 2006
Microbiology 16 Jul 2006
X-Ray 16 Jul 2006
AE Discharge 16 Jul 2006
Medications 16 Jul 2006
Con. Letter 16 Feb 2006
Alerts Yes
Allergies Yes
Demographics
Results
InPats
OutPats
Problems
Demographics
NHS Number 1234567890
Personal Details
Usual Name Ivor Legg
Gender Male
Date of Birth 18/06/1930
Address Details
Usual Address The Clinic
8 Hospital Road
Hospital Way
SO50 9UV
GP Details
Name Dr Hillier GP Code G9020385
To return to the patient folder default view
Information view pane
To switch between event tree and lifeline
Event tree listing patient events chronologically
Information tabs
User Name: Peter Graves

Patient Folder



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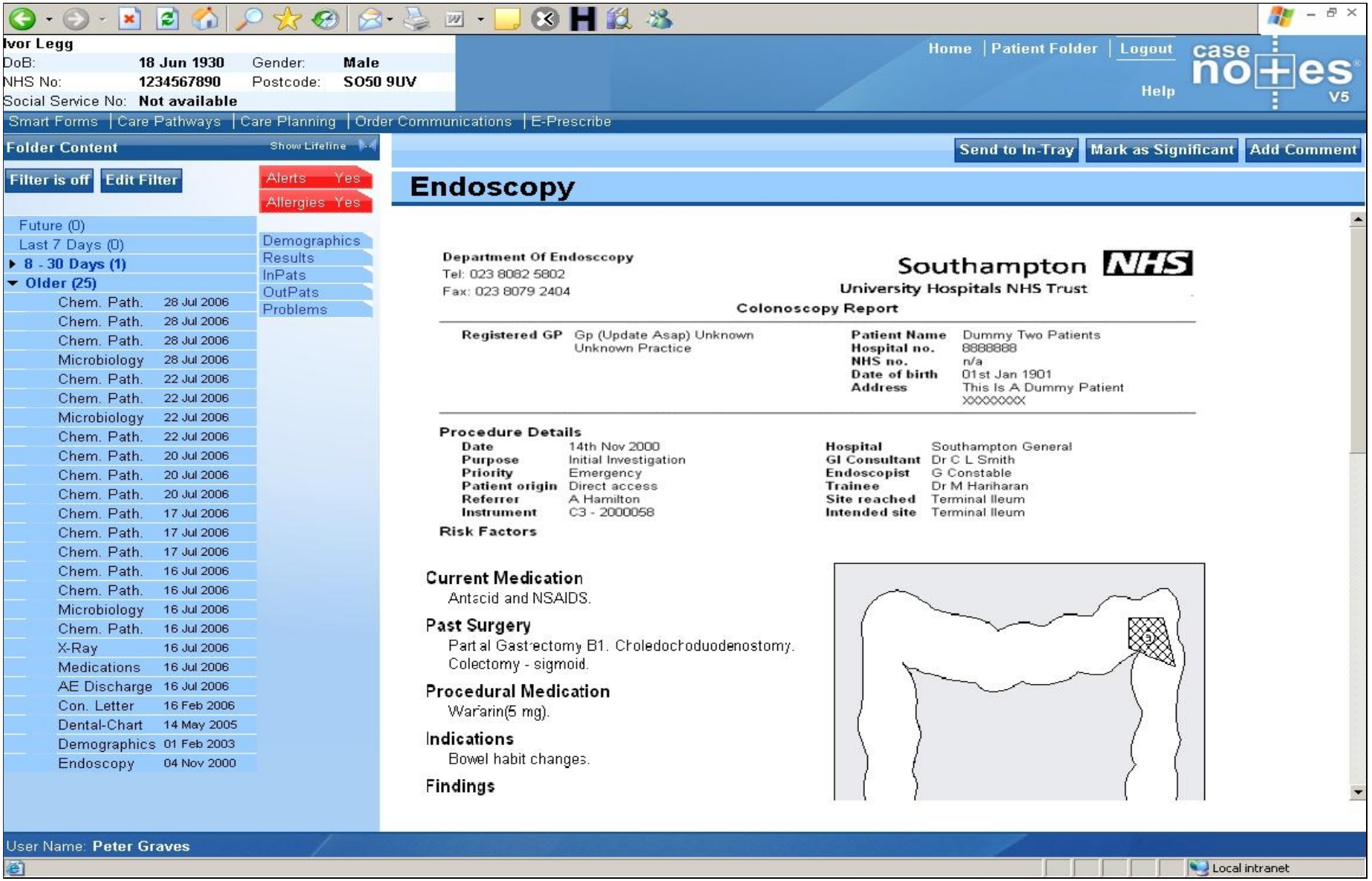
Patient Folder



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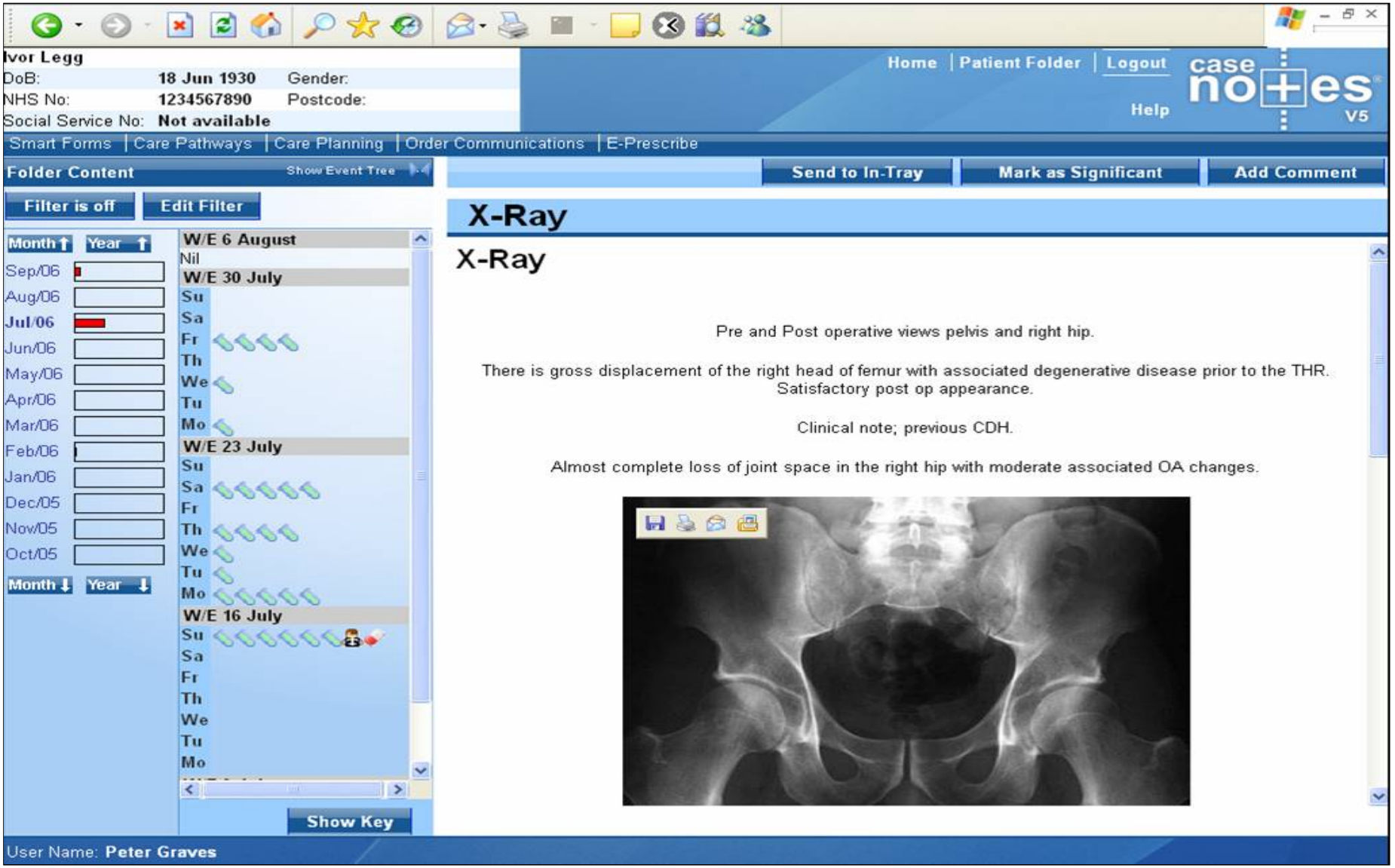
Patient Folder



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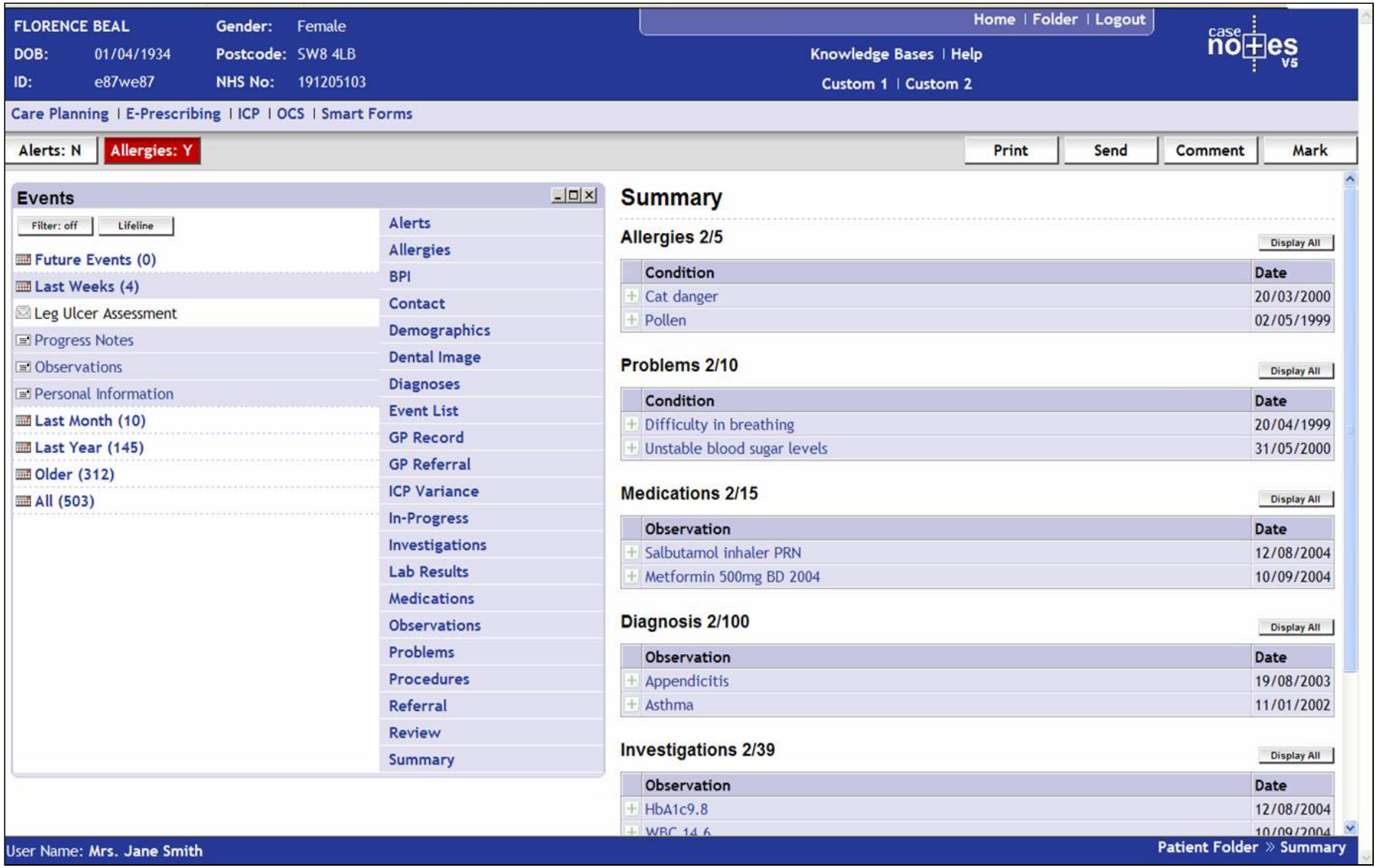
Summary View



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Smart Forms

- Overview -
  - Provide a flexible and powerful way for the user to create, manage and share form-based information associated with individual patients – such as contact information, assessments and referrals.
  - Instantly familiar, as they can be made to look like traditional paper forms.
  - Based on a common Information Model, which is applied to all forms across care settings and through working frameworks such as Long-Term Conditions.
  - May be shared with other team members
  - Documents may be attached from external sources

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Smart Forms

- Features -
  - Flexible presentation using a managed data model, from the Case Notes Information Modelling Toolkit
  - Forms can be completed or continuously updated
  - Configurable file attachment
  - Validation, Save, Publish, Print and ‘advanced’ icons for multiple actions and large print option
  - Send by clinical In-Tray
  - Integrate naturally with workflow – Care Pathways or simple team communications
  - User Access Control to forms or blocks – provenance to block level
  - Smart Forms module is factored and used as an engine for in other modules

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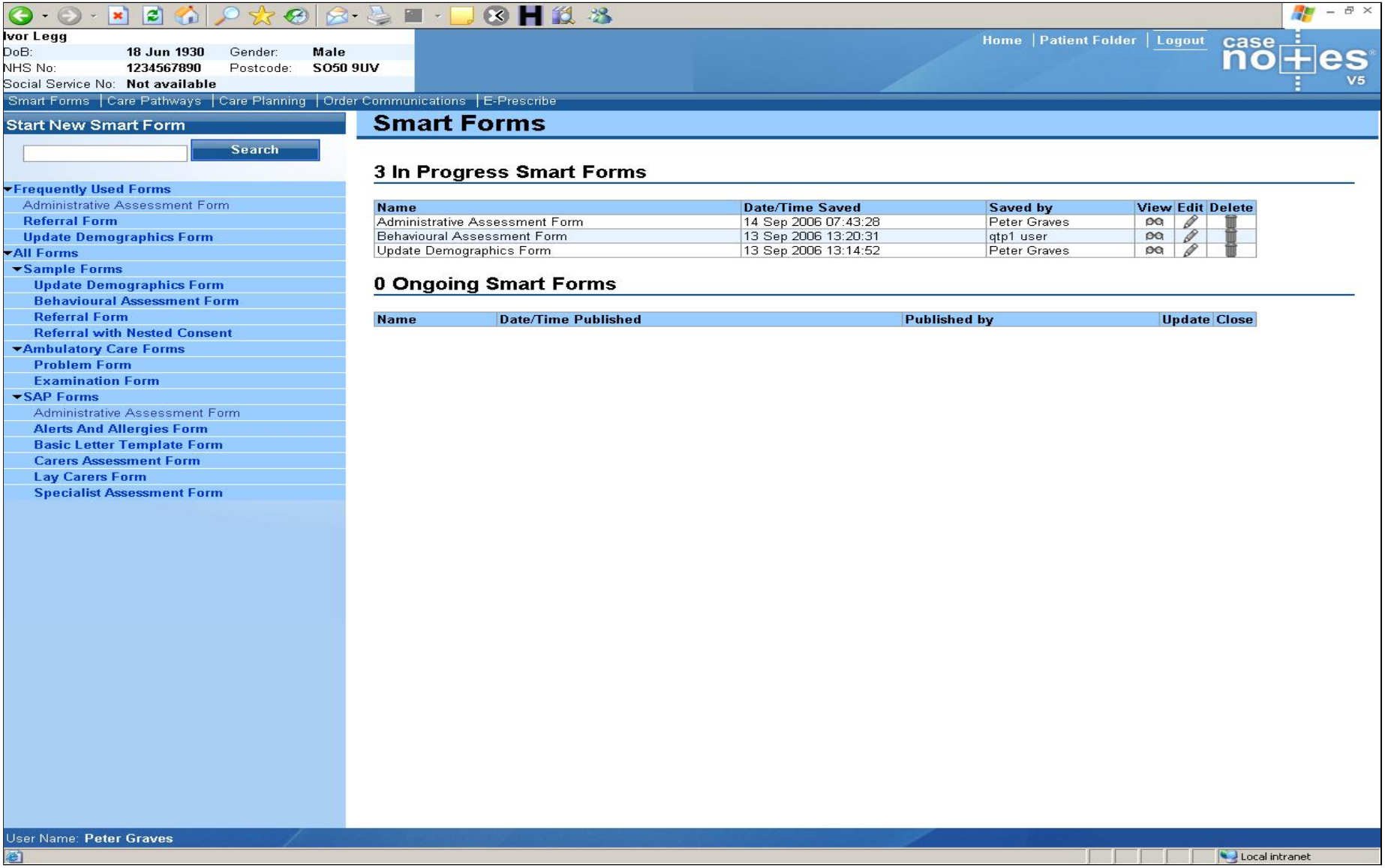
Smart Forms – Control panel



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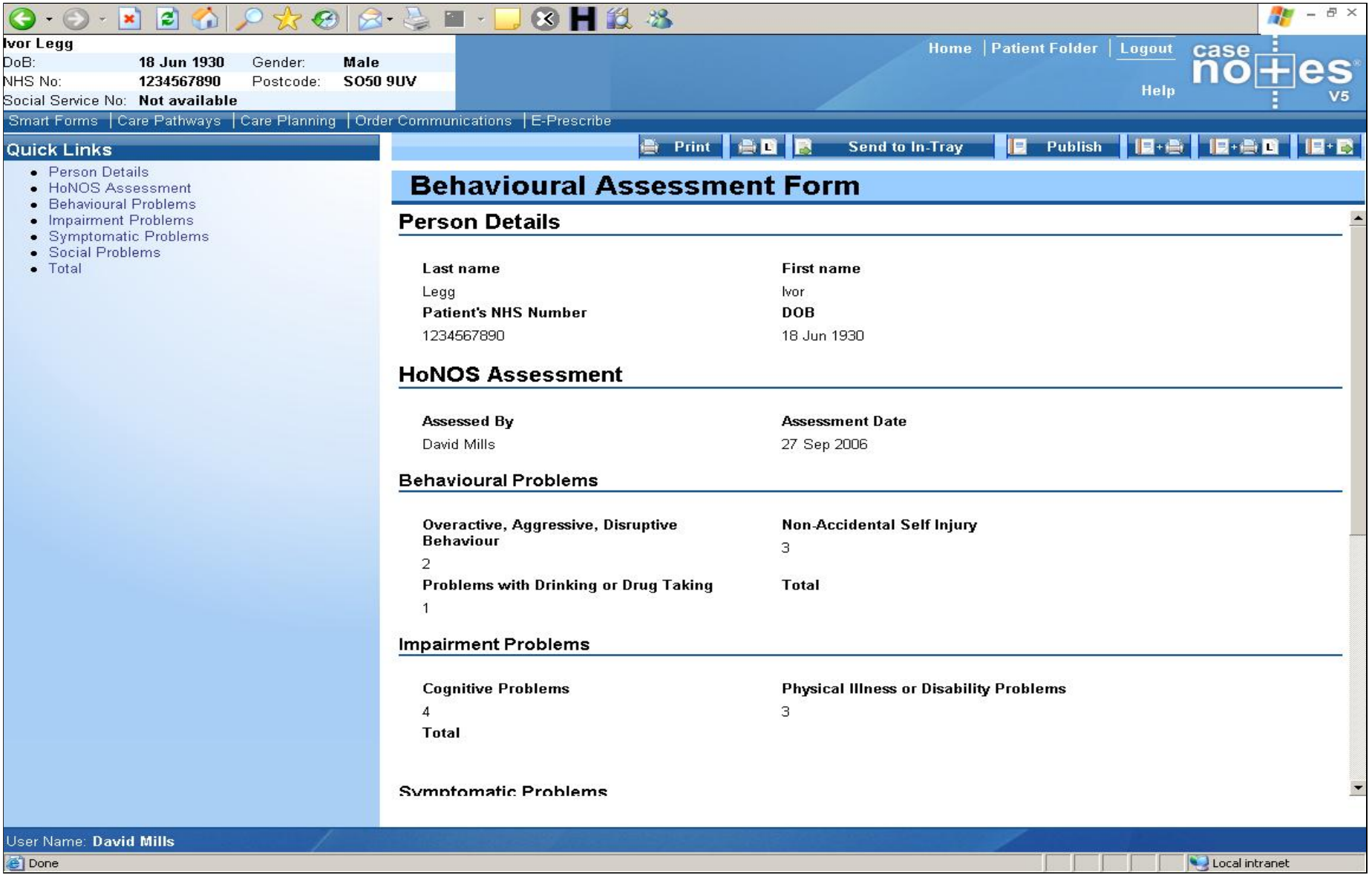
Smart Forms – Publish/Print



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In-Tray

- Overview -
  - In-Tray is a secure clinical version of standard e-mail, allowing users to share information within and across care settings and agencies
  - When a form is published or a result received, it can be automatically sent to the clinician or to the whole team
  - Supports processes such as referral and discharge
  - Supports shared care frameworks such as NSF's for Long-term conditions
  - Particular strengths in team communications, with business logic for confirmation
  - Full retention in the repository, full audit and communication history

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In-Tray

- Features
  - Clinical In-Tray, with Familiar ‘e-mail’ operation, Instant communication
  - Search for specific items, Filter views
  - Priority
  - Covering notes and memos (non patient related communication)
  - Reply and forward
  - Communication History
  - Direct access to patient folder
  - Workgroup Communication management: copy to groups, business rules, representative responses, user In-Tray

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In-Tray example

- Referral
  - Single selection of recipients – auto send on publish
  - Only ‘published’ forms will prompt the referral responses
  - ‘Action required’ flag within In-Tray
  - Ability to ‘forward’ inappropriate referrals
  - Responses captured within the Referral Form
  - Responses accessed via ‘In-Tray’ or ‘Smart Forms’ module
  - Auto-archiving no longer required. (‘Action required’ flag and ‘Edit Response’ ability will be removed once response received)
  - Application of business rules to prevent inappropriate actions (can’t archive until someone responded etc)

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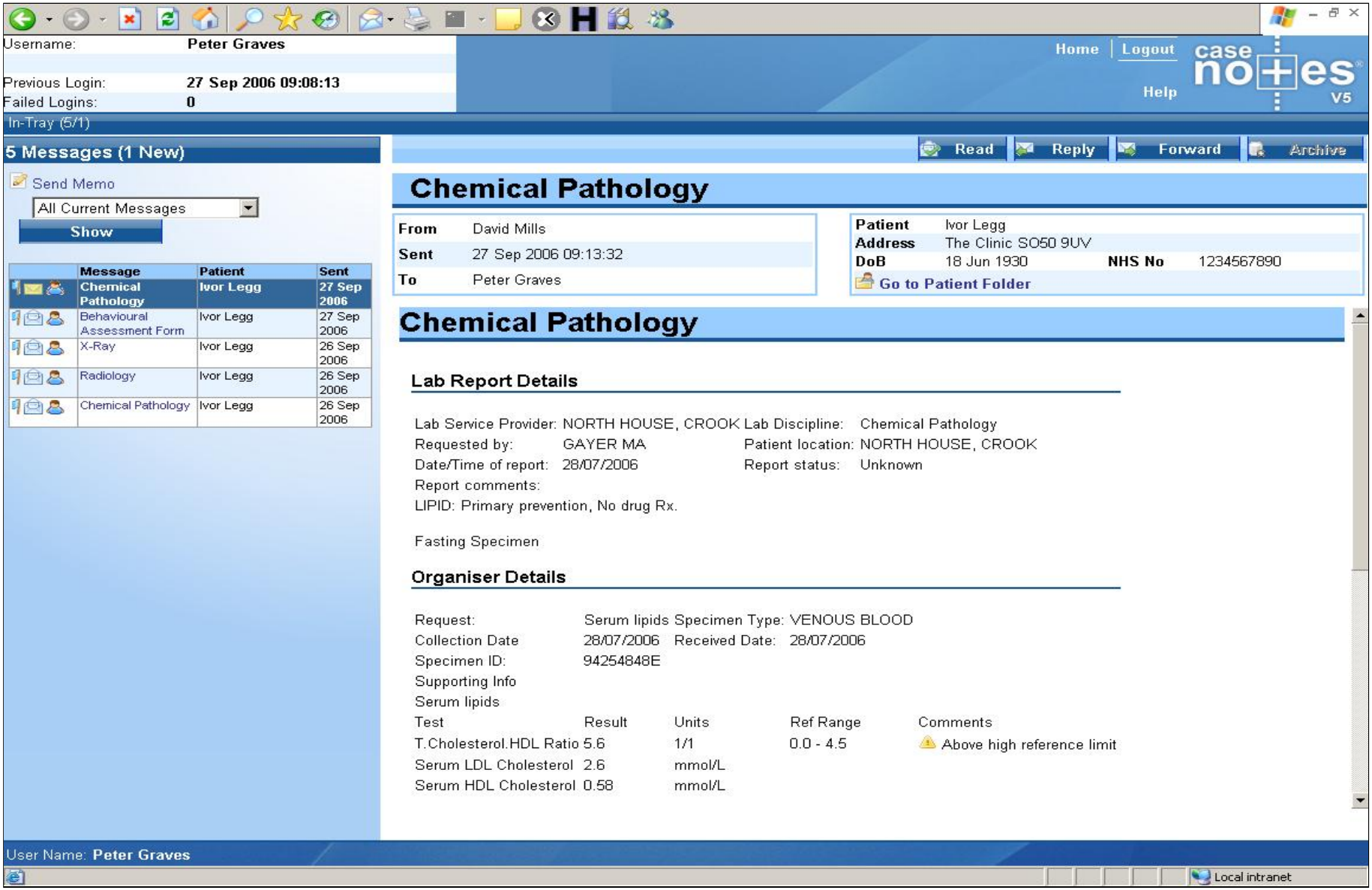
In-Tray



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Order Communications

Overview -

- A fast, efficient and secure way to make Requests for pathology, radiology, and health professional services.
- Flexible and localised definition of Requests
- Rapid entry with ‘request basket’ functionality
- Interfaces to Laboratory and Radiology systems
- Integrated with ‘In-Tray’ functionality
- Suited for use across multiple organisations

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Order Communications

- Features
  - Order selection
    - Search and hierarchical ‘tree’ order selection
    - Haematology, Biochemistry, Microbiology, Histopathology
    - Roles-based access control by investigation
    - ‘Order Sets’ - select individually or ‘All items’
    - Repeat requests
    - Frequently-used and Favourites
    - ‘Quick Links’ - easy access to specific areas, orders in progress
  - Order basket
    - One-click addition to basket
    - View current basket while adding services
    - Having entered your order form – can select, add or delete items.
    - Repeat Request as part of collection details
    - View in-progress orders alongside basket

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Order Communications

- Features, continued
  - Order form
    - Single order form
    - Prepopulation of fields, Patient clinical history written once
    - Multiple services on one order
    - Request Validation
  - Order processing
    - View, Collect, Print, Cancel, multiple selection
    - Phlebotomy lists with location grouping
  - Types & Rules
    - Radiology Service types, AHP service types, Physio, Podiatry
    - Data collection, validation, rules for grouping, duplicates
  - Integration
    - Internal: order from Care Pathways, link to results, In-Tray
    - External: HL7 with LIMS and RIS, Terminology (5.1+)

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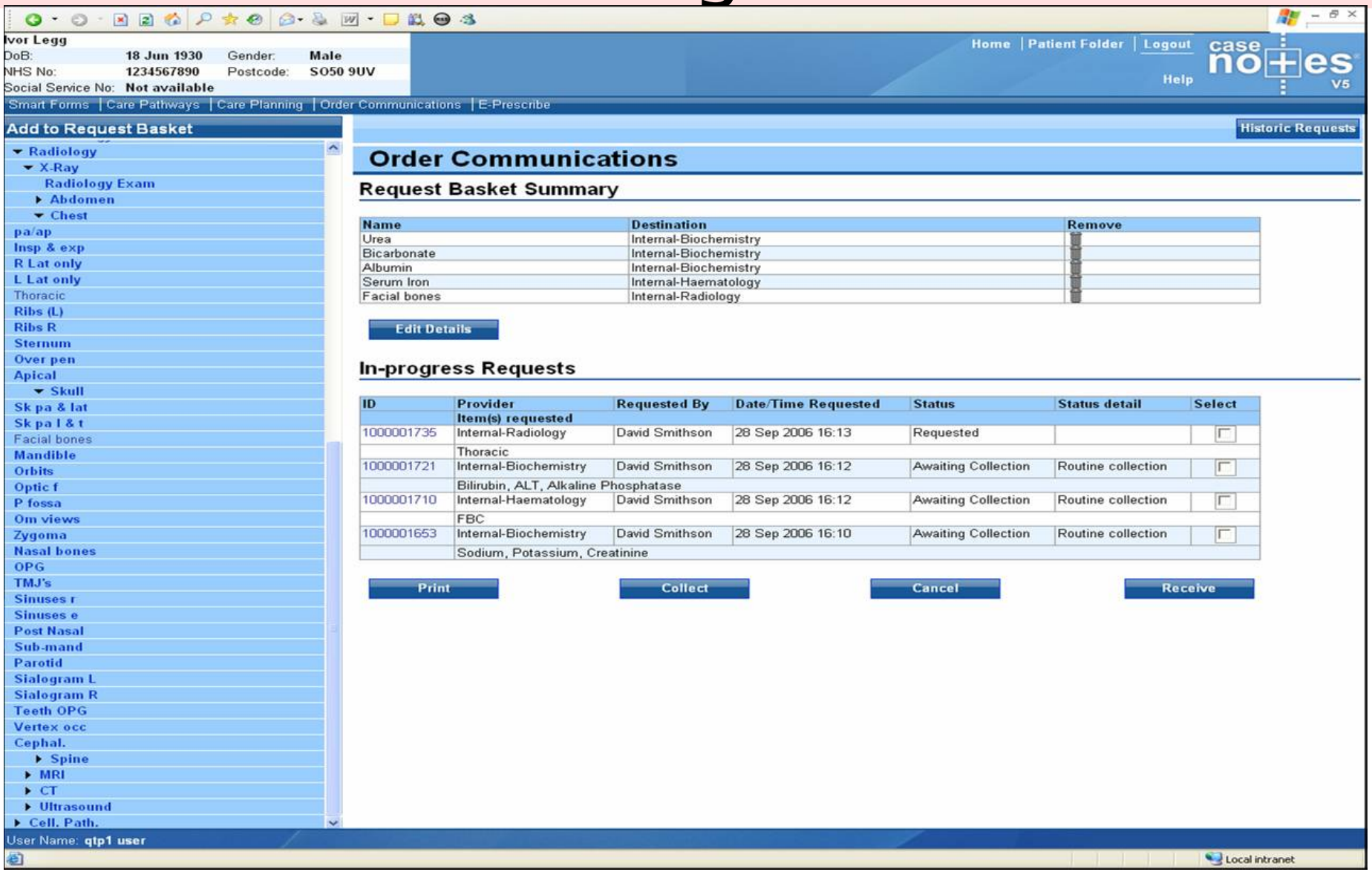
Ordering – Request Basket and In-Progress



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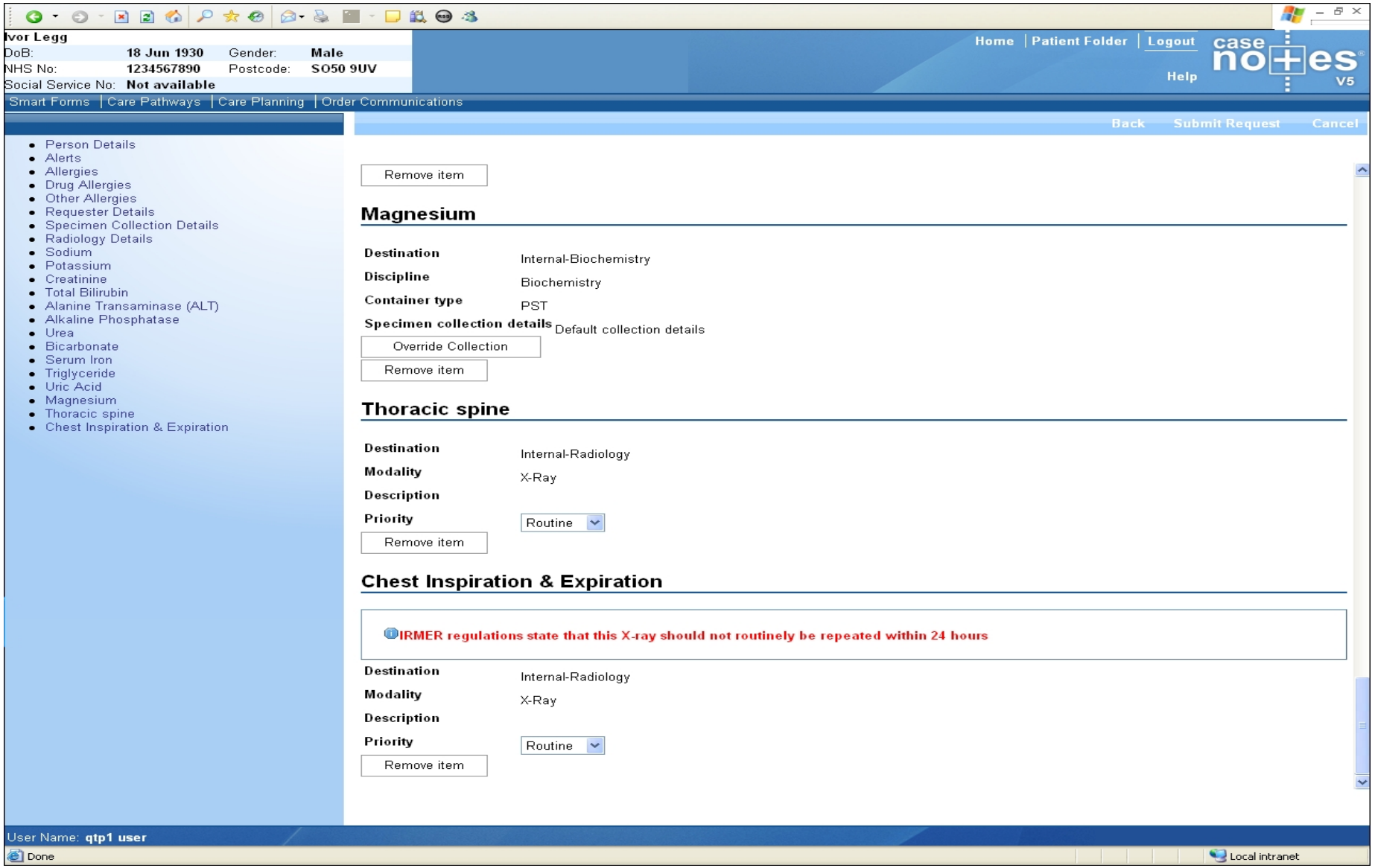
OCS Request



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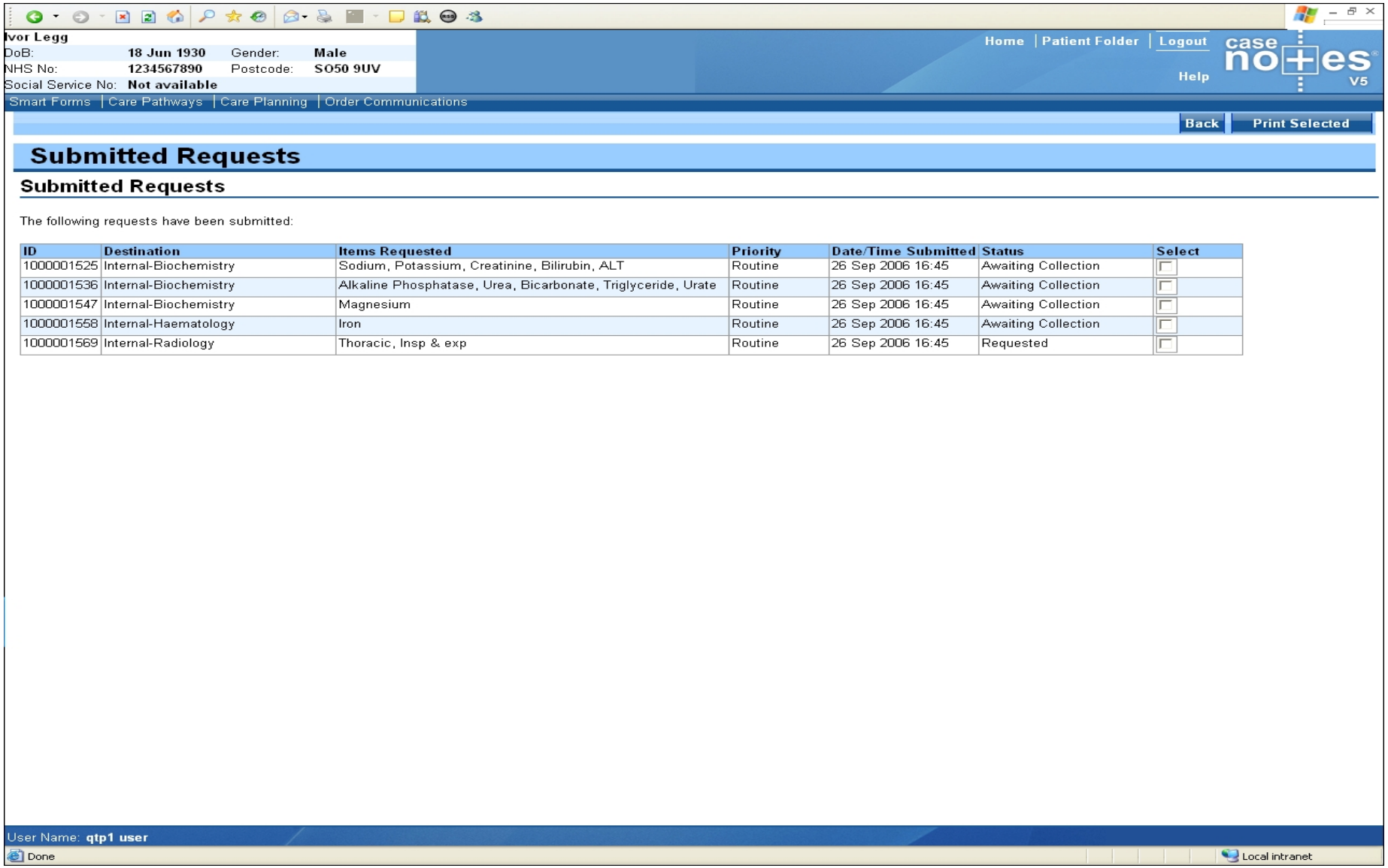
OCS Request



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Results Reporting

- Overview
  - Results are reported automatically to the Patient Folder, with out-of-range results automatically triggered to the user's In-Tray (available in standard Case Notes).
  - Results may be entered manually or from interfaced departmental systems.
  - All historical results reported to Case Notes for that patient are available through the Results Reporting Module.
  - Results can be filtered and selected for display in tabular and graphical format.
  - Case Notes' Results Reporting is proven in deployment across multiple organisations – acute Trusts, Community and GP settings.
  - Results Reporting uses Case Notes' Graphing Service, which includes the capability for generation of graphs on data entered from forms, such as blood pressure or assessment scores.

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Results Reporting

- Features
  - Results are available as events presented in history or lifeline views (available in standard Case Notes)
  - 2-stage filtering of case results history – time and result type
  - Tabular display of results, including free text reports
  - Graphical display of numerical data
    - Multiple curves, out of range indication
    - Logarithmic scale
  - HL7 interfaces to Lab and Radiology systems

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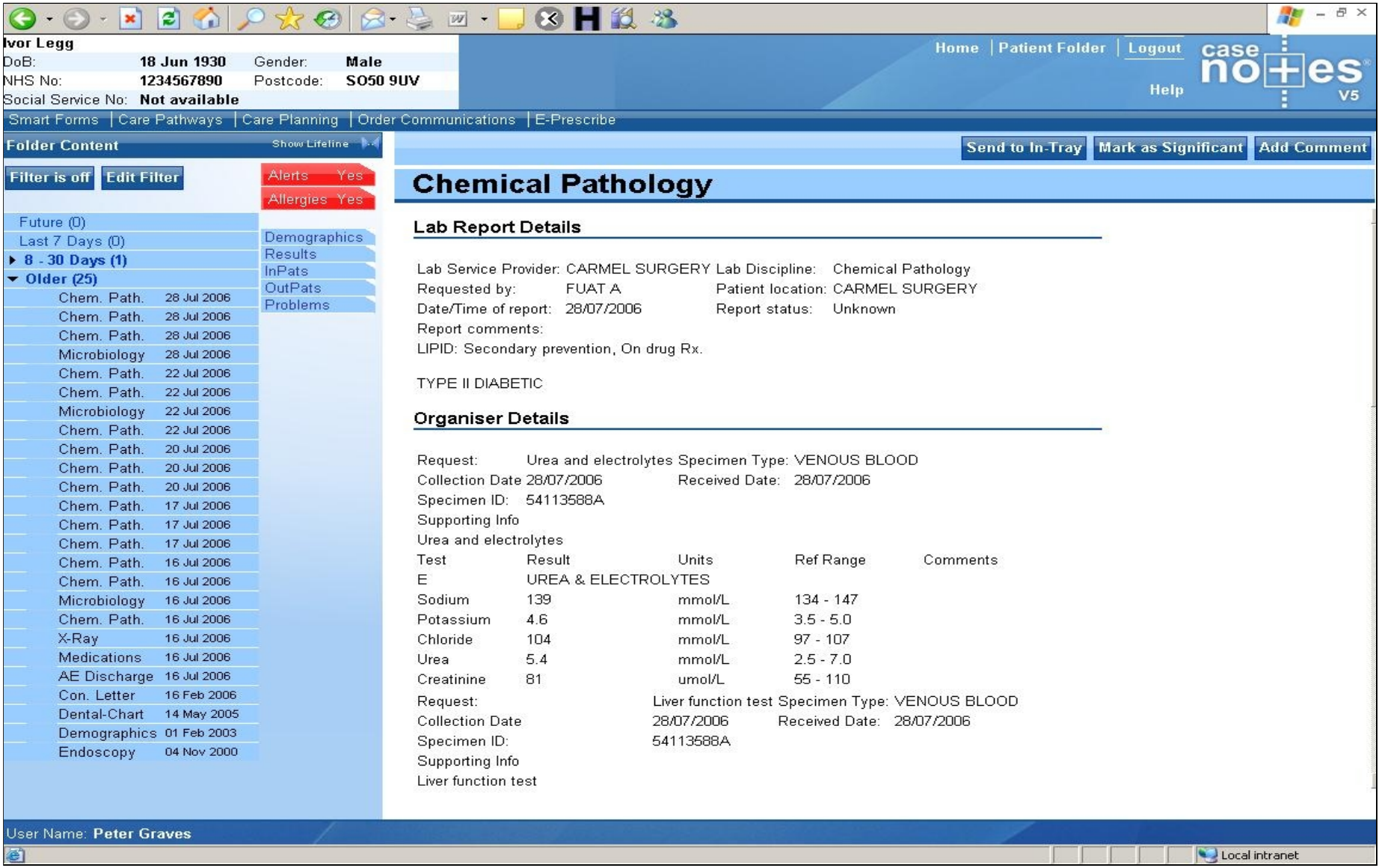
Results Reporting



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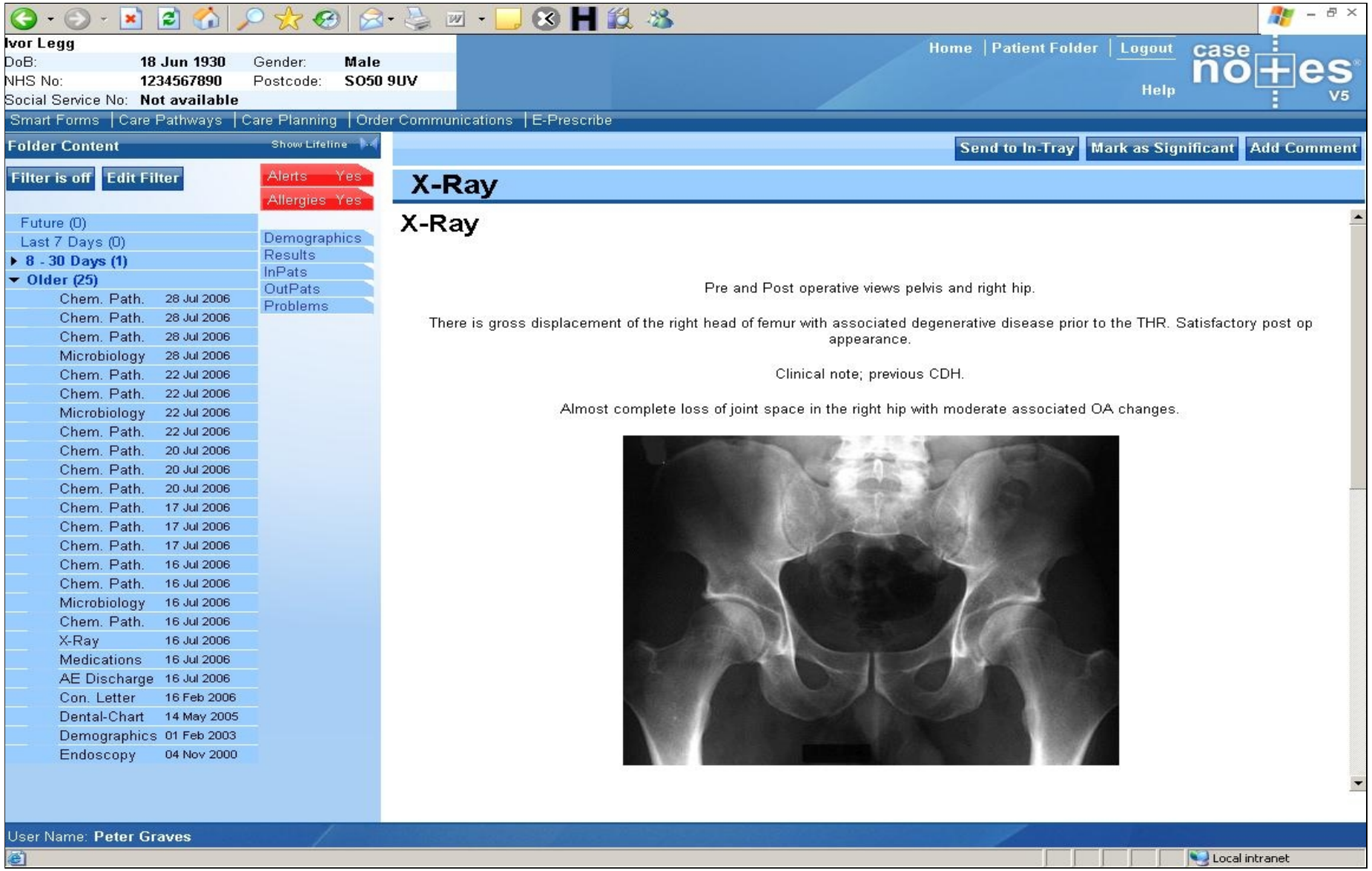
Results Reporting



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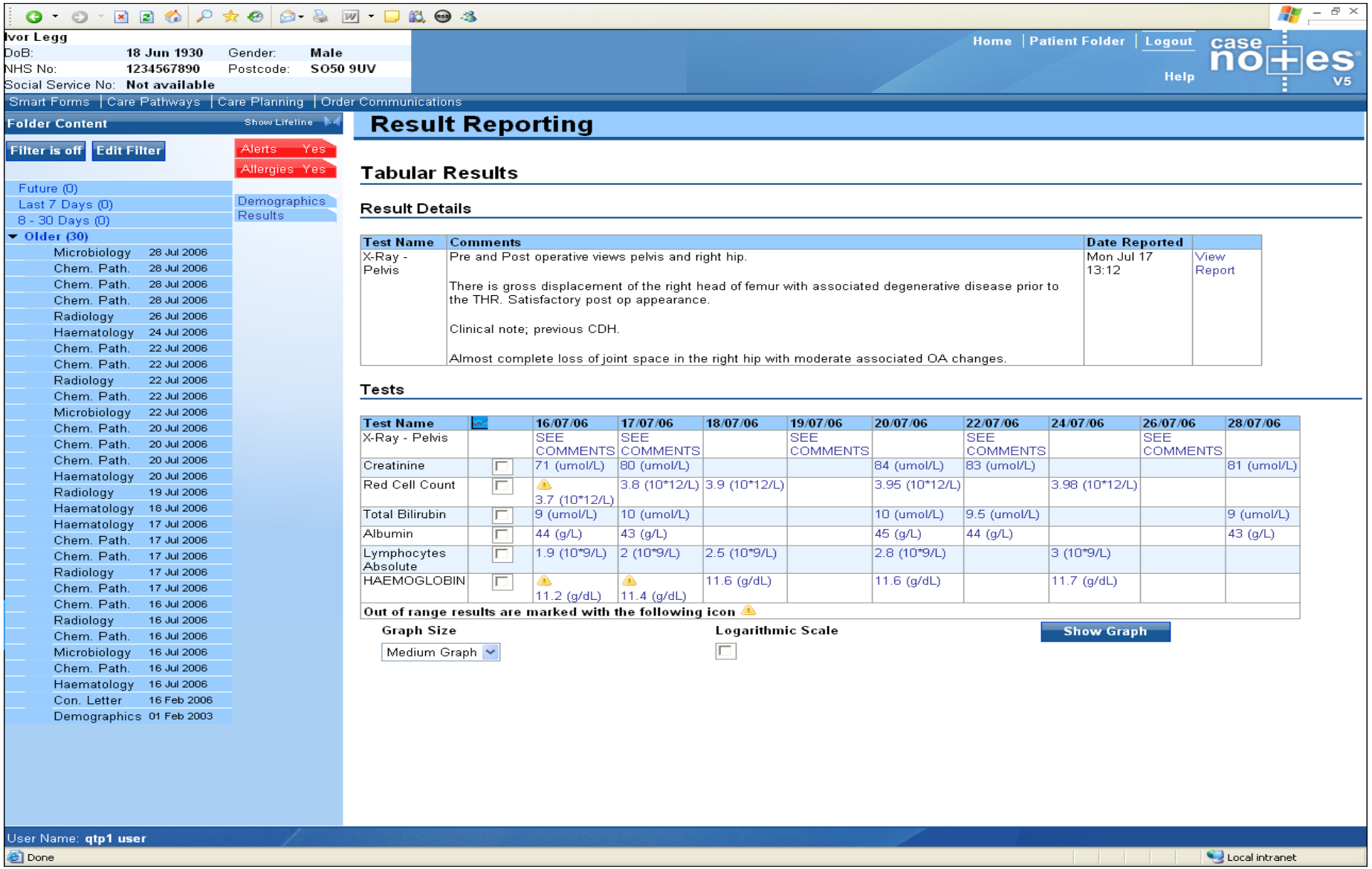
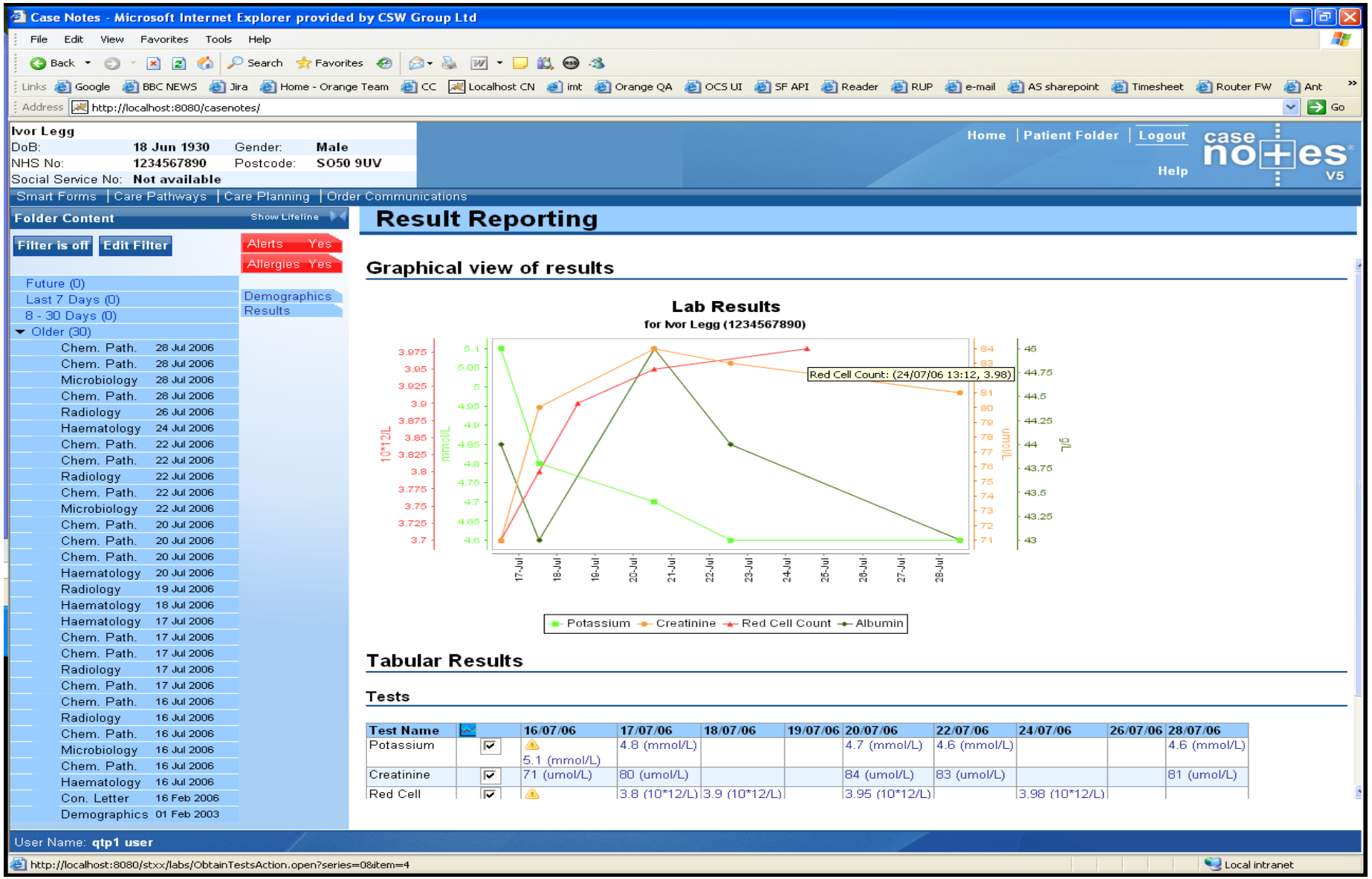
Results Reporting



Results Reporting



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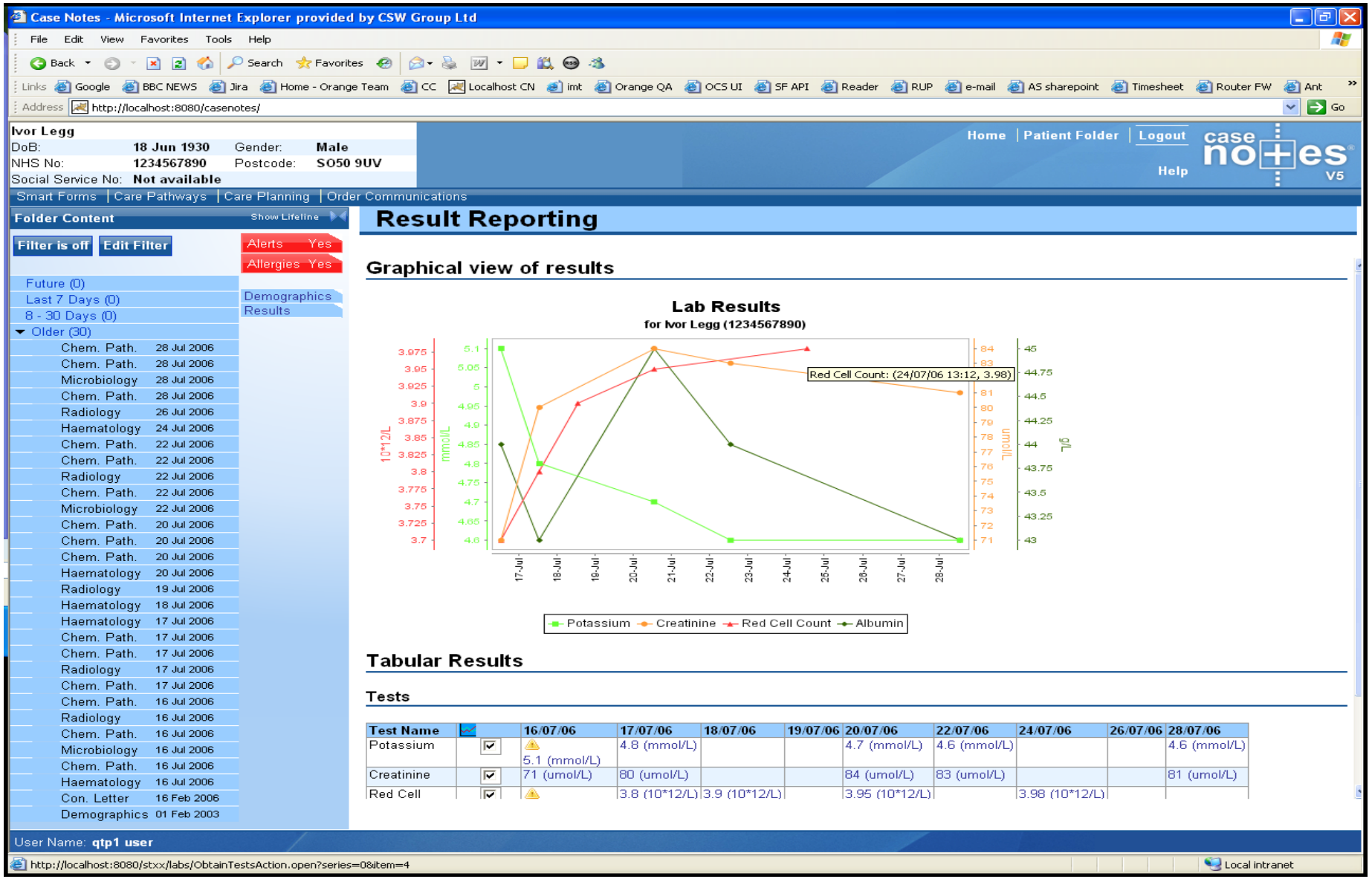
Results Reporting



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Care Planning

- Overview
  - The Care Planning Module helps the Carer to define and organise a set of Problems, Goals and Actions for a patient's care.
  - It is quick to learn and simple to use, for Healthcare and Social Care workers.
  - Care Plans are created in a library builder tool and form an extendable and linkable library of options
  - Active plans are accessed, monitored and updated using on-screen forms

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Care Planning

- Features
  - Care plan Library Builder provides a working environment to enter Problems, Goals and Actions and link them to form Care Plans based around each Problem
  - The library can provide standard or locally tailored Care Plans
  - Access by care co-ordinators, nurses and social carers is controlled by Access Control
  - Plans are selected for the patient and may be modified to suit individual needs
  - The plan is started and available to the care team
  - Team members view the plan and enter actions into a working chart
  - Completed plans are retained in the patient record

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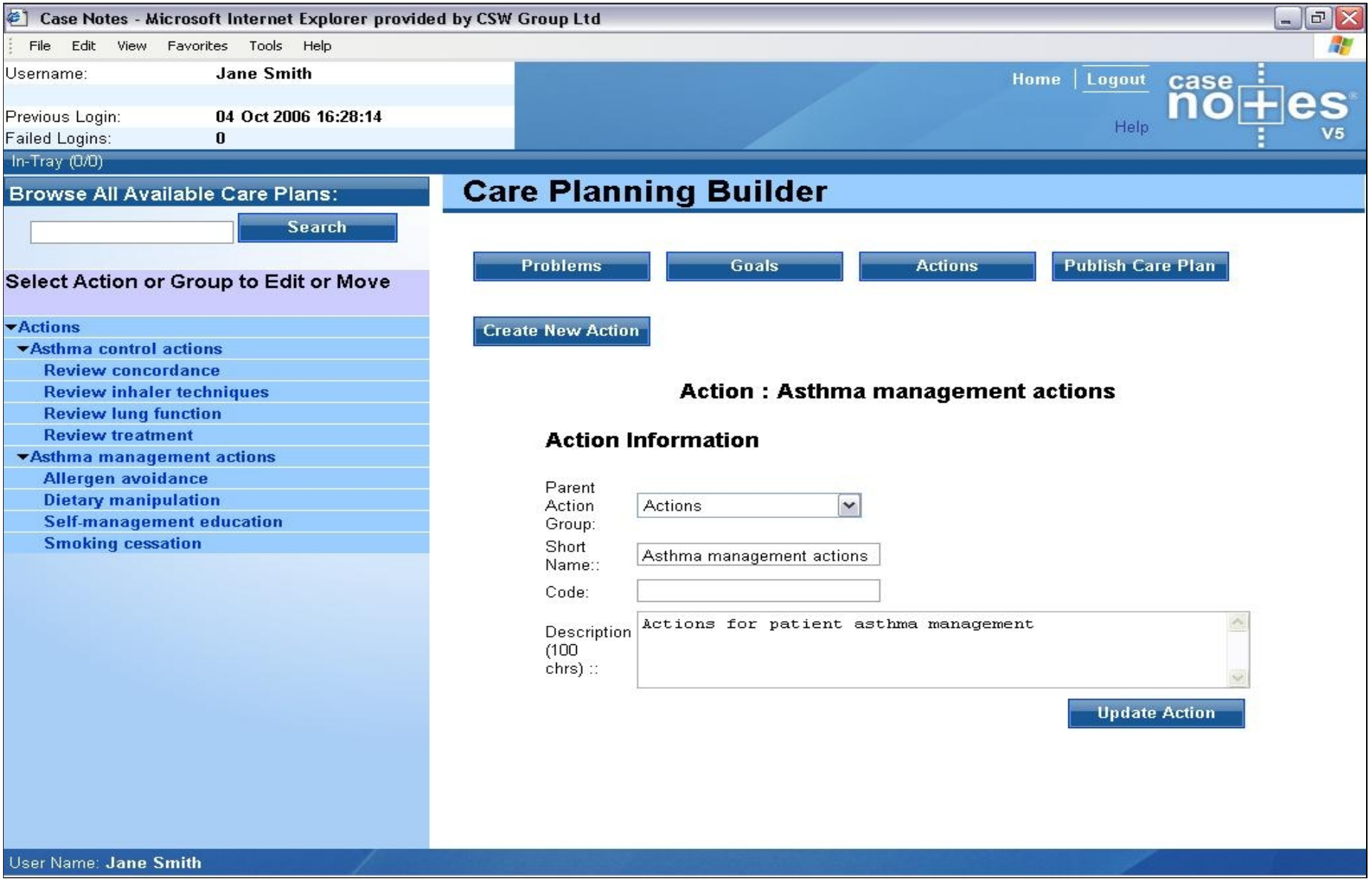
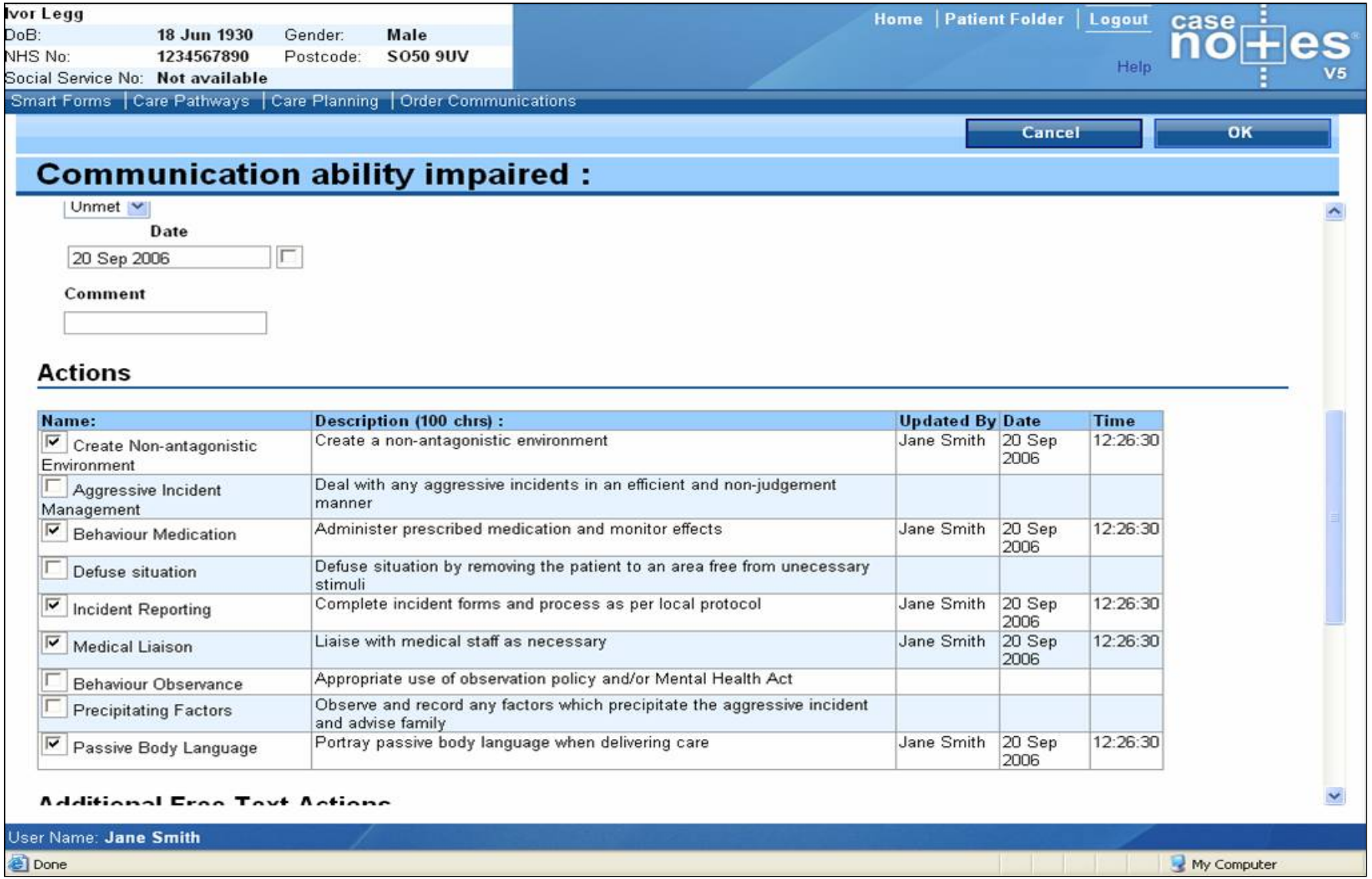
Care Plan Builder



Care Plan - Modify



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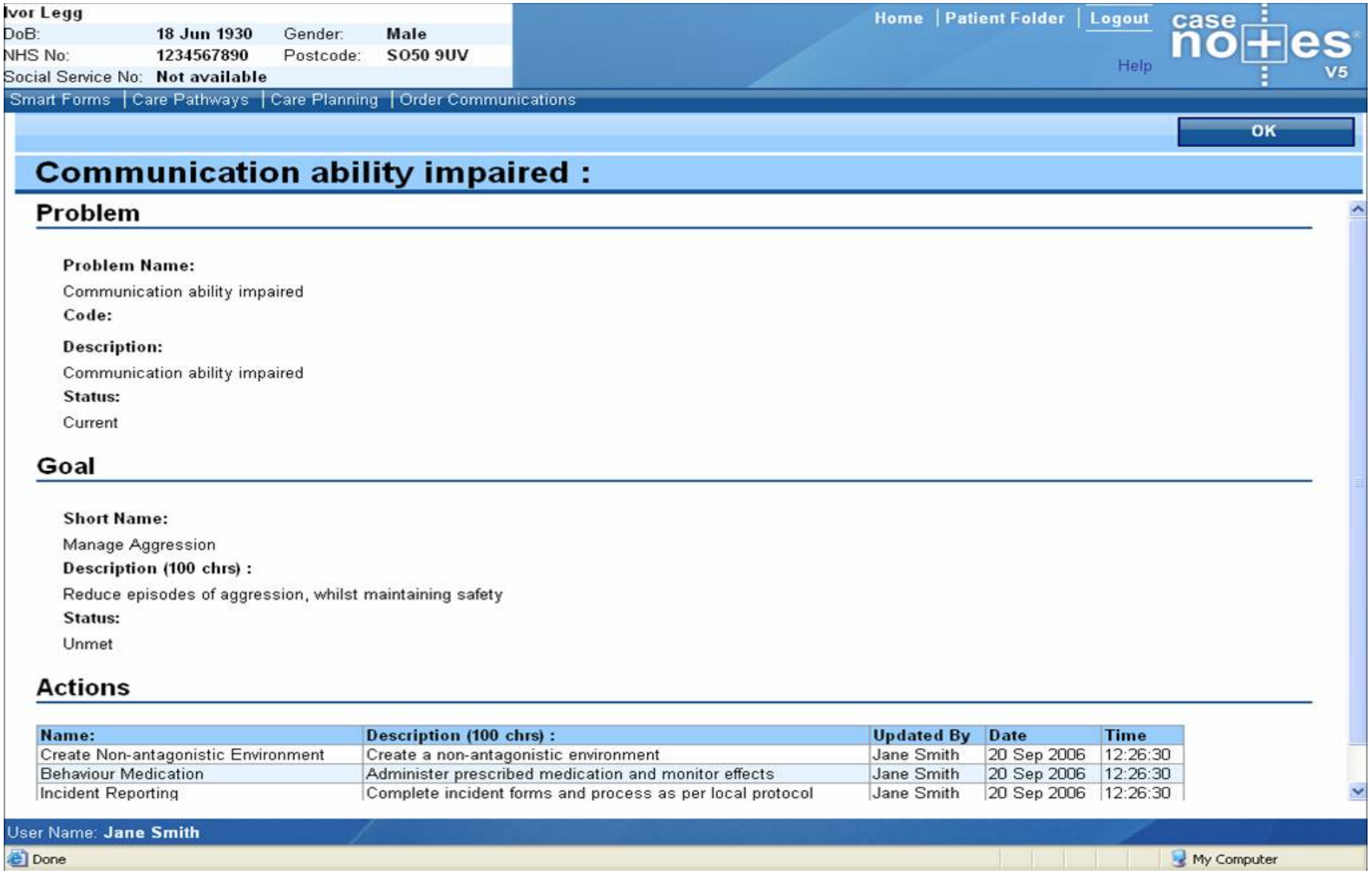
Care Plan - view



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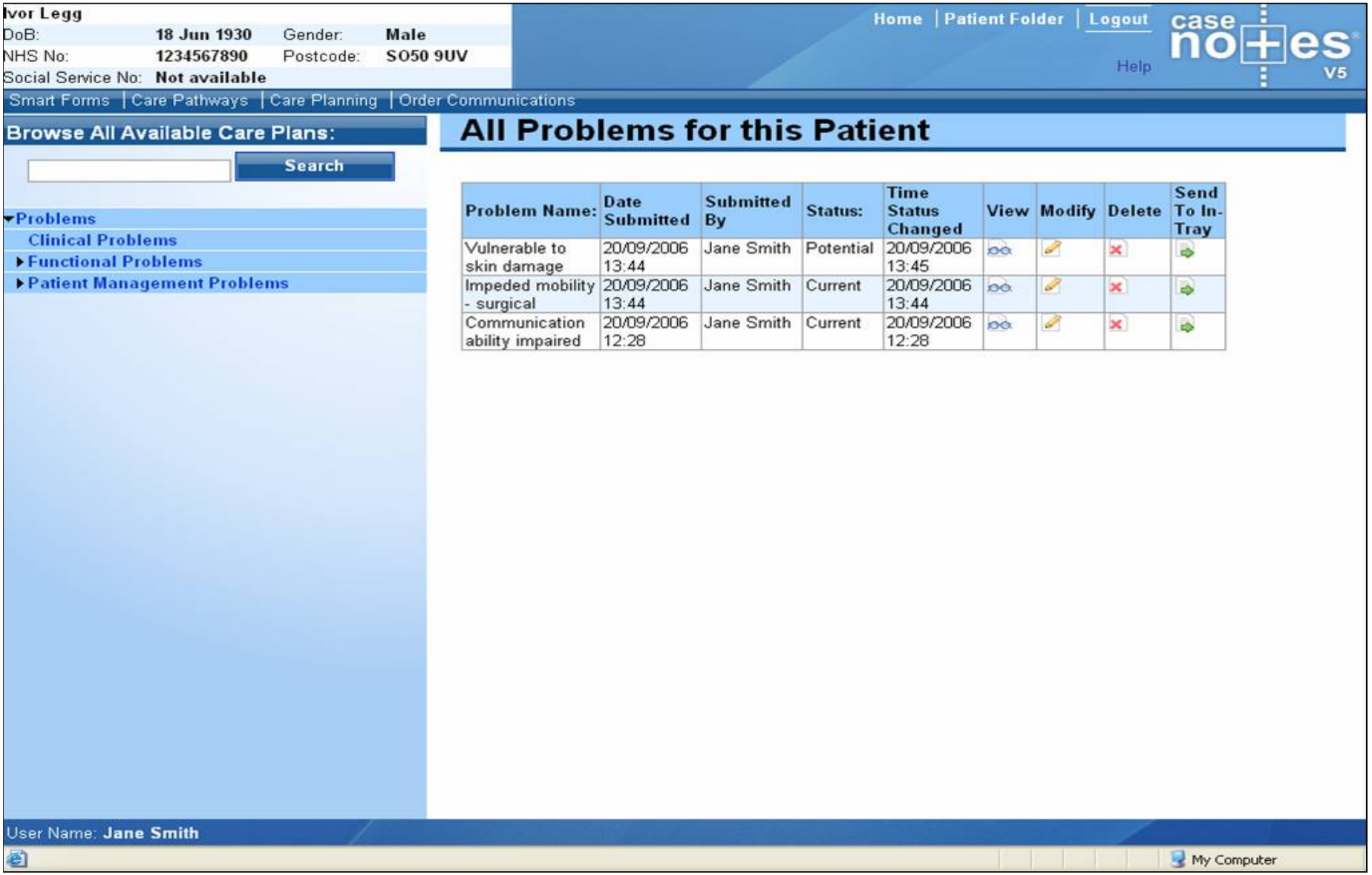
Care Plan – Current view



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Care Pathways

- Overview
  - Care Pathways help the carer to define and organise recommended sequences of care for individual patients
  - The Care Pathway is built using a graphical tool and held in a library
  - It is quick to learn an simple to use, centred around a chart view and linked with Case Notes' care modules to order and record care
  - The pathway can cross multiple care settings and organisations
  - Case Notes' workflow engine links and manages the task relationships and user interactions in real time)

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Care Pathways

- Features
  - Care pathway library builder – template in Visio tool.
  - Pathway includes
    - Task type, Expected date and time,
    - Notify late or missed activity,
    - Mandatory task, task may start early
    - Branches, joins, decisions
  - Pathway selection -
    - Search and hierarchical ‘Tree’ format
    - Customised for specific patient
  - Variance
    - Alter start-date and start times of activities, early/late
    - Skip non-mandatory items
    - Reason for skipping
    - Reassign to different staff roles

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Care Pathways

- Continued…
  - Pathway Start and Activity Table
    - Which pathways are active for the patient
    - Charting available when the pathway is ‘Ready’
    - Three ‘States’ (Ready / Waiting / Completed)
    - Activities linked to OCS and Smart Forms – return to Care Pathways module.
  - Activity History View
    - Completed
    - Completed early or late
    - Deleted or skipped
    - Completed by which roles
    - Outstanding
    - Variance
  - Graphical Display, Task lists across the patient

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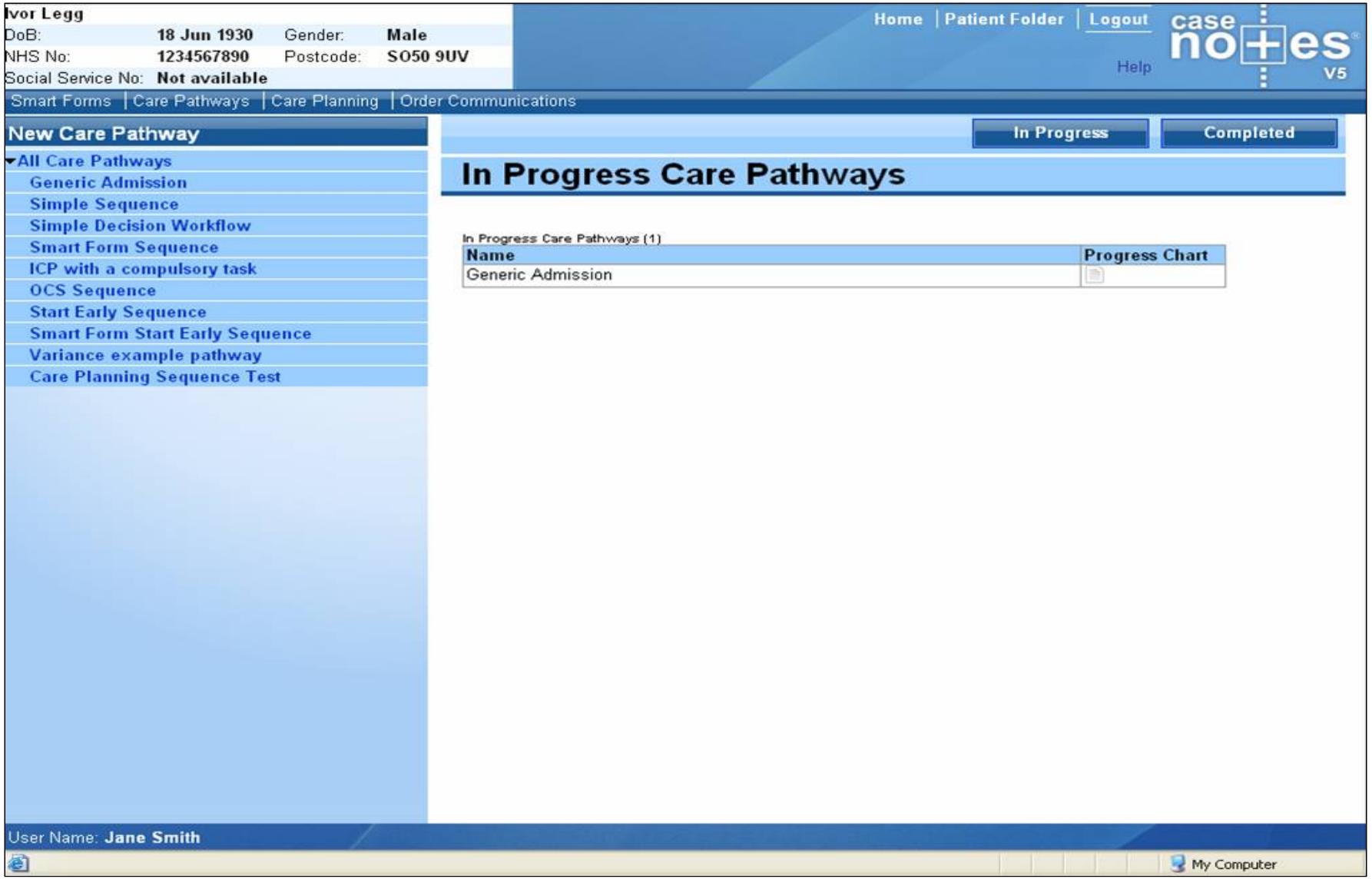
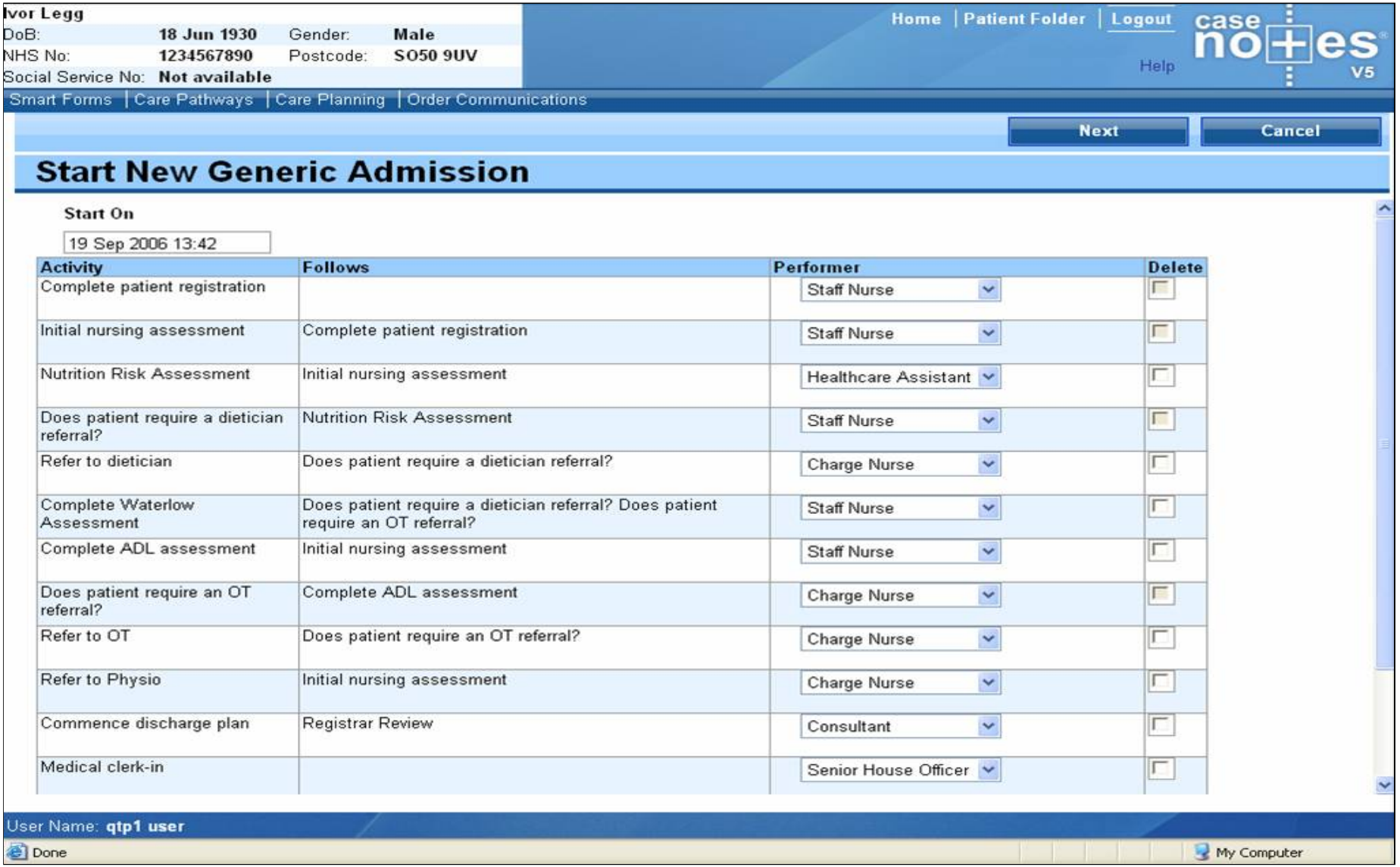
Care Pathways – Select New Pathway



Care Pathways – Start New Pathway



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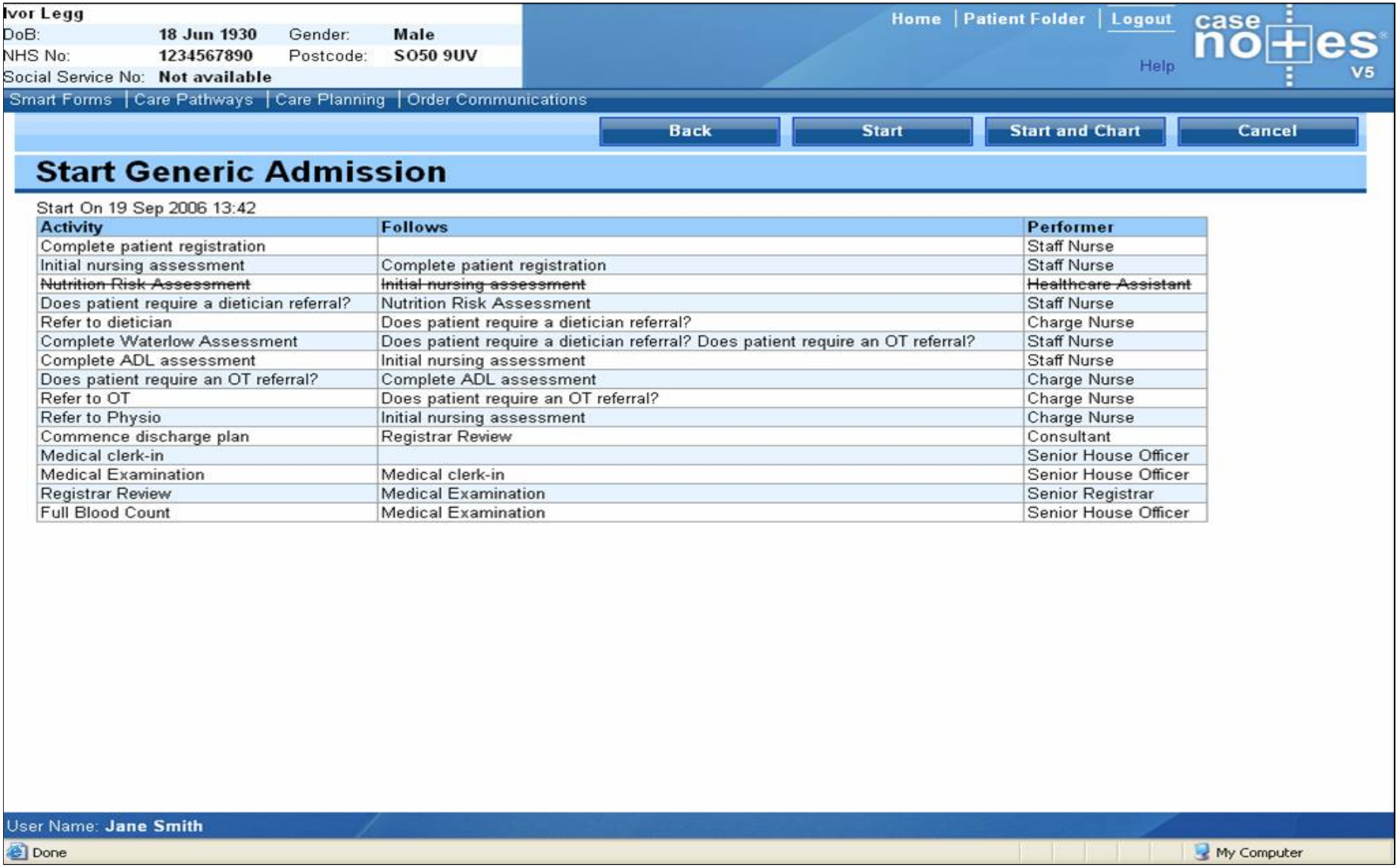
Care Pathways - Confirm



Activity	Follows	Performer
Complete patient registration		Staff Nurse
Initial nursing assessment	Complete patient registration	Staff Nurse
~~Nutrition Risk Assessment~~	~~Initial nursing assessment~~	~~Healthcare Assistant~~
Does patient require a dietician referral?	Nutrition Risk Assessment	Staff Nurse
Refer to dietician	Does patient require a dietician referral?	Charge Nurse
Complete Waterlow Assessment	Does patient require a dietician referral? Does patient require an OT referral?	Staff Nurse
Complete ADL assessment	Initial nursing assessment	Staff Nurse
Does patient require an OT referral?	Complete ADL assessment	Charge Nurse
Refer to OT	Does patient require an OT referral?	Charge Nurse
Refer to Physio	Initial nursing assessment	Charge Nurse
Commence discharge plan	Registrar Review	Consultant
Medical clerk-in		Senior House Officer
Medical Examination	Medical clerk-in	Senior House Officer
Registrar Review	Medical Examination	Senior Registrar
Full Blood Count	Medical Examination	Senior House Officer

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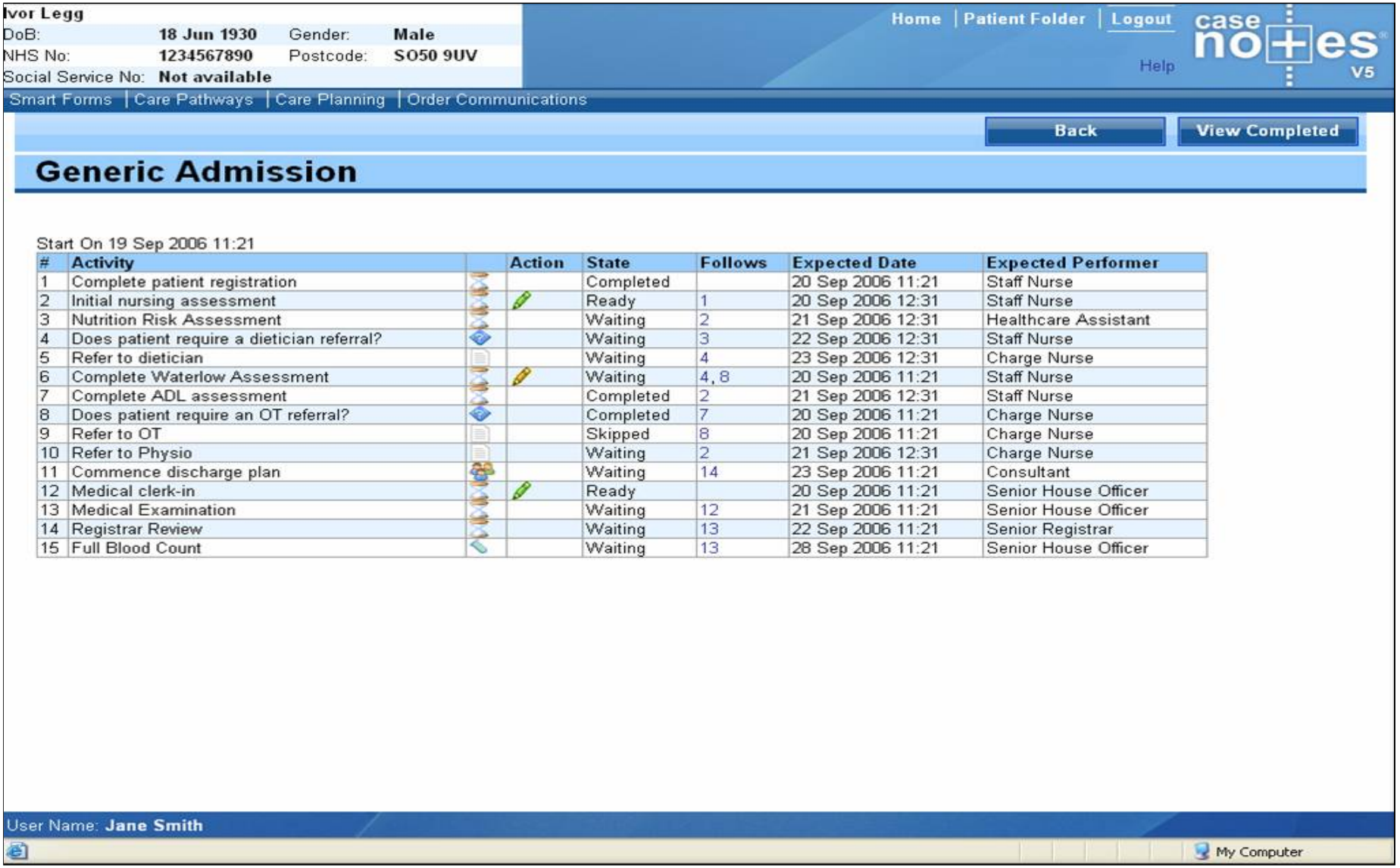
Care Pathways – Progress Chart



Ivor Legg
DoB: 18 Jun 1930 Gender: Male
NHS No: 1234567890 Postcode: SO50 9UV
Social Service No: Not available

Home | Patient Folder | Logout
Help
case notes V5

Smart Forms | Care Pathways | Care Planning | Order Communications

Back | View Completed

Generic Admission

Start On 19 Sep 2006 11:21

#	Activity		Action	State	Follows	Expected Date	Expected Performer
1	Complete patient registration			Completed		20 Sep 2006 11:21	Staff Nurse
2	Initial nursing assessment			Ready	1	20 Sep 2006 12:31	Staff Nurse
3	Nutrition Risk Assessment			Waiting	2	21 Sep 2006 12:31	Healthcare Assistant
4	Does patient require a dietician referral?			Waiting	3	22 Sep 2006 12:31	Staff Nurse
5	Refer to dietician			Waiting	4	23 Sep 2006 12:31	Charge Nurse
6	Complete Waterlow Assessment			Waiting	4, 8	20 Sep 2006 11:21	Staff Nurse
7	Complete ADL assessment			Completed	2	21 Sep 2006 12:31	Staff Nurse
8	Does patient require an OT referral?			Completed	7	20 Sep 2006 11:21	Charge Nurse
9	Refer to OT			Skipped	8	20 Sep 2006 11:21	Charge Nurse
10	Refer to Physio			Waiting	2	21 Sep 2006 12:31	Charge Nurse
11	Commence discharge plan			Waiting	14	23 Sep 2006 11:21	Consultant
12	Medical clerk-in			Ready		20 Sep 2006 11:21	Senior House Officer
13	Medical Examination			Waiting	12	21 Sep 2006 11:21	Senior House Officer
14	Registrar Review			Waiting	13	22 Sep 2006 11:21	Senior Registrar
15	Full Blood Count			Waiting	13	28 Sep 2006 11:21	Senior House Officer

User Name: Jane Smith

My Computer

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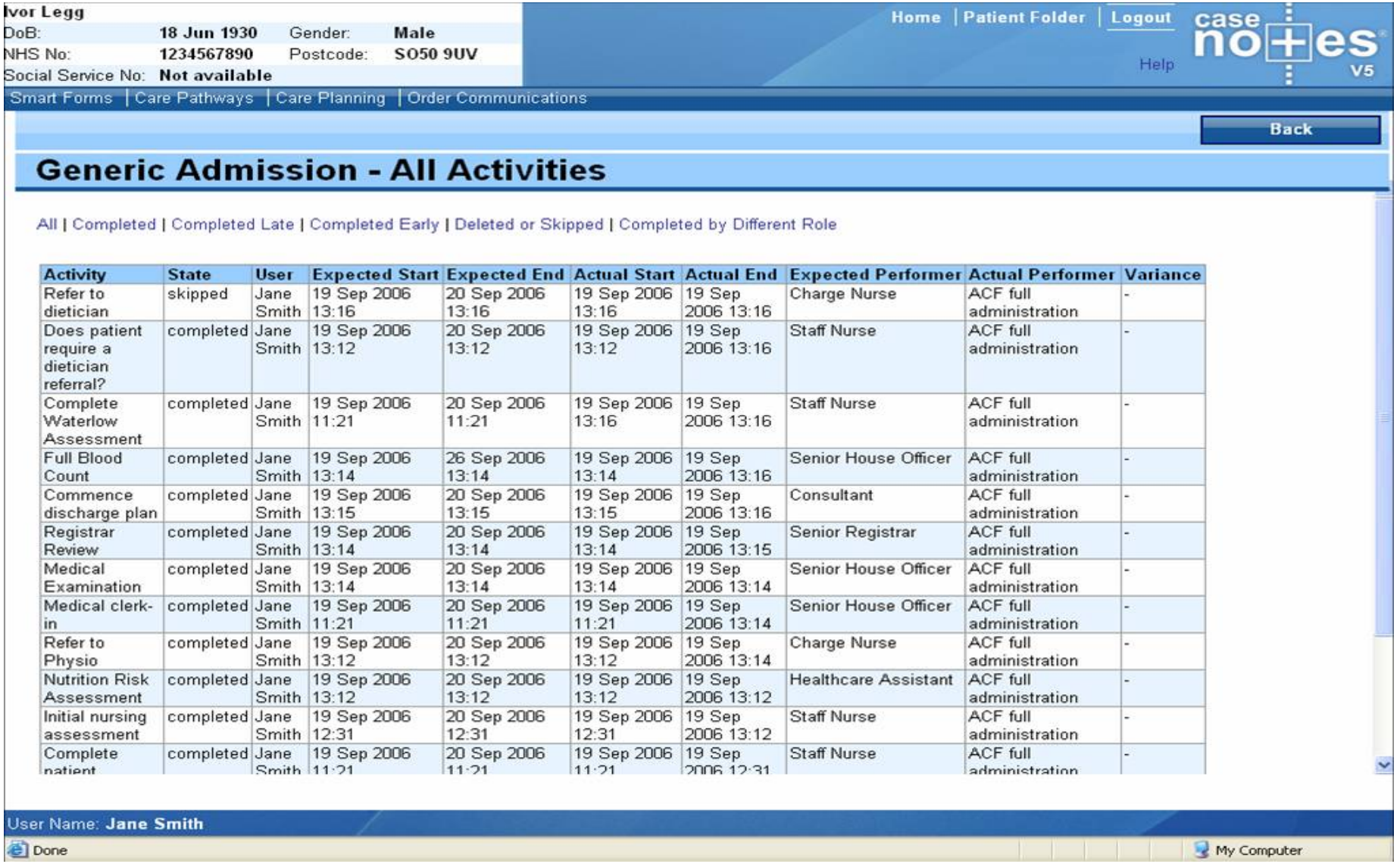
Care Pathways - History



Activity	State	User	Expected Start	Expected End	Actual Start	Actual End	Expected Performer	Actual Performer	Variance
Refer to dietician	skipped	Jane Smith	19 Sep 2006 13:16	20 Sep 2006 13:16	19 Sep 2006 13:16	19 Sep 2006 13:16	Charge Nurse	ACF full administration	-
Does patient require a dietician referral?	completed	Jane Smith	19 Sep 2006 13:12	20 Sep 2006 13:12	19 Sep 2006 13:12	19 Sep 2006 13:16	Staff Nurse	ACF full administration	-
Complete Waterlow Assessment	completed	Jane Smith	19 Sep 2006 11:21	20 Sep 2006 11:21	19 Sep 2006 13:16	19 Sep 2006 13:16	Staff Nurse	ACF full administration	-
Full Blood Count	completed	Jane Smith	19 Sep 2006 13:14	26 Sep 2006 13:14	19 Sep 2006 13:14	19 Sep 2006 13:16	Senior House Officer	ACF full administration	-
Commence discharge plan	completed	Jane Smith	19 Sep 2006 13:15	20 Sep 2006 13:15	19 Sep 2006 13:15	19 Sep 2006 13:16	Consultant	ACF full administration	-
Registrar Review	completed	Jane Smith	19 Sep 2006 13:14	20 Sep 2006 13:14	19 Sep 2006 13:14	19 Sep 2006 13:15	Senior Registrar	ACF full administration	-
Medical Examination	completed	Jane Smith	19 Sep 2006 13:14	20 Sep 2006 13:14	19 Sep 2006 13:14	19 Sep 2006 13:14	Senior House Officer	ACF full administration	-
Medical clerk-in	completed	Jane Smith	19 Sep 2006 11:21	20 Sep 2006 11:21	19 Sep 2006 11:21	19 Sep 2006 13:14	Senior House Officer	ACF full administration	-
Refer to Physio	completed	Jane Smith	19 Sep 2006 13:12	20 Sep 2006 13:12	19 Sep 2006 13:12	19 Sep 2006 13:14	Charge Nurse	ACF full administration	-
Nutrition Risk Assessment	completed	Jane Smith	19 Sep 2006 13:12	20 Sep 2006 13:12	19 Sep 2006 13:12	19 Sep 2006 13:12	Healthcare Assistant	ACF full administration	-
Initial nursing assessment	completed	Jane Smith	19 Sep 2006 12:31	20 Sep 2006 12:31	19 Sep 2006 12:31	19 Sep 2006 13:12	Staff Nurse	ACF full administration	-
Complete patient	completed	Jane Smith	19 Sep 2006 11:21	20 Sep 2006 11:21	19 Sep 2006 11:21	19 Sep 2006 12:31	Staff Nurse	ACF full administration	-

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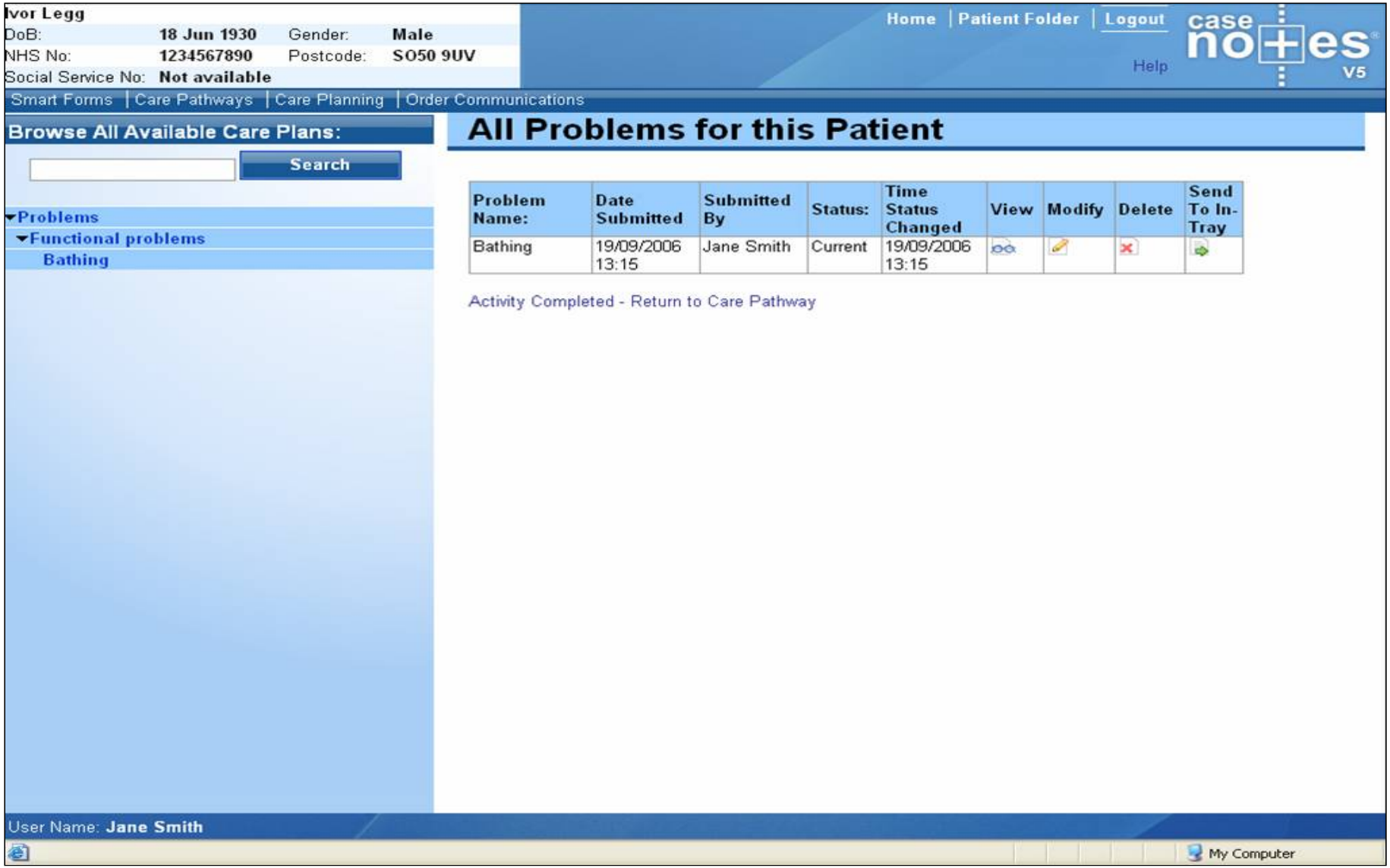
Care Pathways – link to Care Plan



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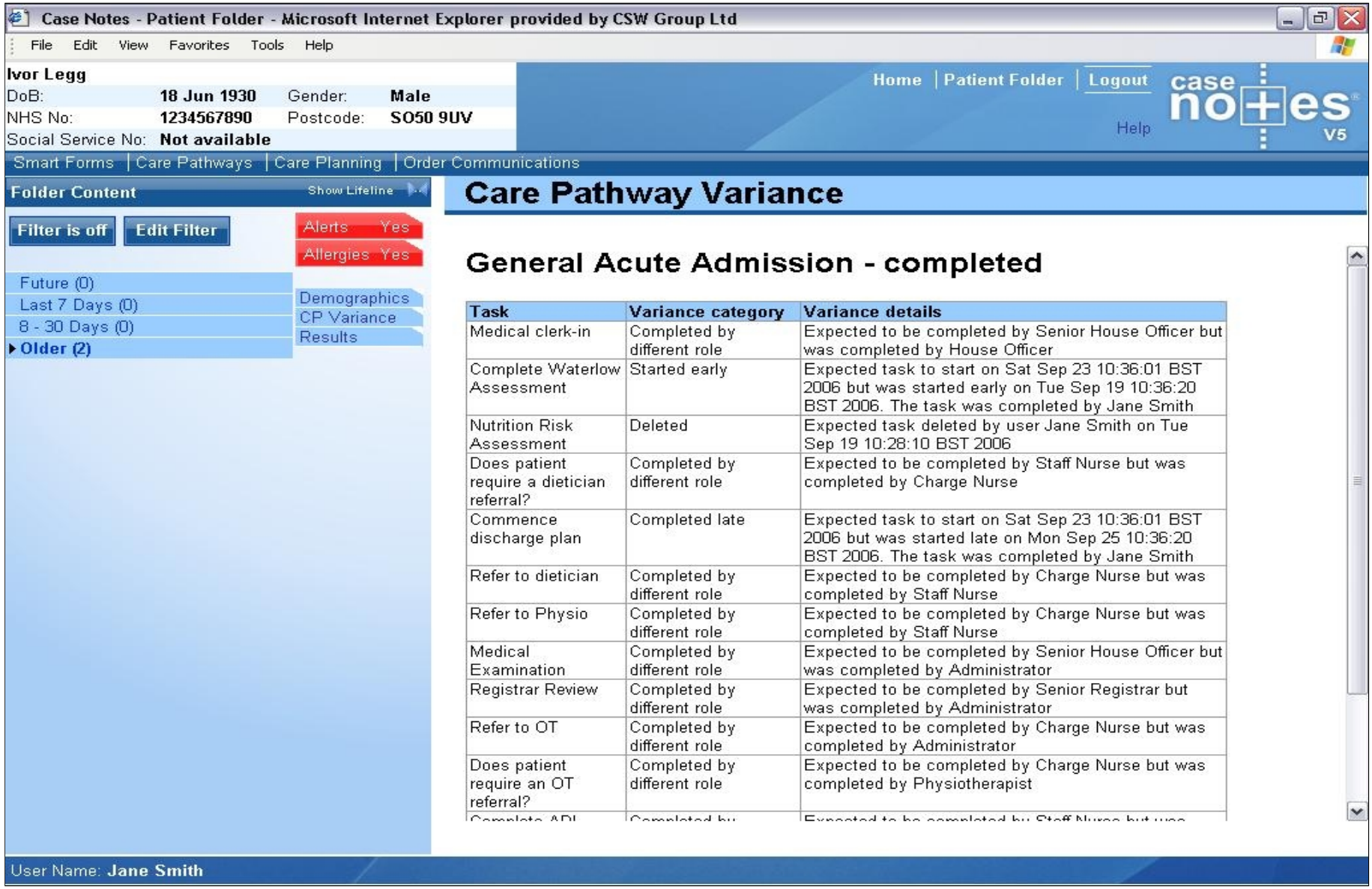
Care Pathways – Variance Report



Task	Variance category	Variance details
Medical clerk-in	Completed by different role	Expected to be completed by Senior House Officer but was completed by House Officer
Complete Waterlow Assessment	Started early	Expected task to start on Sat Sep 23 10:36:01 BST 2006 but was started early on Tue Sep 19 10:36:20 BST 2006. The task was completed by Jane Smith
Nutrition Risk Assessment	Deleted	Expected task deleted by user Jane Smith on Tue Sep 19 10:28:10 BST 2006
Does patient require a dietician referral?	Completed by different role	Expected to be completed by Staff Nurse but was completed by Charge Nurse
Commence discharge plan	Completed late	Expected task to start on Sat Sep 23 10:36:01 BST 2006 but was started late on Mon Sep 25 10:36:20 BST 2006. The task was completed by Jane Smith
Refer to dietician	Completed by different role	Expected to be completed by Charge Nurse but was completed by Staff Nurse
Refer to Physio	Completed by different role	Expected to be completed by Charge Nurse but was completed by Staff Nurse
Medical Examination	Completed by different role	Expected to be completed by Senior House Officer but was completed by Administrator
Registrar Review	Completed by different role	Expected to be completed by Senior Registrar but was completed by Administrator
Refer to OT	Completed by different role	Expected to be completed by Charge Nurse but was completed by Administrator
Does patient require an OT referral?	Completed by different role	Expected to be completed by Charge Nurse but was completed by Physiotherapist

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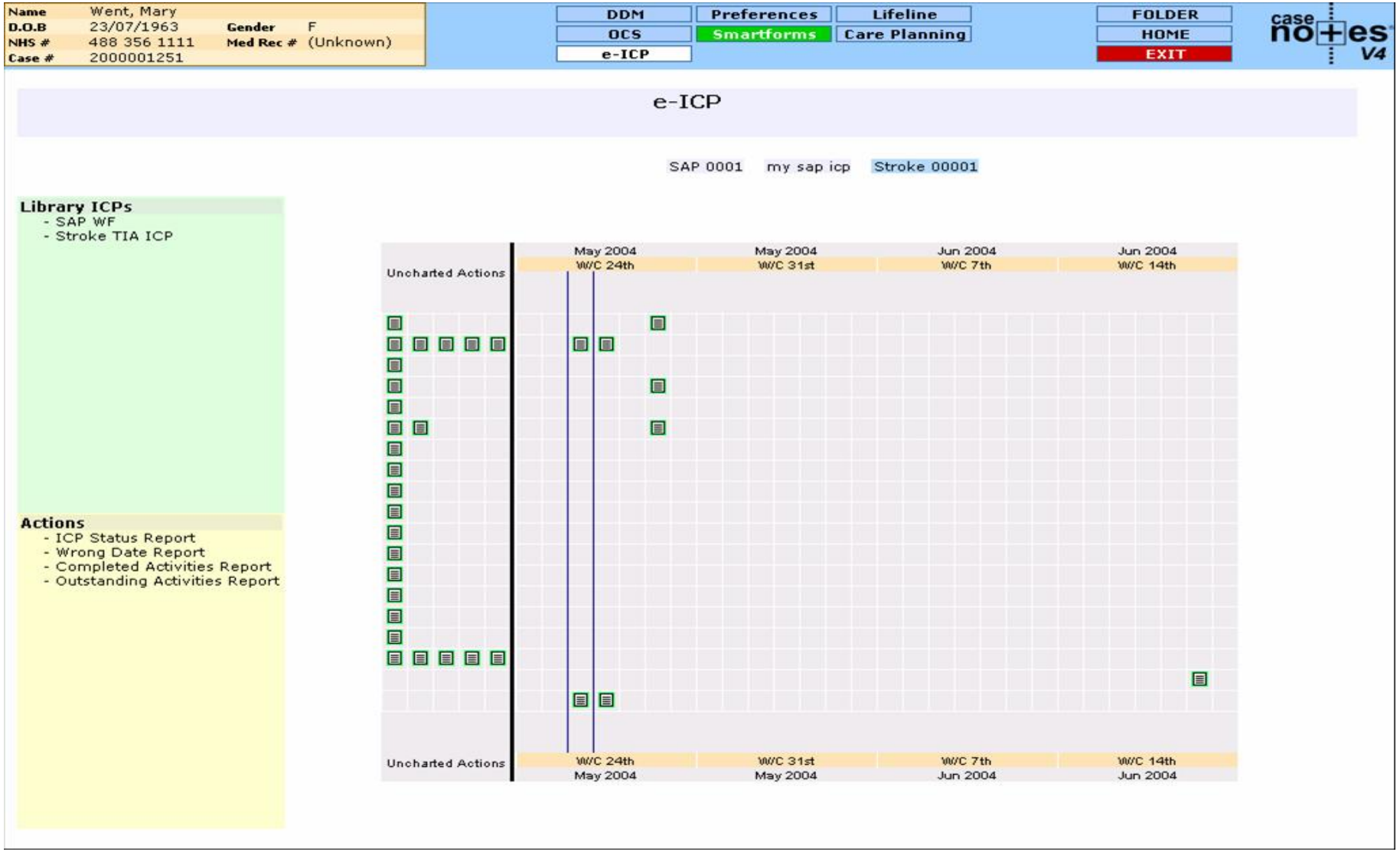
Care Pathways



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Care Pathway Builder

- Features
  - Pathways are entered and imported as library items, available immediately in Case Notes
  - VISIO tool is quick to use and contains a full set of objects for use in building pathways
  - Tasks are viewed and edited on a panel, including start-conditions and links to other tasks
  - Process is viewed as a VISIO flowchart or process chart
  - Suitable for simple, framework or complex and detailed pathway definition
  - Supports tasks which will occur through integrated modules within Case Notes or across interfaces to Case Notes

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Care Pathway Builder

- Benefits
  - Standard care pathways or local definition
  - Simplicity of use allows leads within directorates, specialities or team-leads to add and modify plans
  - Versatile and able to manage many types of clinical event: manual actions, forms-based assessments, laboratory orders, care plans
  - Defines elements of shared care across communities

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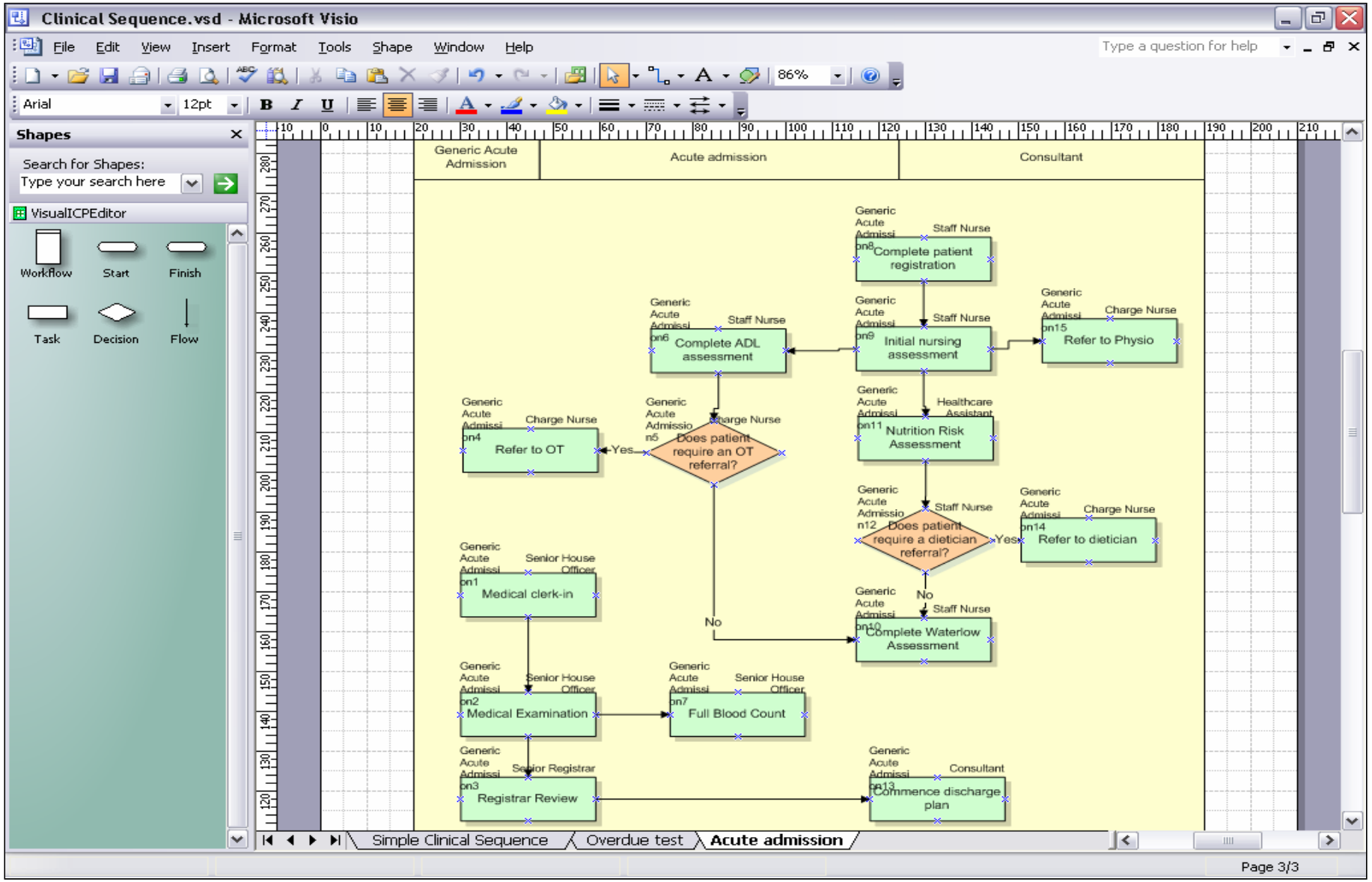
Care Pathway Builder



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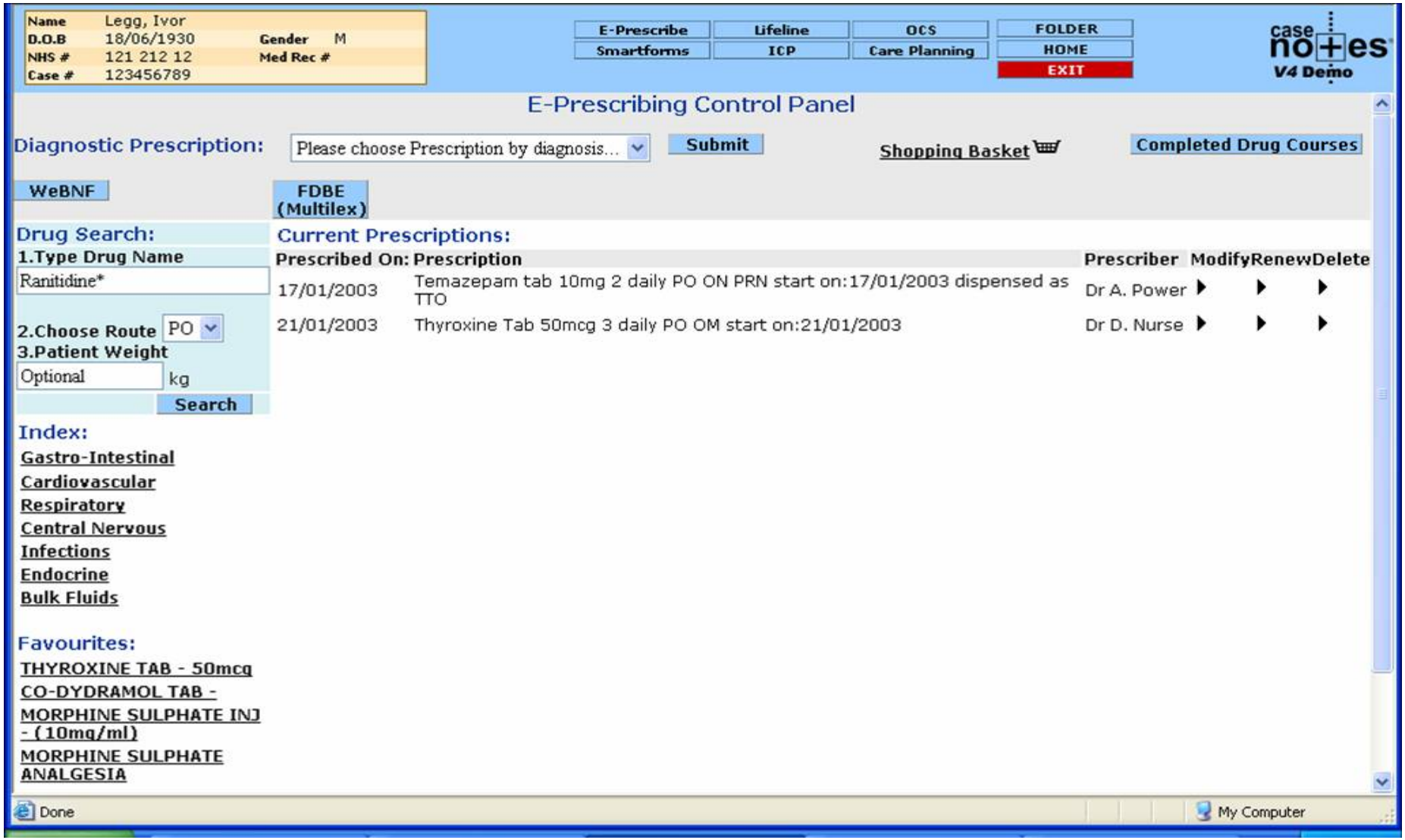
Electronic Prescribing



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Open Source cityEHR System

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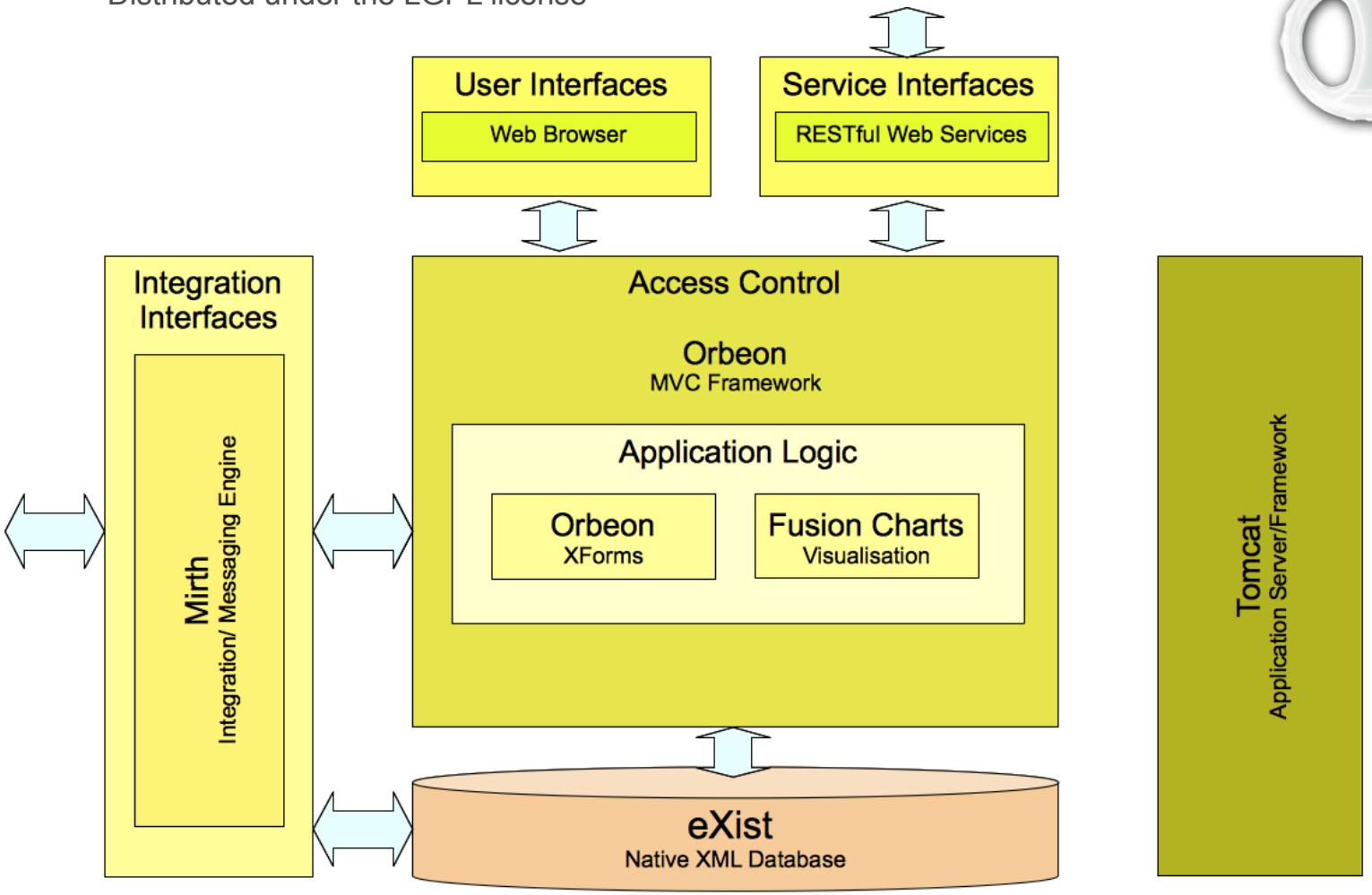
cityEHR Open Source EHR

- The cityEHR system is built using open source software
- cityEHR is an enterprise-scale health records system
- Developed at City University, London
- Distributed under the LGPL license



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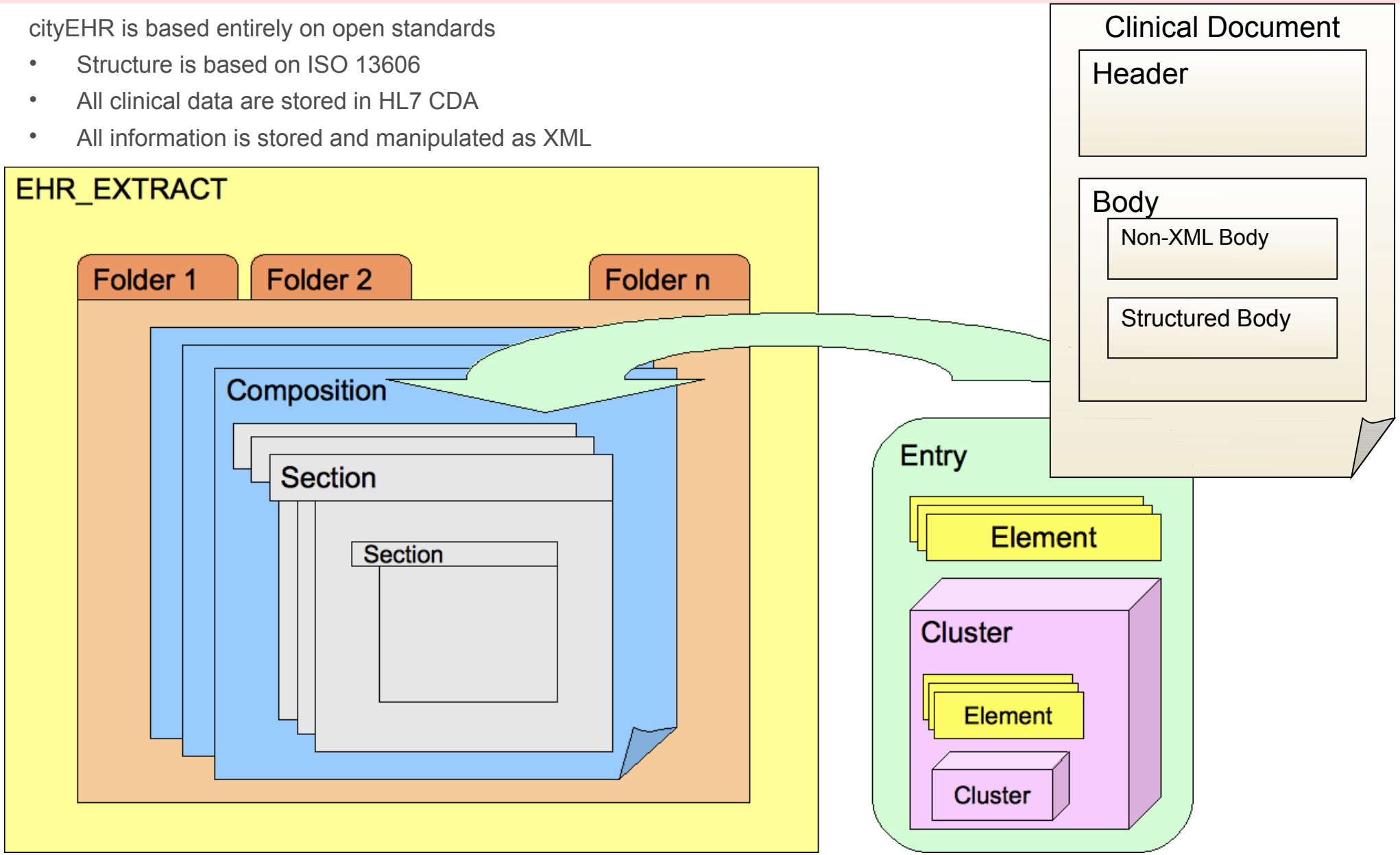
cityEHR Open Standards

cityEHR is based entirely on open standards

- Structure is based on ISO 13606
- All clinical data are stored in HL7 CDA
- All information is stored and manipulated as XML



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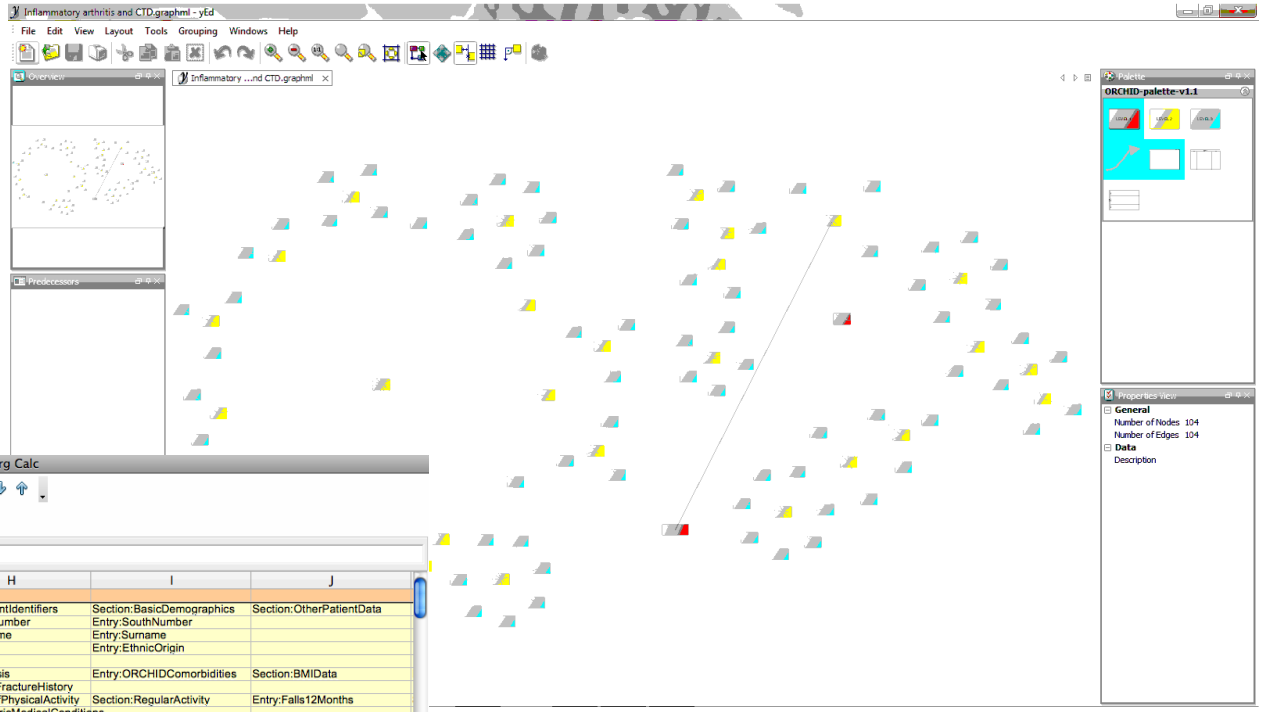
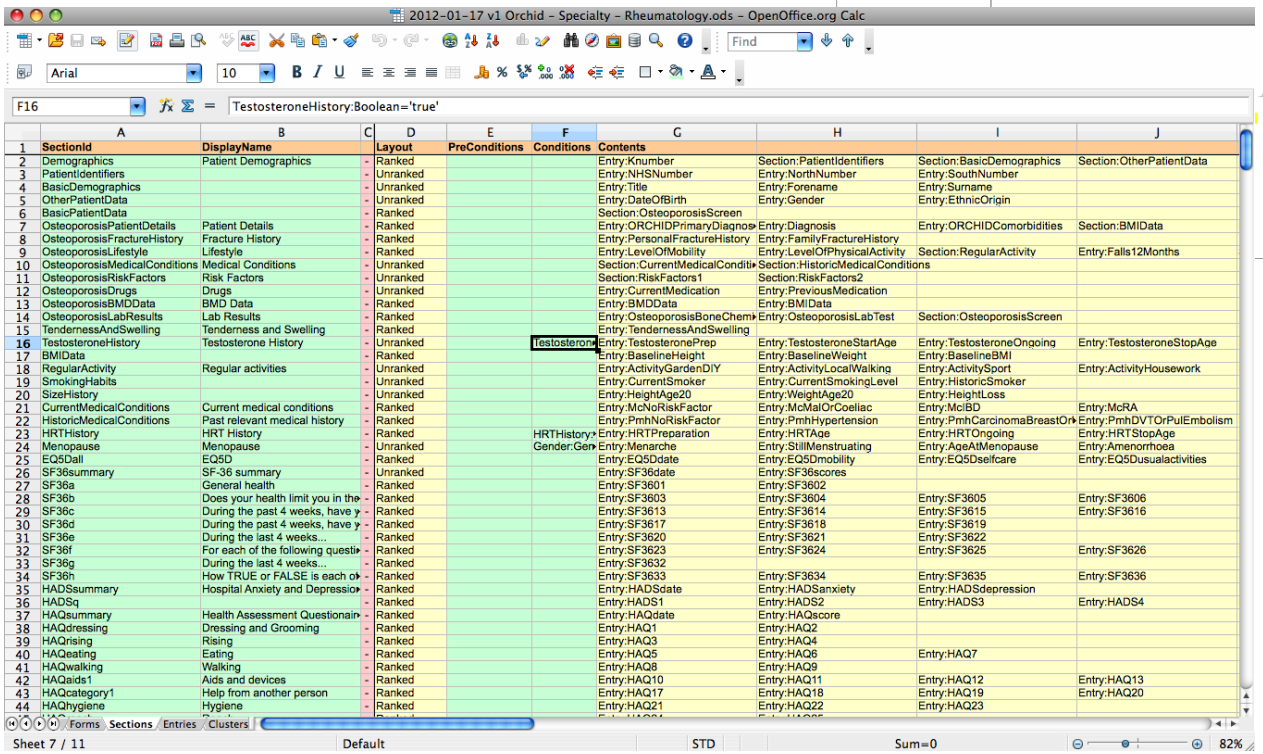
cityEHR Modelling Tools

- Models are developed using standard tools
  - spreadsheet, graphing tool
- Any tooling could be used (in theory)
- Saved as XML and transformed to an ontology





	A	B	C	D	E	F	G	H	I	J
1	SectionId	DisplayName		Layout	PreConditions	Conditions	Contents			
2	Demographics	Patient Demographics	-	Ranked			Entry:Knumber	Section:PatientIdentifiers	Section:BasicDemographics	Section:OtherPatientData
3	PatientIdentifiers		-	Unranked			Entry:NHSNumber	Entry:NorthNumber	Entry:SouthNumber	
4	BasicDemographics		-	Unranked			Entry:Title	Entry:Forename	Entry:Surname	
5	OtherPatientData		-	Unranked			Entry:DateOfBirth	Entry:Gender	Entry:EthnicOrigin	
6	BasicPatientData		-	Ranked			Section:OsteoporosisScreen			
7	OsteoporosisPatientDetails	Patient Details	-	Ranked			Entry:ORCHIDPrimaryDiagnos	Entry:Diagnosis	Entry:ORCHIDComorbidities	Section:BMIData
8	OsteoporosisFractureHistory	Fracture History	-	Ranked			Entry:PersonalFractureHistory	Entry:FamilyFractureHistory		
9	OsteoporosisLifestyle	Lifestyle	-	Ranked			Entry:LevelOfMobility	Entry:LevelOfPhysicalActivity	Section:RegularActivity	Entry:Falls12Months
10	OsteoporosisMedicalConditions	Medical Conditions	-	Unranked			Section:CurrentMedicalConditi	Section:HistoricMedicalConditions		
11	OsteoporosisRiskFactors	Risk Factors	-	Unranked			Section:RiskFactors1	Section:RiskFactors2		
12	OsteoporosisDrugs	Drugs	-	Unranked			Entry:CurrentMedication	Entry:PreviousMedication		
13	OsteoporosisBMDData	BMD Data	-	Ranked			Entry:BMDData	Entry:BMIData		
14	OsteoporosisLabResults	Lab Results	-	Ranked			Entry:OsteoporosisBoneChem	Entry:OsteoporosisLabTest	Section:OsteoporosisScreen	
15	TendernessAndSwelling	Tenderness and Swelling	-	Ranked			Entry:TendernessAndSwelling			
16	TestosteroneHistory	Testosterone History	-	Unranked		Testosteron	Entry:TestosteronePrep	Entry:TestosteroneStartAge	Entry:TestosteroneOngoing	Entry:TestosteroneStopAge
17	BMIData		-	Ranked			Entry:BaselineHeight	Entry:BaselineWeight	Entry:BaselineBMI	
18	RegularActivity	Regular activities	-	Unranked			Entry:ActivityGardenDIY	Entry:ActivityLocalWalking	Entry:ActivitySport	Entry:ActivityHousework
19	SmokingHabits		-	Unranked			Entry:CurrentSmoker	Entry:CurrentSmokingLevel	Entry:HistoricSmoker	
20	SizeHistory		-	Unranked			Entry:HeightAge20	Entry:WeightAge20	Entry:HeightLoss	
21	CurrentMedicalConditions	Current medical conditions	-	Ranked			Entry:McNoRiskFactor	Entry:McMalOrCoeliac	Entry:McIBD	Entry:McRA
22	HistoricMedicalConditions	Past relevant medical history	-	Ranked			Entry:PmhNoRiskFactor	Entry:PmhHypertension	Entry:PmhCarcinomaBreastOr	Entry:PmhDVTOrPulEmbolism
23	HRTHistory	HRT History	-	Ranked		HRTHistory	Entry:HRTPreparation	Entry:HRTAge	Entry:HRTOngoing	Entry:HRTStopAge
24	Menopause	Menopause	-	Unranked		Gender:Ger	Entry:Menarche	Entry:StillMenstruating	Entry:AgeAtMenopause	Entry:Amenorrhoea
25	EQ5Dall	EQ5D	-	Ranked			Entry:EQ5Ddate	Entry:EQ5Dmobility	Entry:EQ5Dselfcare	Entry:EQ5Dusualactivities
26	SF36summary	SF-36 summary	-	Unranked			Entry:SF36date	Entry:SF36scores		
27	SF36a	General health	-	Ranked			Entry:SF3601	Entry:SF3602		
28	SF36b	Does your health limit you in the	-	Ranked			Entry:SF3603	Entry:SF3604	Entry:SF3605	Entry:SF3606
29	SF36c	During the past 4 weeks, have y	-	Ranked			Entry:SF3613	Entry:SF3614	Entry:SF3615	Entry:SF3616
30	SF36d	During the past 4 weeks, have y	-	Ranked			Entry:SF3617	Entry:SF3618	Entry:SF3619	
31	SF36e	During the last 4 weeks...	-	Ranked			Entry:SF3620	Entry:SF3621	Entry:SF3622	
32	SF36f	For each of the following questi	-	Ranked			Entry:SF3623	Entry:SF3624	Entry:SF3625	Entry:SF3626
33	SF36g	During the last 4 weeks...	-	Ranked			Entry:SF3632			
34	SF36h	How TRUE or FALSE is each of	-	Ranked			Entry:SF3633	Entry:SF3634	Entry:SF3635	Entry:SF3636
35	HADSsummary	Hospital Anxiety and Depressio	-	Ranked			Entry:HADSdate	Entry:HADSanxiety	Entry:HADSdepression	
36	HADSq		-	Ranked			Entry:HADS1	Entry:HADS2	Entry:HADS3	Entry:HADS4
37	HAQsummary	Health Assessment Questionair	-	Ranked			Entry:HAQdate	Entry:HAQscore		
38	HAQdressing	Dressing and Grooming	-	Ranked			Entry:HAQ1	Entry:HAQ2		
39	HAQrising	Rising	-	Ranked			Entry:HAQ3	Entry:HAQ4		
40	HAQeating	Eating	-	Ranked			Entry:HAQ5	Entry:HAQ6	Entry:HAQ7	
41	HAQwalking	Walking	-	Ranked			Entry:HAQ8	Entry:HAQ9		
42	HAQaids1	Aids and devices	-	Ranked			Entry:HAQ10	Entry:HAQ11	Entry:HAQ12	Entry:HAQ13
43	HAQcategory1	Help from another person	-	Ranked			Entry:HAQ17	Entry:HAQ18	Entry:HAQ19	Entry:HAQ20
44	HAQhygiene	Hygiene	-	Ranked			Entry:HAQ21	Entry:HAQ22	Entry:HAQ23	

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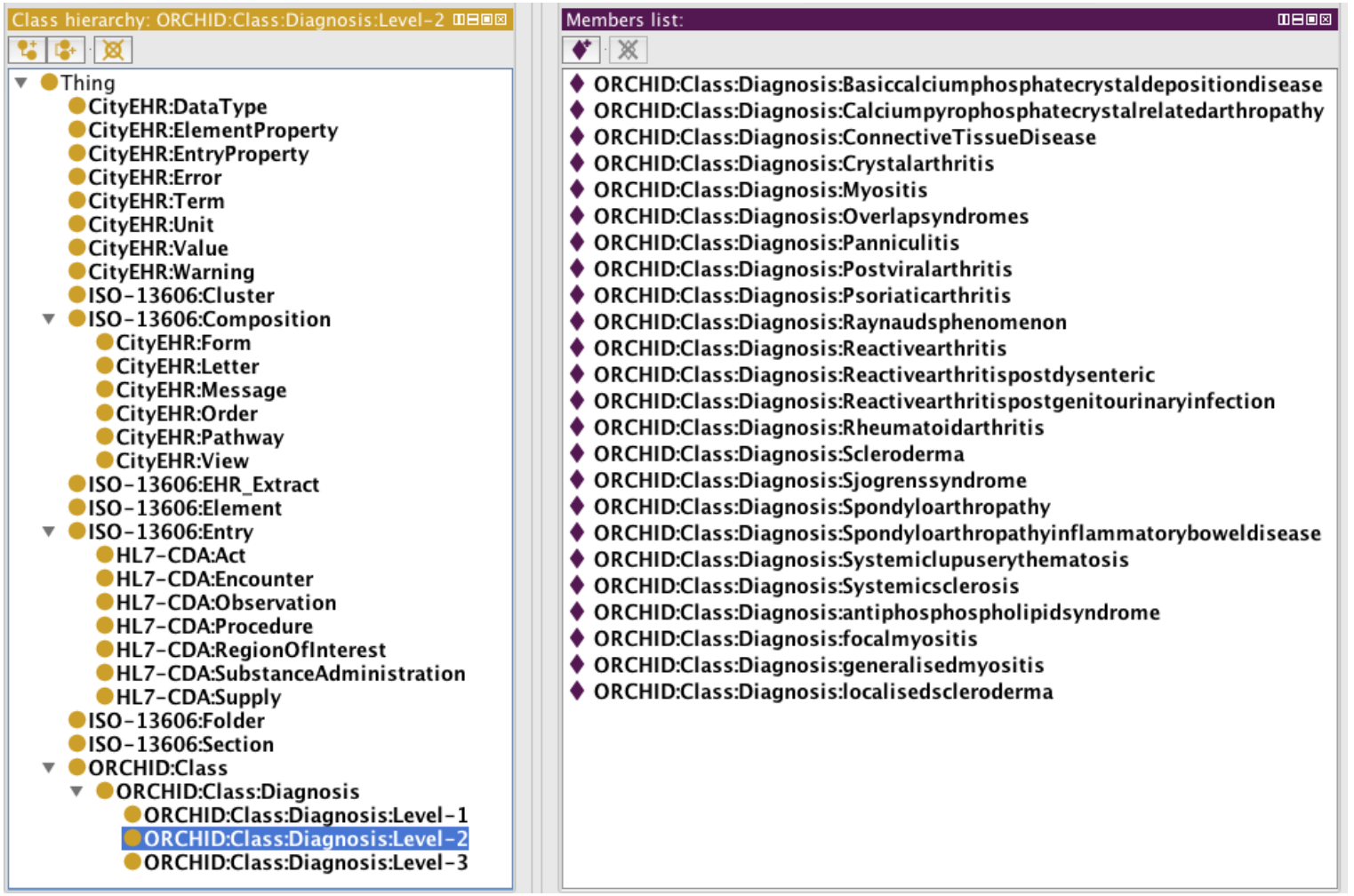
cityEHR Ontology-Driven EHR

- The ontology is stored in standard OWL/XML
- Which is transformed to the runtime configuration
  - loaded to the cityEHR system using its Administration tools



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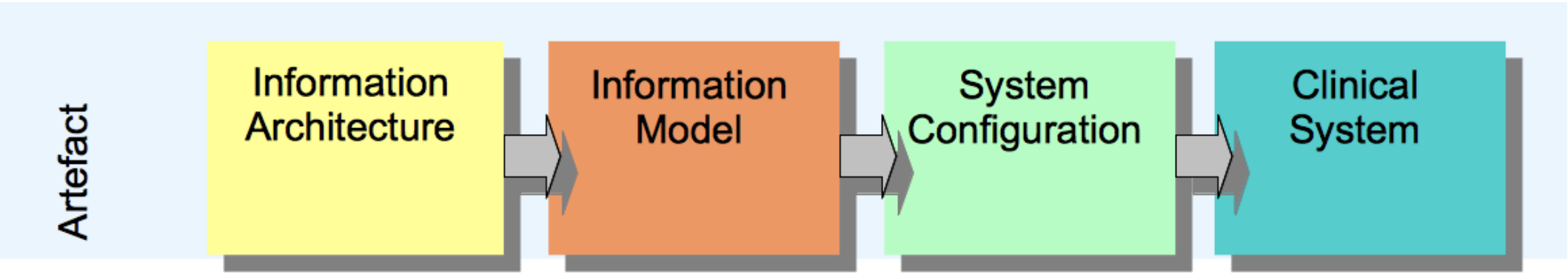
cityEHR Clinician Driven EHR

- Clinicians create clinical models for their EHR system
- Using the cityEHR architectural model
- The runtime EHR system is generated from the information models
  - views of the patient record
  - search criteria
  - data collection forms
  - clinical messages
  - (pathways, orders, prescriptions)



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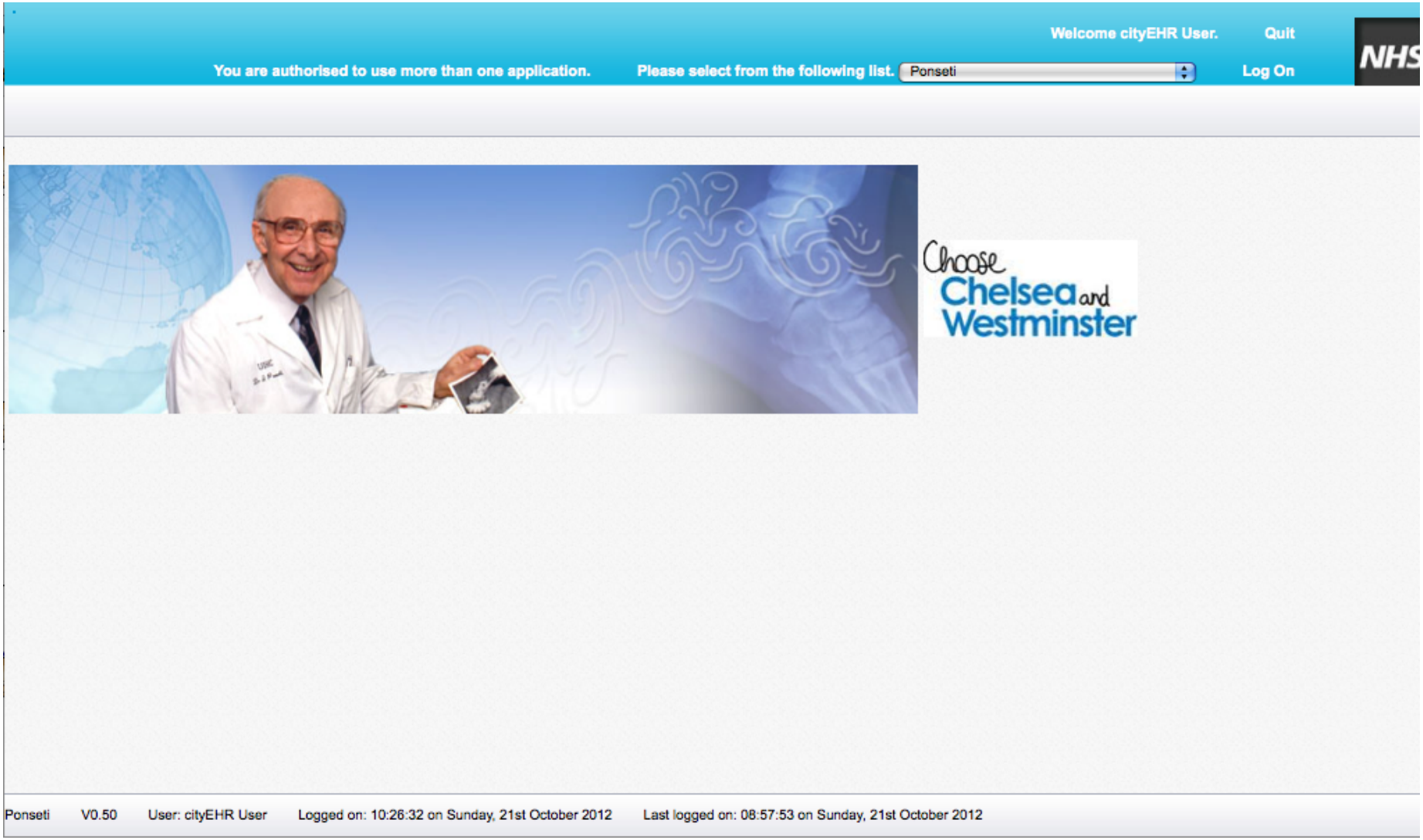
cityEHR Open Source EHR

- The resulting EHR system is an enterprise-scale application
- Server-based, accessed through a web browser



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References and Further Reading

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   http://www.nigb.nhs.uk/guarantee/2009-nhs-crg.pdf

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