WORKSHOP: How to get the best use of a system

Jamie Coleman
Andrew Jones

27th March 2012

ICC, Birmingham

NIHR Programme Grant for Applied Research

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Workshops

* The Building Blocks
* Making the case / Managing Implementation
* **How to get the best use of a system**

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Aims and Objectives

* By the end of the workshop we will:
  * Understand transformational change that ePrescribing can have to institutions
  * Explore the secondary benefits of ePrescribing systems
  * Discuss what additional work can be done to make systems better in the future

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Introduction

* Adopting ePrescribing is a strategic decision
  * Quality and Safety often quoted as the key drivers
* Lots of additional benefits other than digitising the drug chart
* Requires clinical and technological input to realise many of the additional benefits
* Journey – not a destination!

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Doers, Window shoppers, Floggers

* I am a …
  * **Doer**
    * Got a system or about to implement
  * **Window Shopper**
    * Want a system, don't know which one
  * **Flogger**
    * System suppliers / providers

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Basic, Better, **Best**

* Think of the BEST system or bits of a system you've seen (or supplied)
  * What are these BEST bits?
  * Why are they so good?

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Crystal Balls

What would you like ePrescribing systems to be able to do? Why?

* Unlimited Money
* Unlimited PC power
* No liability

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How do we get there?

* What do we need to provide the sorts of things you've discussed? (other than money, time and programmers)
* What are the challenges to doing this in the NHS?

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Some Thoughts from Us…

Integrating Clinical Evidence into ePrescribing Medicines Optimisation

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BMJ Group

Integrating Clinical Evidence into ePrescribing

Dr Andrew Jones
Clinical Specialist
BMJ Group

BMJ Group

The 4 critical predictors of clinical decision support success

Feature	Adj. OR
Automatic provision of decision support as part of clinician workflow	**112**
Provision of decision support at time and location of decision making	**15**
Computer based generation of decision support	**6**
Provision of recommendation rather than just an assessment	**7**

Table 1 - Features of CDSS associated with improved clinical practice

BMJ Group

Current ePMA decision support

Feature	
Automatic provision of decision support as part of clinician workflow	✓
Provision of decision support at time and location of decision making	✓
Computer based generation of decision support	✓
Provision of recommendation rather than just an assessment	✗

Table 1 - Features of CDSS associated with improved clinical practice

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- How do we develop recommendations for medication therapy?
- Published clinical evidence and systematic reviews are the source used in practice
- There are issues:
  - The burden of evidence is significant
  - Requires synthesis, interpretation and representation
  - Getting evidence into practice is notoriously difficult

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Evidence into Practice

- It took 200 years before the Royal Navy routinely used lemon juice to prevent scurvy. First study 1601 [1]
- Routine use of thrombolytic therapy in acute MI early 1990s. The first RCT that showed the benefit late 1950s [2]
- Antenatal corticosteroid use in preterm labour - 22 years for international guidelines to first recommended after first evidence [3]
- On average it takes 17 years for 14% of clinical research to become routine practice [4]

4. ***Antman EM, Lau J, Kupelnick B, Mosteller F, Chalmers TC. A comparison of results of meta-analyses of randomized control trials and recommendations of clinical experts: treatments for myocardial infarction.*** *JAMA 1992;268(2):240-248..*

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The burden of evidence is significant

…although figures vary

- 35,000 biomedical journal articles published annually
- 150,000 articles / month
- 120,000 RCT/year
- 500,000 articles are indexed in PubMed every year

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"The application of what we know already will have a bigger impact on health and disease than any drug or technology likely to be introduced in the next decade"

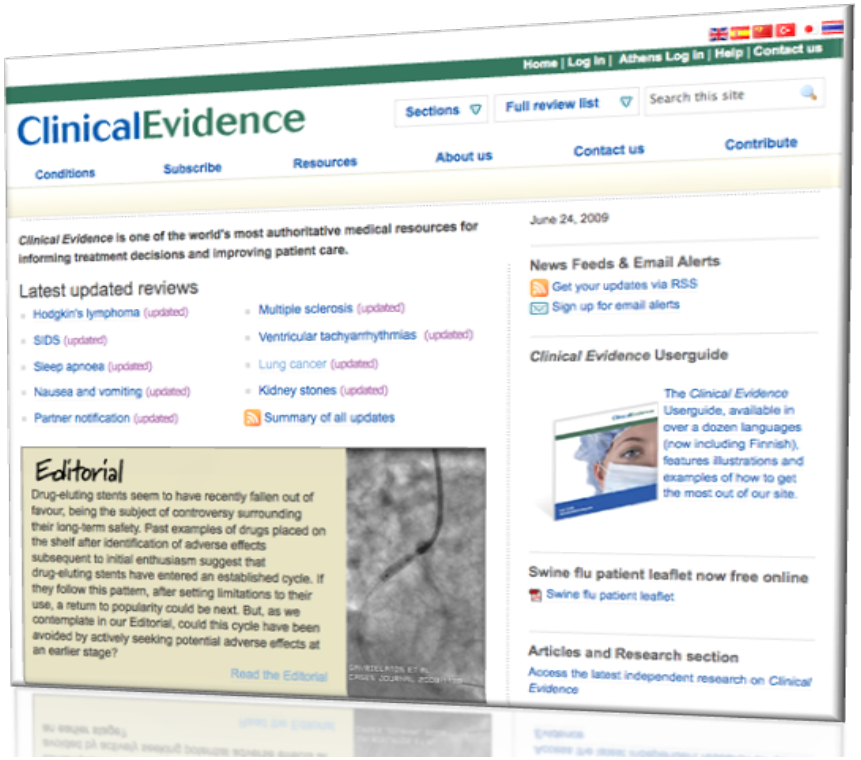
Sir Muir Gray

Chief knowledge officer of the NHS

BMJ Group

ClinicalEvidence

- Systematic reviews of 3300 interventions
- First published in 1999
- Reaches more than a million clinicians worldwide in seven languages
- Updated monthly



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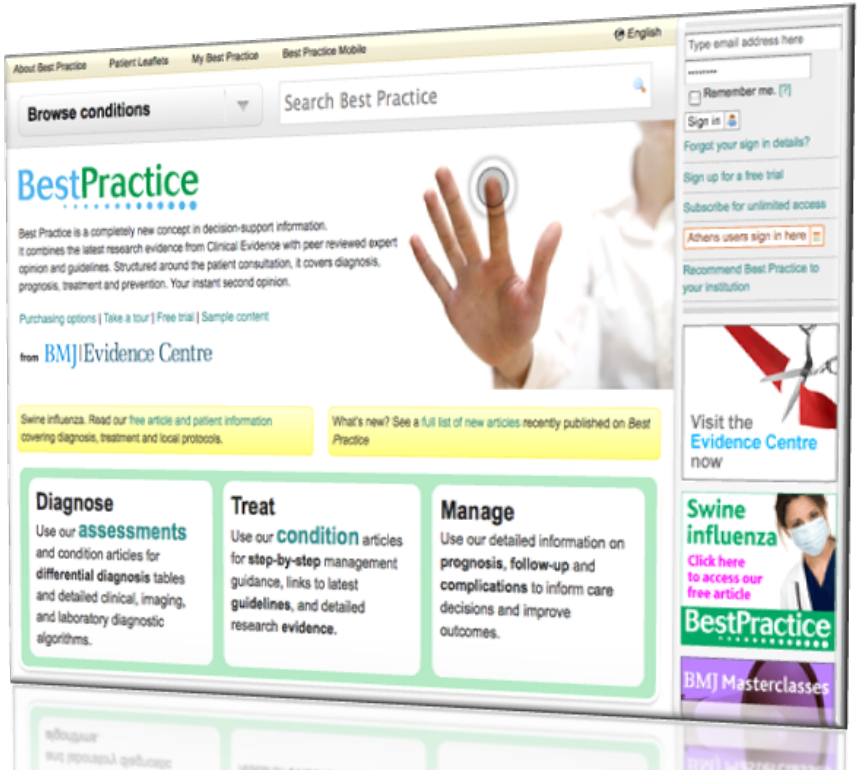
BestPractice

- Evidence, expert opinion and guidelines
- Designed to fit the medical model
- Assessment, diagnosis, treatment, management
- Web interface designed to be used at the Point of Care



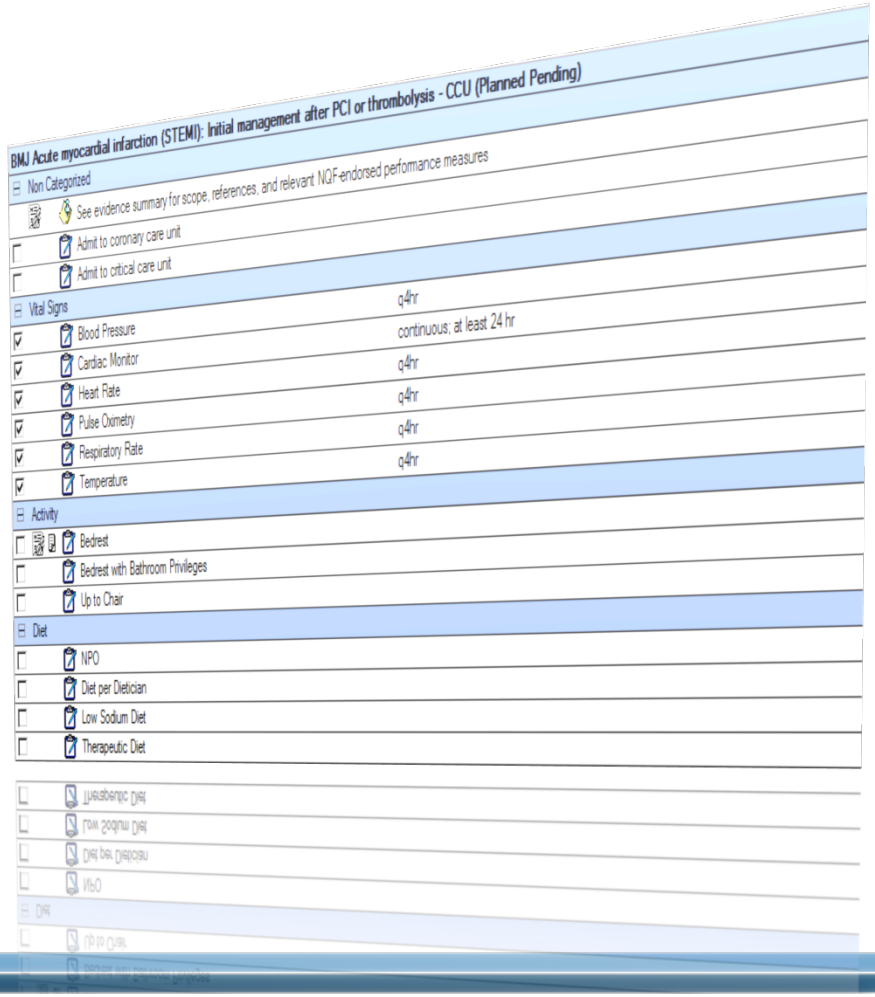
BMJ Group

ActionSETS

CARE PROTOCOLS

FROM THE BMJ EVIDENCE CENTRE

- Order sets based on clinical evidence
- Organised into care protocols
- Covering up to 80% of acute admissions
- Evidence based reduction in mortality, cost and complication rate



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ActionSETS
CARE PROTOCOLS
FROM THE BMJ EVIDENCE CENTRE

- Lists of tests, medicines or other treatments required to diagnose and manage patients
- 523 sets covering over 150 conditions
- Evidence based ClinicalEvidence BestPractice
- Designed for order comms systems but can also be used for non-electronic processes
- Vendor agnostic knowledge base and can be implemented in any orders system

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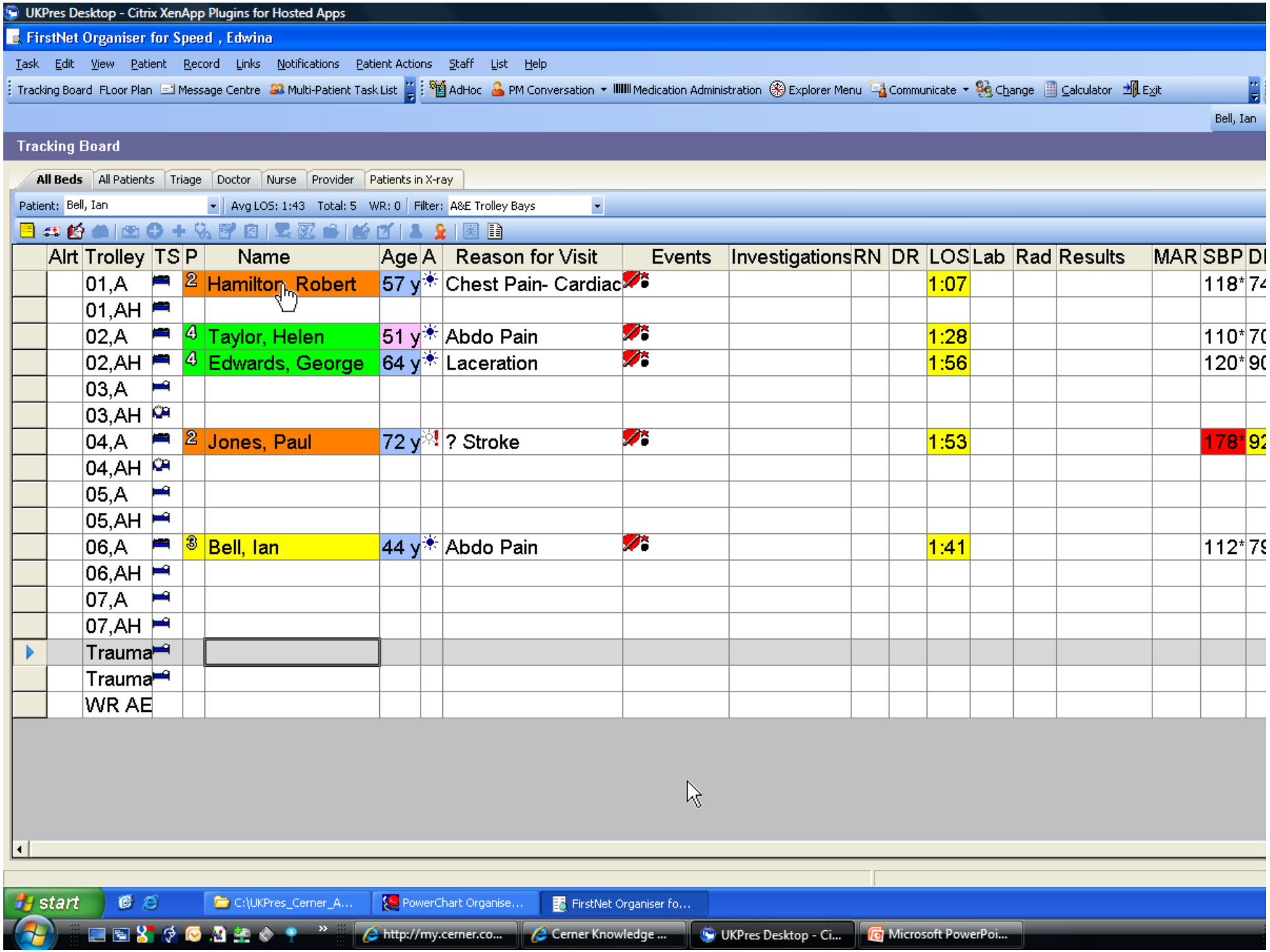
ActionSETS
CARE PROTOCOLS
FROM THE BMJ EVIDENCE CENTRE

- Phased to divide the care pathway into appropriate care settings
- Include NICE guidelines and BNF Drug Information
- Deep links to the evidence and learning resources
- Generally customised by clients to meet local practice, formulary and guidelines
- Updated automatically as the evidence changes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Patient: Bell, Ian Avg LOS: 1:43 Total: 5 WR: 0 Filter: A&E Trolley Bays
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01,A 2 Hamilton, Robert 57 y Chest Pain- Cardiac 1:07 118* 74
01,AH
02,A 4 Taylor, Helen 51 y Abdo Pain 1:28 110* 70
02,AH 4 Edwards, George 64 y Laceration 1:56 120* 90
03,A
03,AH
04,A 2 Jones, Paul 72 y ? Stroke 1:53 178* 92
04,AH
05,A
05,AH
06,A 3 Bell, Ian 44 y Abdo Pain 1:41 112* 79
06,AH
07,A
07,AH
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Trauma
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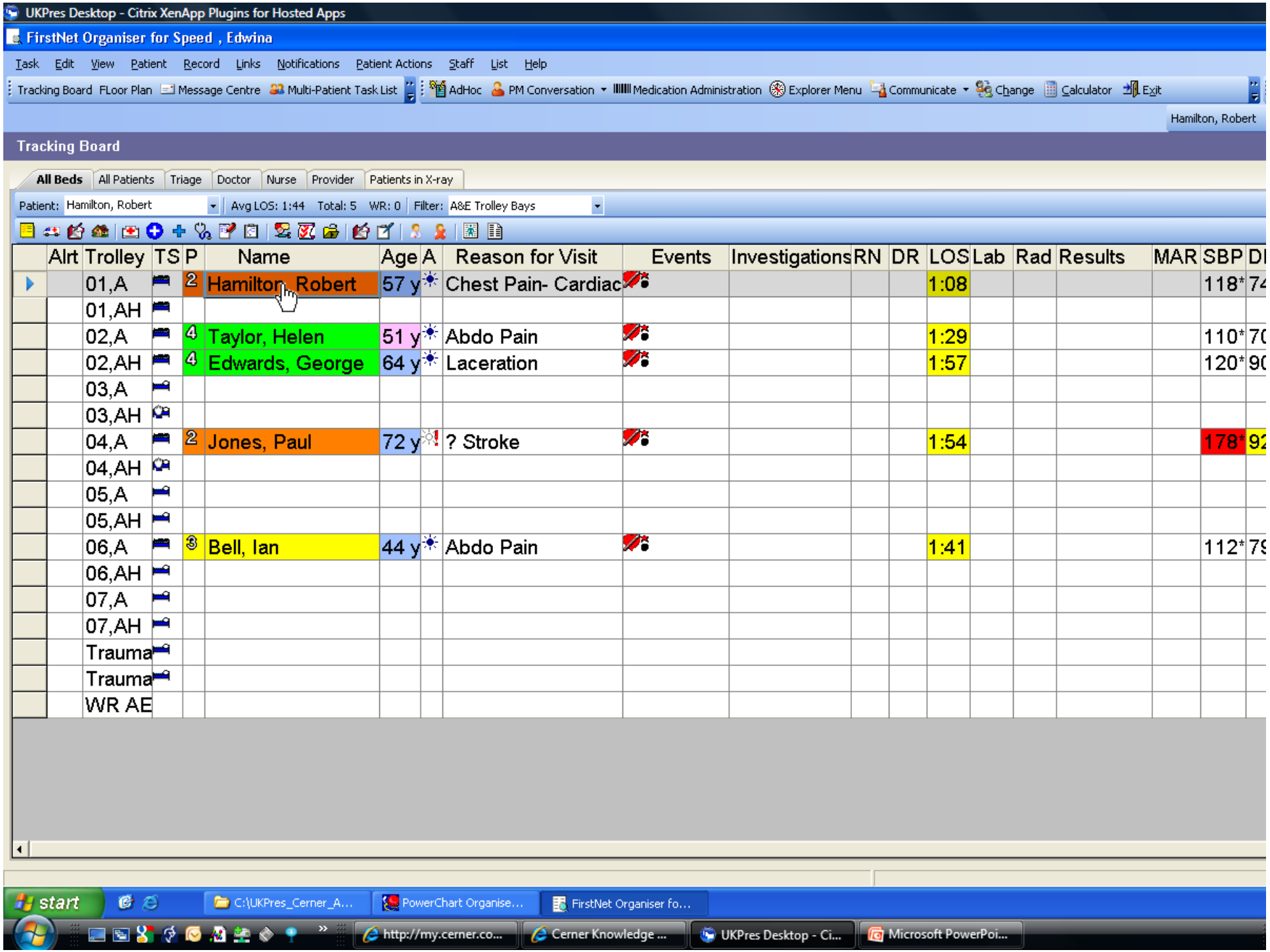
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04,A 2 Jones, Paul 72 y ? Stroke 1:54 178* 92
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06,A 3 Bell, Ian 44 y Abdo Pain 1:41 112* 79
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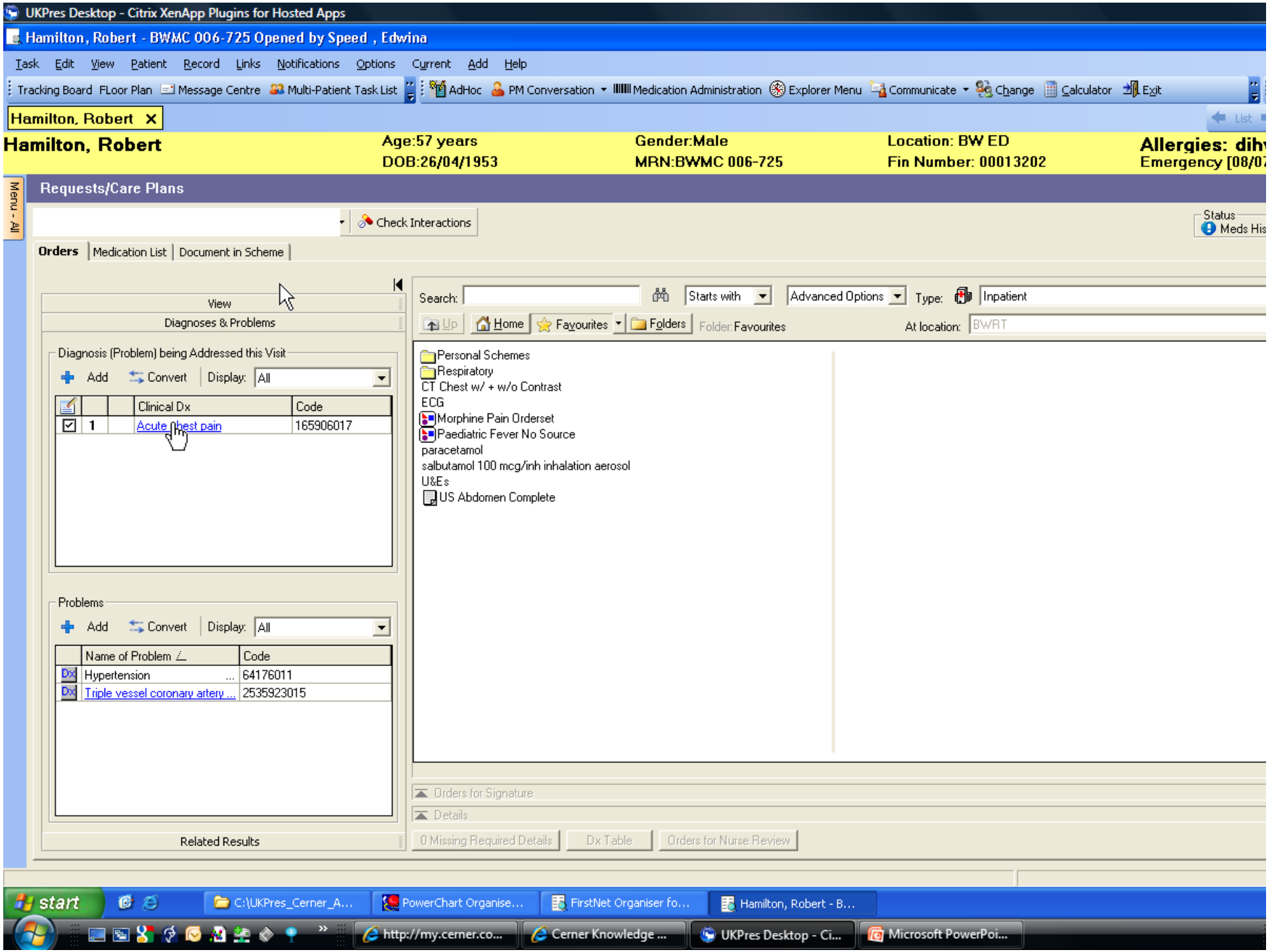
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DOB:26/04/1953
Gender:Male
MRN:BWMC 006-725
Location: BW ED
Fin Number: 00013202
Allergies: dih
Emergency [08/07
Menu - All
Requests/Care Plans
Check Interactions
Status
Meds His
Orders
Medication List
Document in Scheme
View
Diagnoses & Problems
Diagnosis (Problem) being Addressed this Visit
Add
Convert
Display: All
Clinical Dx
Code
1
Acute chest pain
165906017
Problems
Add
Convert
Display: All
Name of Problem
Code
Hypertension
64176011
Triple vessel coronary artery ...
2535923015
Related Results
Search:
Starts with
Advanced Options
Type: Inpatient
Up
Home
Favourites
Folders
Folder: Favourites
At location: BWRT
Personal Schemes
Respiratory
CT Chest w/ + w/o Contrast
ECG
Morphine Pain Orderset
Paediatric Fever No Source
paracetamol
salbutamol 100 mcg/inh inhalation aerosol
U&Es
US Abdomen Complete
Orders for Signature
Details
0 Missing Required Details
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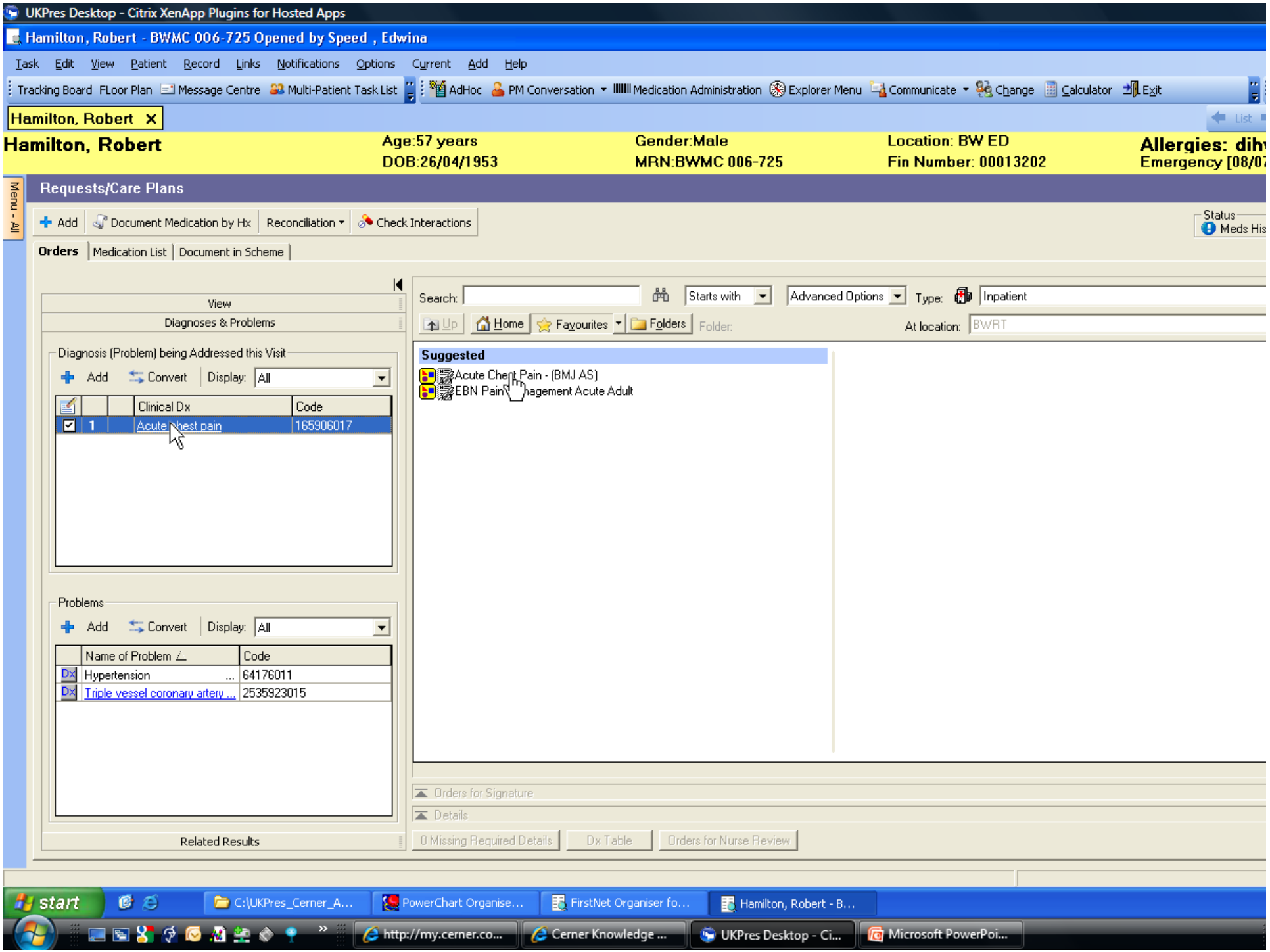
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Diagnoses & Problems
Diagnosis (Problem) being Addressed this Visit
Add Convert Display: All
Clinical Dx Code
1 Acute chest pain 165906017
Problems
Add Convert Display: All
Name of Problem Code
Dx Hypertension ... 64176011
Dx Triple vessel coronary artery ... 2535923015
Related Results
Search: Starts with Advanced Options Type: Inpatient
Up Home Favourites Folders Folder: At location: BWRT
Suggested
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EBN Pain Management Acute Adult
Orders for Signature
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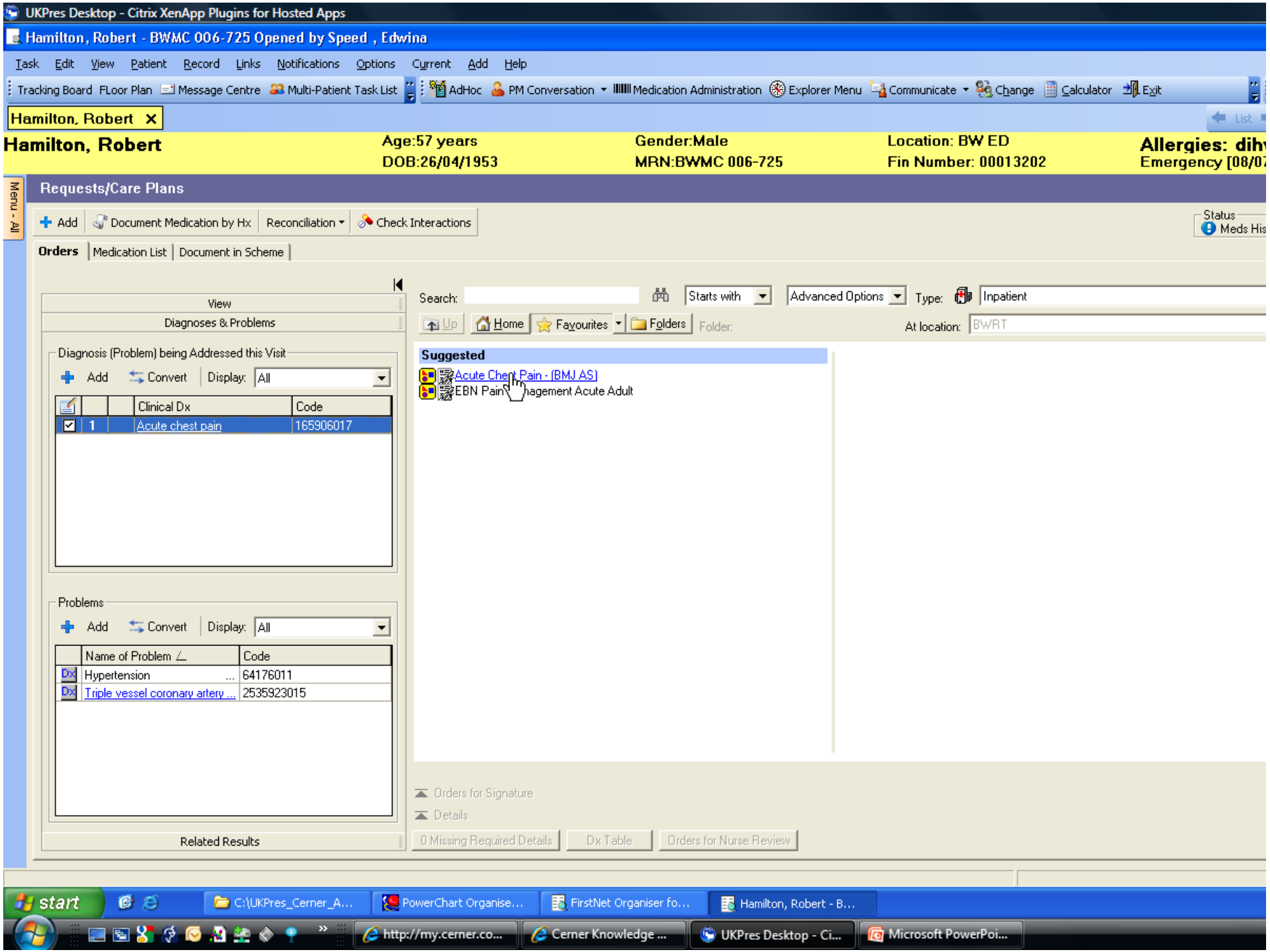
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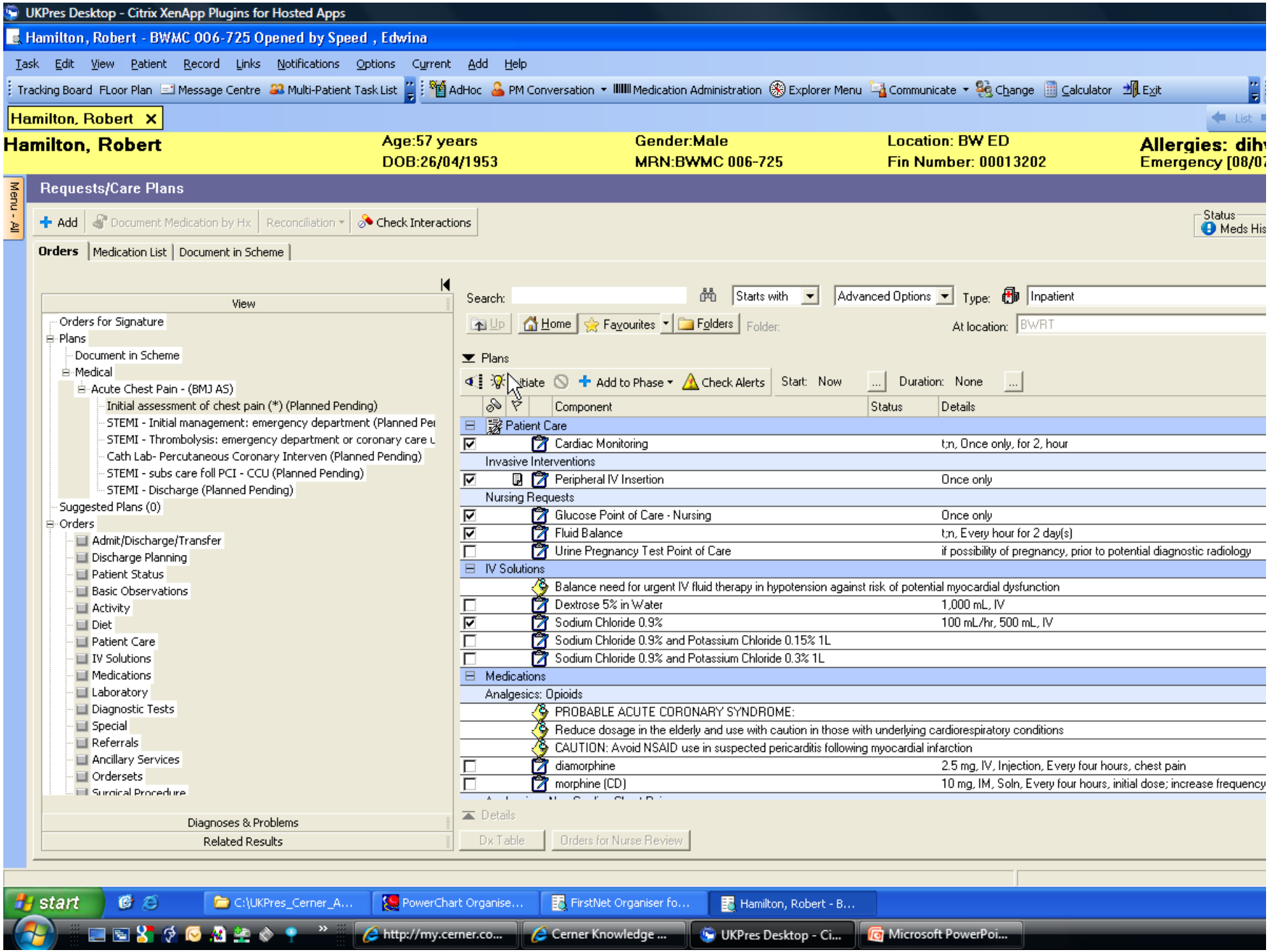
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Search:
Starts with
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Type: Inpatient
Up Home Favourites Folders Folder:
At location: BWRT
Plans
tiate Add to Phase Check Alerts Start: Now Duration: None
Component Status Details
Patient Care
Cardiac Monitoring t;n, Once only, for 2, hour
Invasive Interventions
Peripheral IV Insertion Once only
Nursing Requests
Glucose Point of Care - Nursing Once only
Fluid Balance t;n, Every hour for 2 day(s)
Urine Pregnancy Test Point of Care if possibility of pregnancy, prior to potential diagnostic radiology
IV Solutions
Balance need for urgent IV fluid therapy in hypotension against risk of potential myocardial dysfunction
Dextrose 5% in Water 1,000 mL, IV
Sodium Chloride 0.9% 100 mL/hr, 500 mL, IV
Sodium Chloride 0.9% and Potassium Chloride 0.15% 1L
Sodium Chloride 0.9% and Potassium Chloride 0.3% 1L
Medications
Analgesics: Opioids
PROBABLE ACUTE CORONARY SYNDROME:
Reduce dosage in the elderly and use with caution in those with underlying cardiorespiratory conditions
CAUTION: Avoid NSAID use in suspected pericarditis following myocardial infarction
diamorphine 2.5 mg, IV, Injection, Every four hours, chest pain
morphine (CD) 10 mg, IM, Soln, Every four hours, initial dose; increase frequency
Details
Dx Table Orders for Nurse Review
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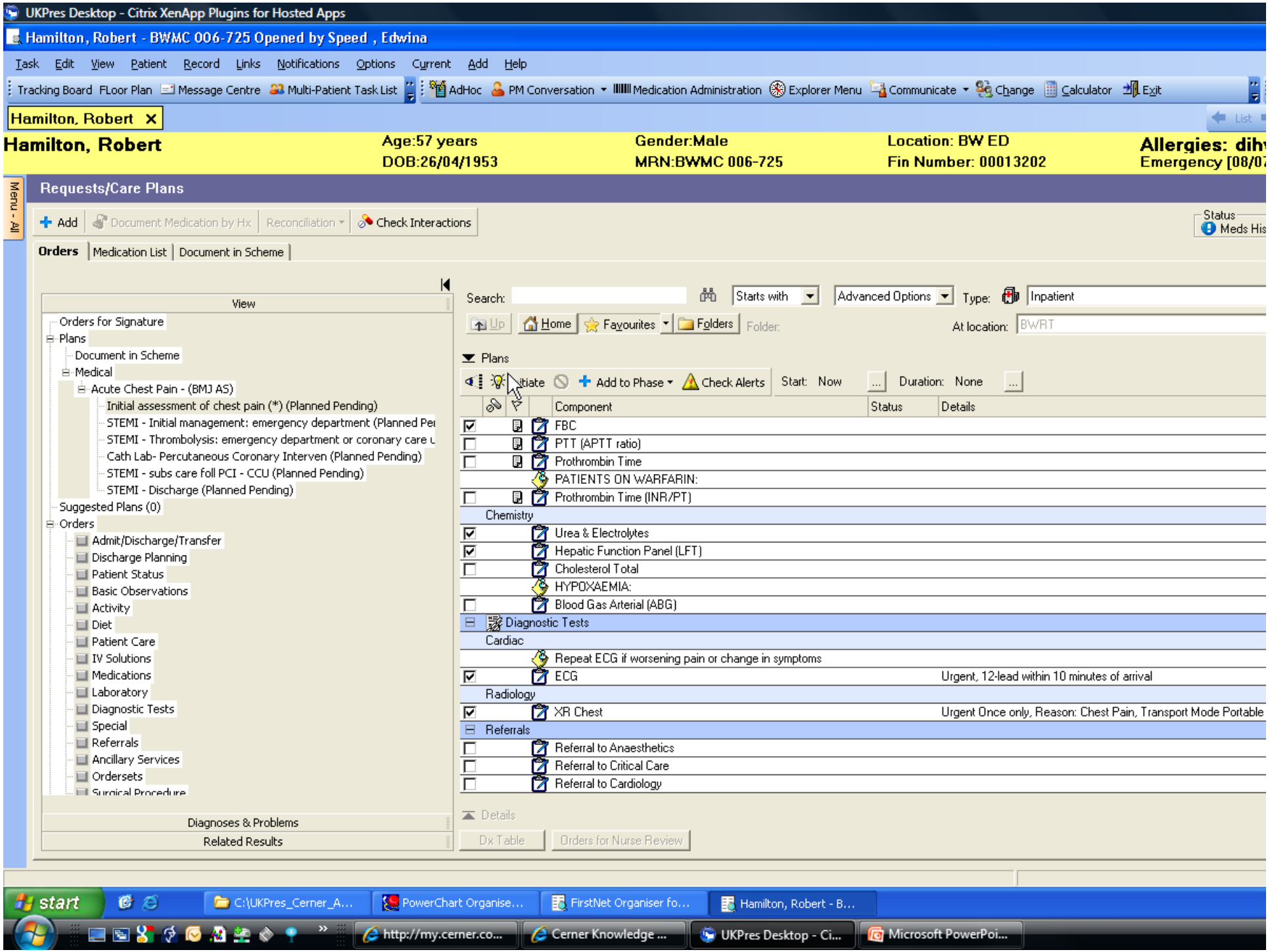
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Component Status Details
FBC
PTT (APTT ratio)
Prothrombin Time
PATIENTS ON WARFARIN:
Prothrombin Time (INR/PT)
Chemistry
Urea & Electrolytes
Hepatic Function Panel (LFT)
Cholesterol Total
HYPOXAEMIA:
Blood Gas Arterial (ABG)
Diagnostic Tests
Cardiac
Repeat ECG if worsening pain or change in symptoms
ECG Urgent, 12-lead within 10 minutes of arrival
Radiology
XR Chest Urgent Once only, Reason: Chest Pain, Transport Mode Portable
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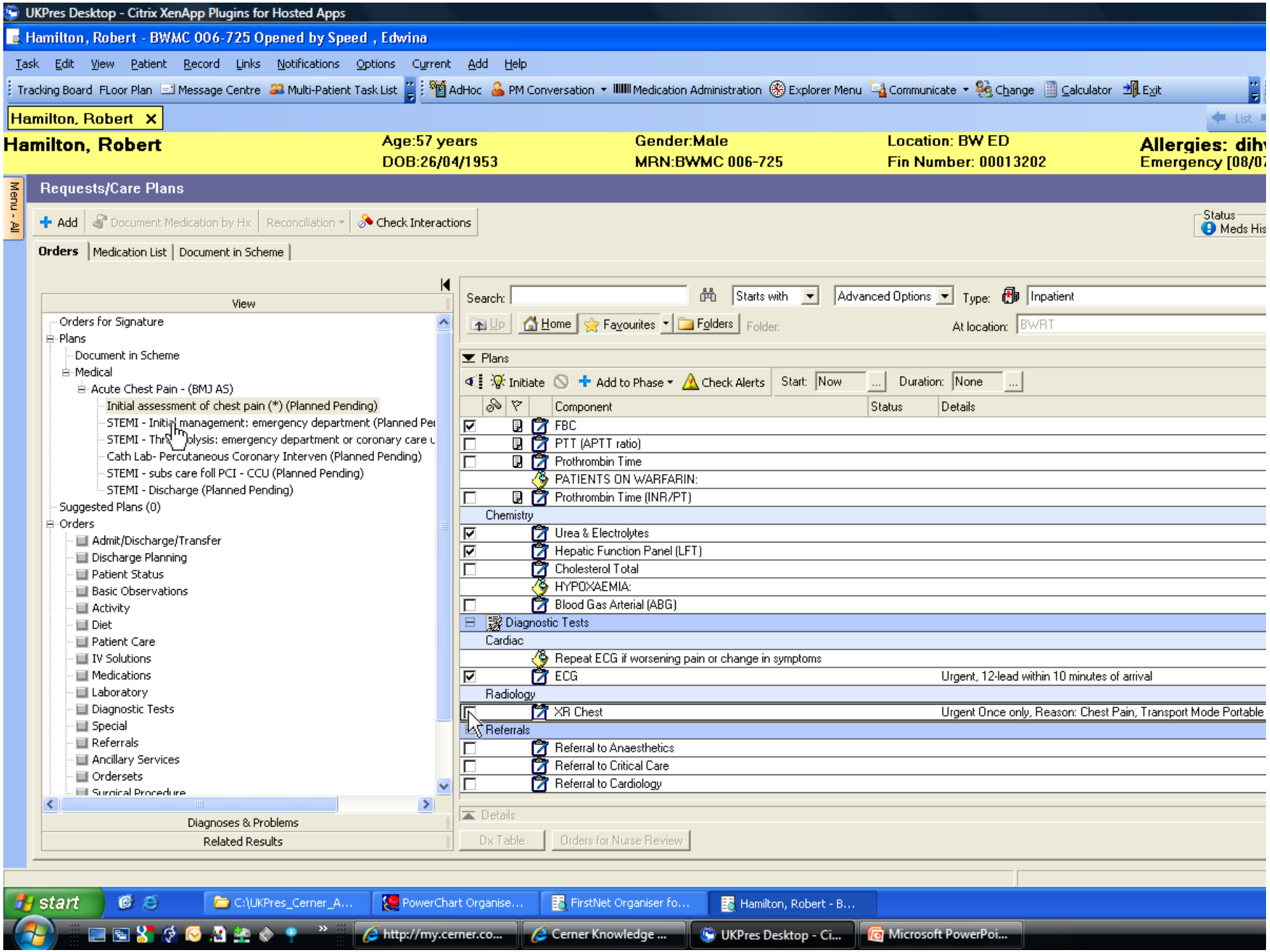
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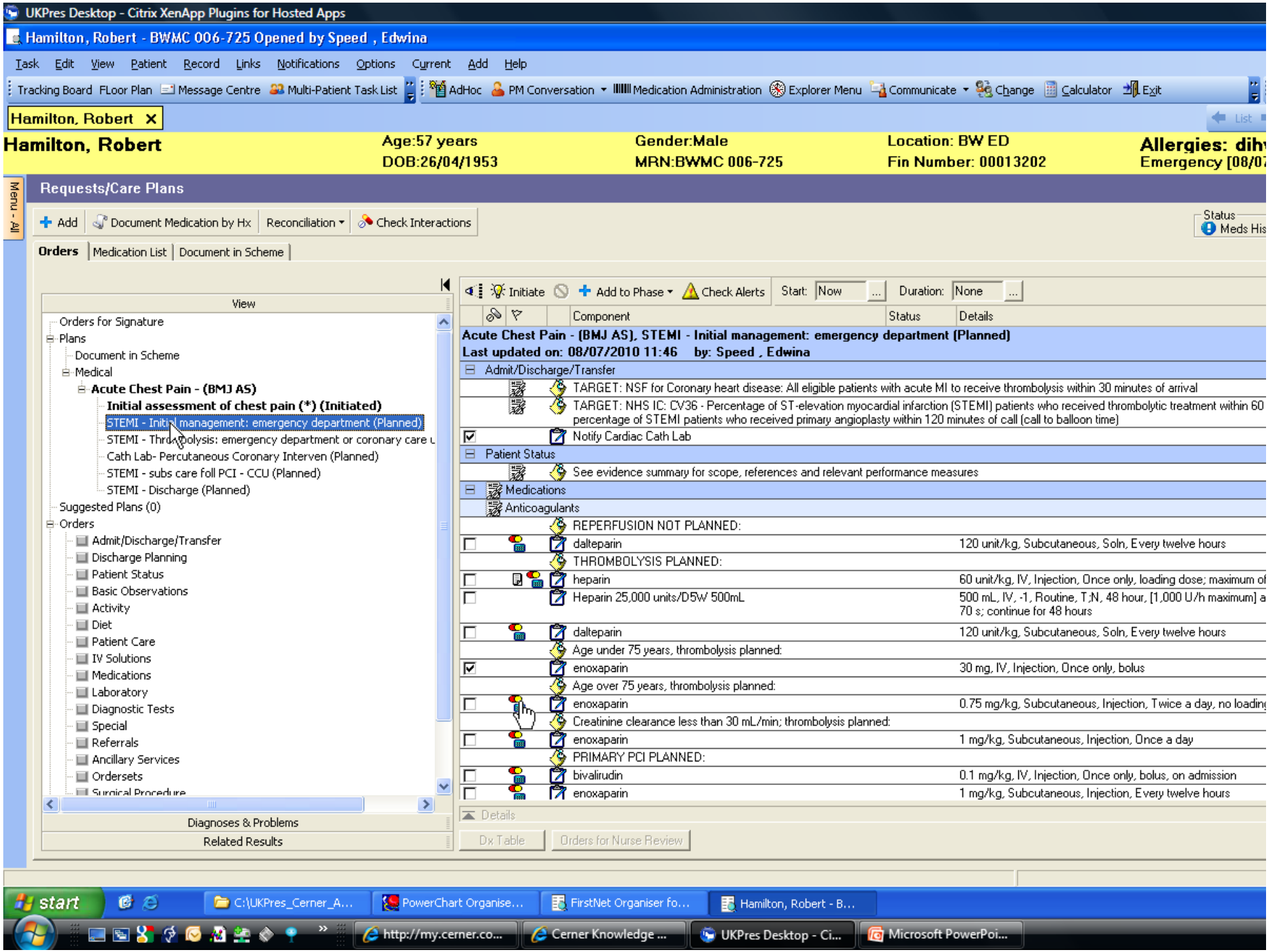
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Patient Status
Basic Observations
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Diet
Patient Care
IV Solutions
Medications
Laboratory
Diagnostic Tests
Special
Referrals
Ancillary Services
Ordersets
Surgical Procedure
Diagnoses & Problems
Related Results
Initiate Add to Phase Check Alerts Start: Now Duration: None
Component Status Details
Acute Chest Pain - (BMJ AS), STEMI - Initial management: emergency department (Planned)
Last updated on: 08/07/2010 11:46 by: Speed , Edwina
Admit/Discharge/Transfer
TARGET: NSF for Coronary heart disease: All eligible patients with acute MI to receive thrombolysis within 30 minutes of arrival
TARGET: NHS IC: CV36 - Percentage of ST-elevation myocardial infarction (STEMI) patients who received thrombolytic treatment within 60 percentage of STEMI patients who received primary angioplasty within 120 minutes of call (call to balloon time)
Notify Cardiac Cath Lab
Patient Status
See evidence summary for scope, references and relevant performance measures
Medications
Anticoagulants
REPERFUSION NOT PLANNED:
dalteparin 120 unit/kg, Subcutaneous, Soln, Every twelve hours
THROMBOLYSIS PLANNED:
heparin 60 unit/kg, IV, Injection, Once only, loading dose; maximum of
Heparin 25,000 units/D5W 500mL 500 mL, IV, -1, Routine, T;N, 48 hour, [1,000 U/h maximum] a 70 s; continue for 48 hours
dalteparin 120 unit/kg, Subcutaneous, Soln, Every twelve hours
Age under 75 years, thrombolysis planned:
enoxaparin 30 mg, IV, Injection, Once only, bolus
Age over 75 years, thrombolysis planned:
enoxaparin 0.75 mg/kg, Subcutaneous, Injection, Twice a day, no loading
Creatinine clearance less than 30 mL/min; thrombolysis planned:
enoxaparin 1 mg/kg, Subcutaneous, Injection, Once a day
PRIMARY PCI PLANNED:
bivalirudin 0.1 mg/kg, IV, Injection, Once only, bolus, on admission
enoxaparin 1 mg/kg, Subcutaneous, Injection, Every twelve hours
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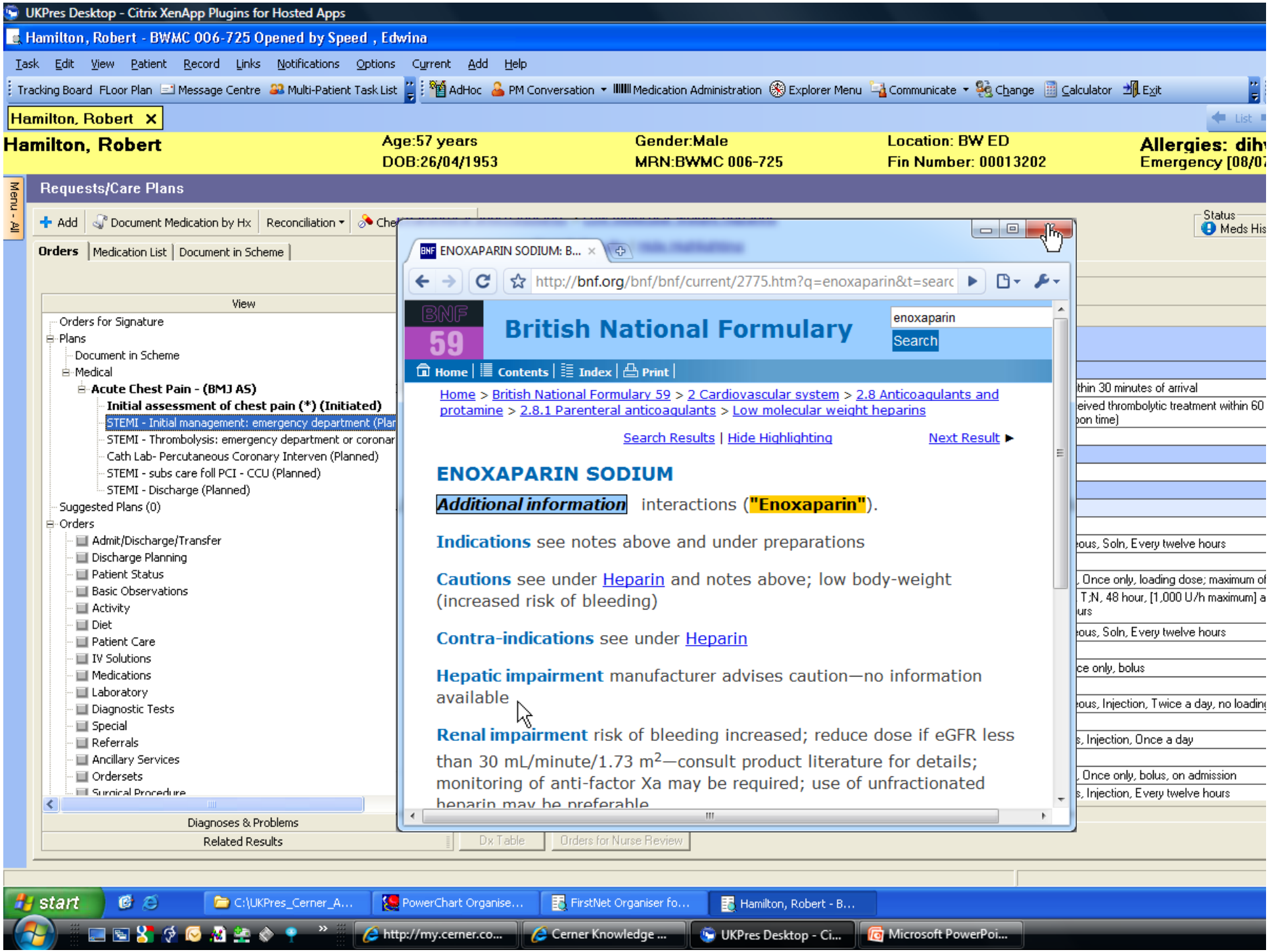
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Hamilton, Robert
Age:57 years
DOB:26/04/1953
Gender:Male
MRN:BWMC 006-725
Location: BW ED
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STEMI - Thrombolysis: emergency department or coronar
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STEMI - subs care foll PCI - CCU (Planned)
STEMI - Discharge (Planned)
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Next Result
ENOXAPARIN SODIUM
Additional information interactions ("Enoxaparin").
Indications see notes above and under preparations
Cautions see under Heparin and notes above; low body-weight (increased risk of bleeding)
Contra-indications see under Heparin
Hepatic impairment manufacturer advises caution—no information available
Renal impairment risk of bleeding increased; reduce dose if eGFR less than 30 mL/minute/1.73 m2—consult product literature for details; monitoring of anti-factor Xa may be required; use of unfractionated heparin may be preferable
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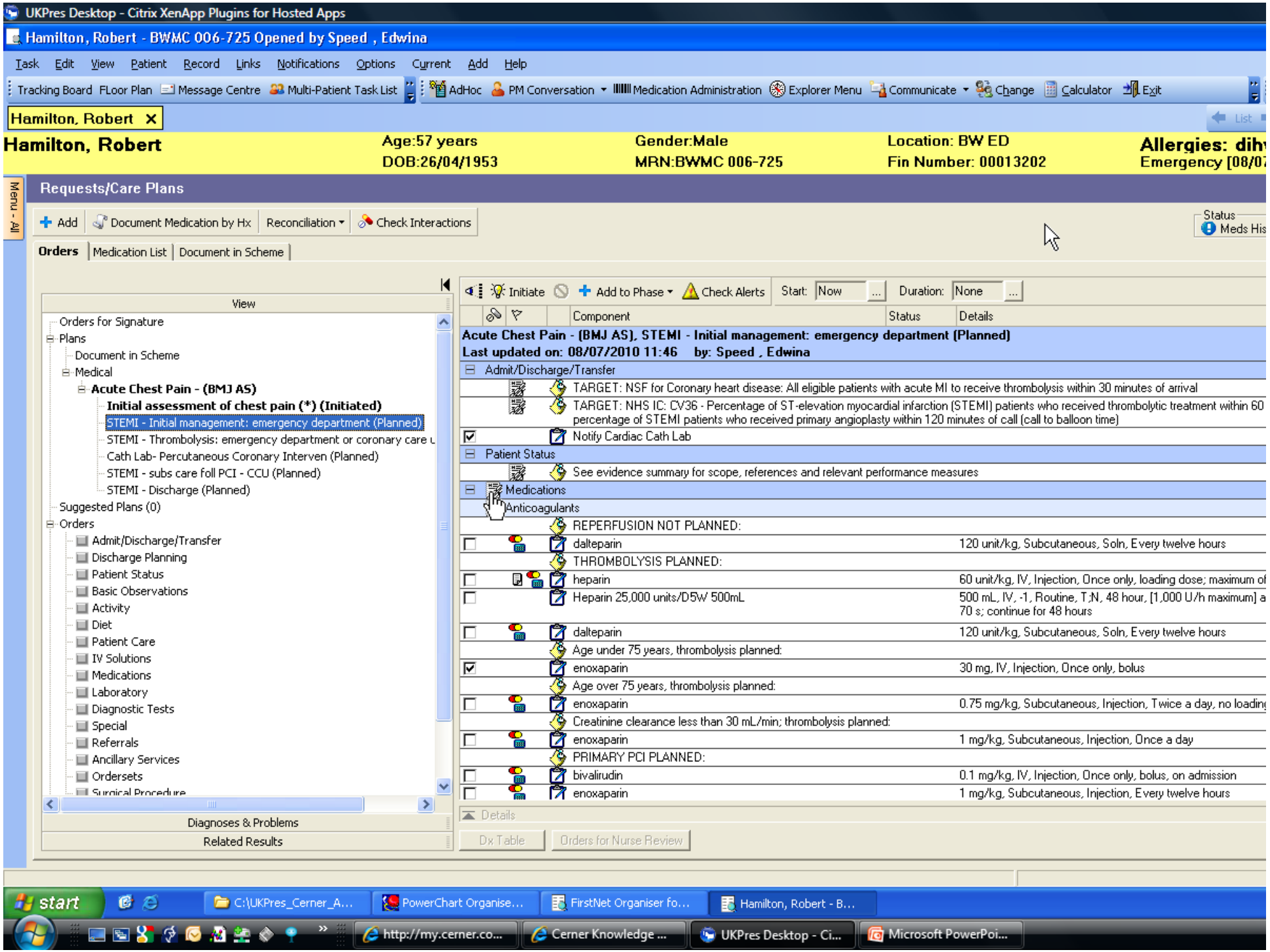
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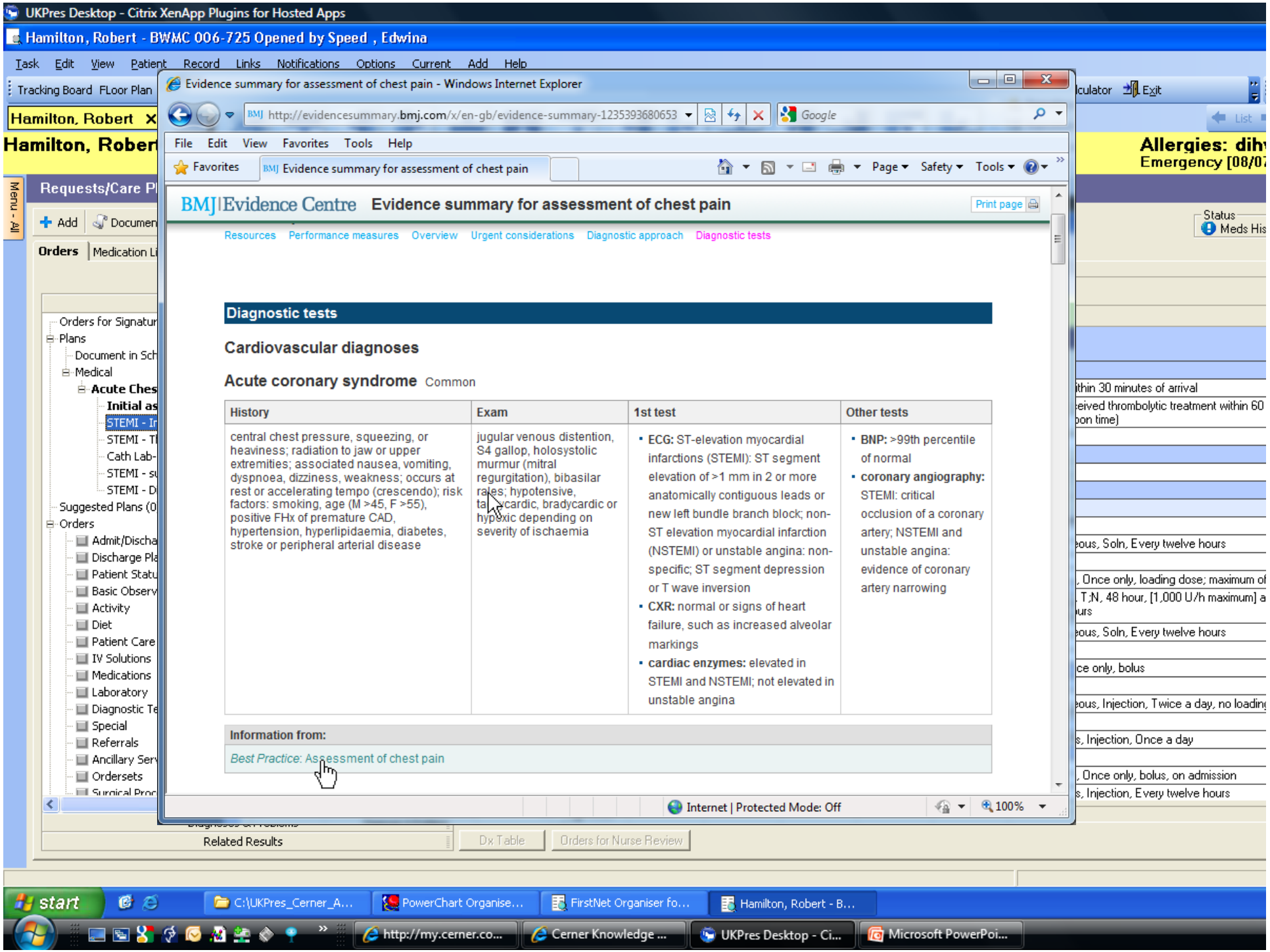
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Diagnostic tests
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Acute coronary syndrome Common
History
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Other tests
central chest pressure, squeezing, or heaviness; radiation to jaw or upper extremities; associated nausea, vomiting, dyspnoea, dizziness, weakness; occurs at rest or accelerating tempo (crescendo); risk factors: smoking, age (M >45, F >55), positive FHx of premature CAD, hypertension, hyperlipidaemia, diabetes, stroke or peripheral arterial disease
jugular venous distention, S4 gallop, holosystolic murmur (mitral regurgitation), bibasilar rales; hypotensive, tachycardic, bradycardic or hypoxic depending on severity of ischaemia
ECG: ST-elevation myocardial infarctions (STEMI): ST segment elevation of >1 mm in 2 or more anatomically contiguous leads or new left bundle branch block; non-ST elevation myocardial infarction (NSTEMI) or unstable angina: non-specific; ST segment depression or T wave inversion
CXR: normal or signs of heart failure, such as increased alveolar markings
cardiac enzymes: elevated in STEMI and NSTEMI; not elevated in unstable angina
BNP: >99th percentile of normal
coronary angiography: STEMI: critical occlusion of a coronary artery; NSTEMI and unstable angina: evidence of coronary artery narrowing
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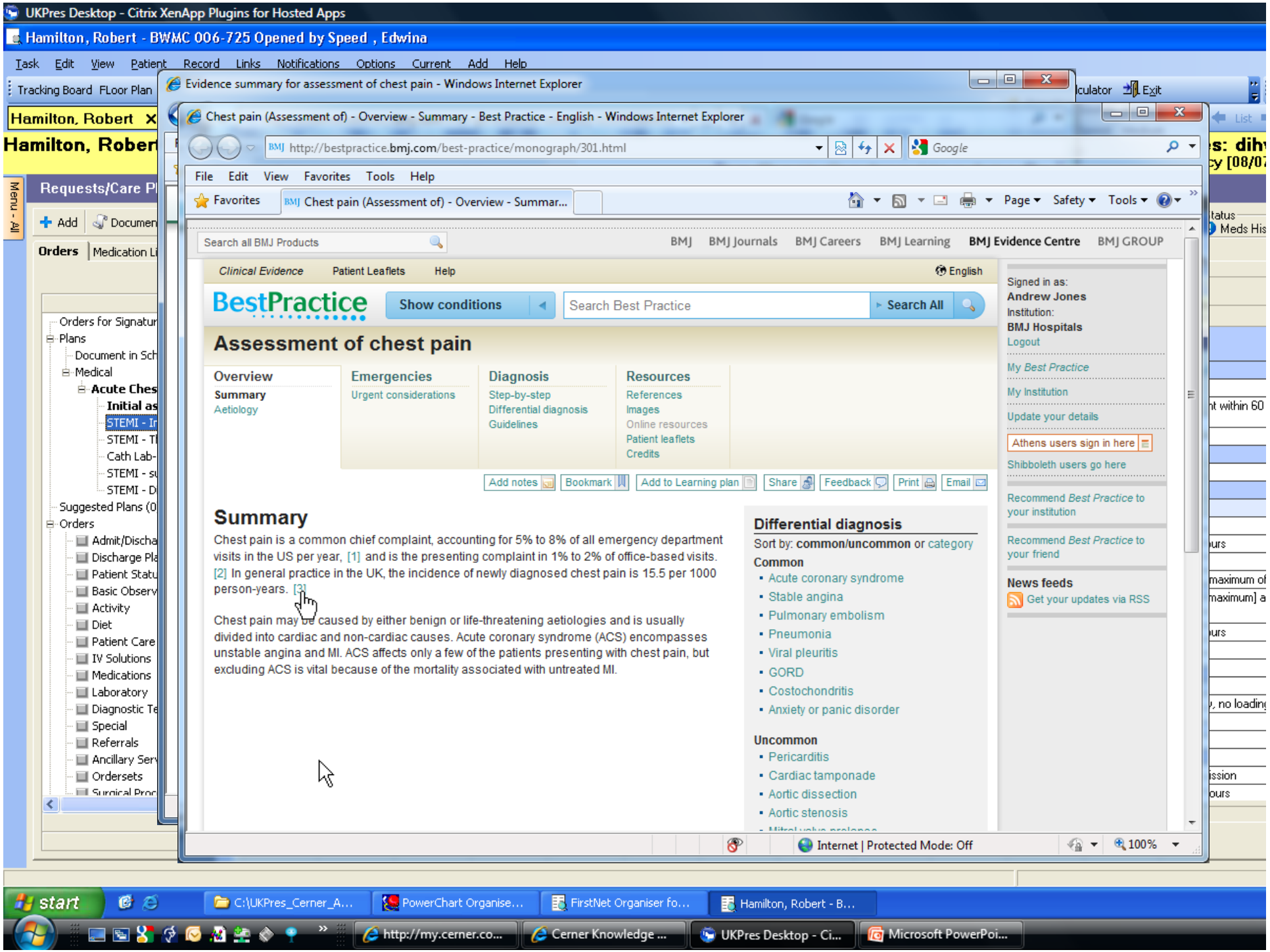
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Summary
Chest pain is a common chief complaint, accounting for 5% to 8% of all emergency department visits in the US per year, [1] and is the presenting complaint in 1% to 2% of office-based visits. [2] In general practice in the UK, the incidence of newly diagnosed chest pain is 15.5 per 1000 person-years. [3]
Chest pain may be caused by either benign or life-threatening aetiologies and is usually divided into cardiac and non-cardiac causes. Acute coronary syndrome (ACS) encompasses unstable angina and MI. ACS affects only a few of the patients presenting with chest pain, but excluding ACS is vital because of the mortality associated with untreated MI.
Differential diagnosis
Sort by: common/uncommon or category
Common
Acute coronary syndrome
Stable angina
Pulmonary embolism
Pneumonia
Viral pleuritis
GORD
Costochondritis
Anxiety or panic disorder
Uncommon
Pericarditis
Cardiac tamponade
Aortic dissection
Aortic stenosis
Signed in as:
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Institution:
BMJ Hospitals
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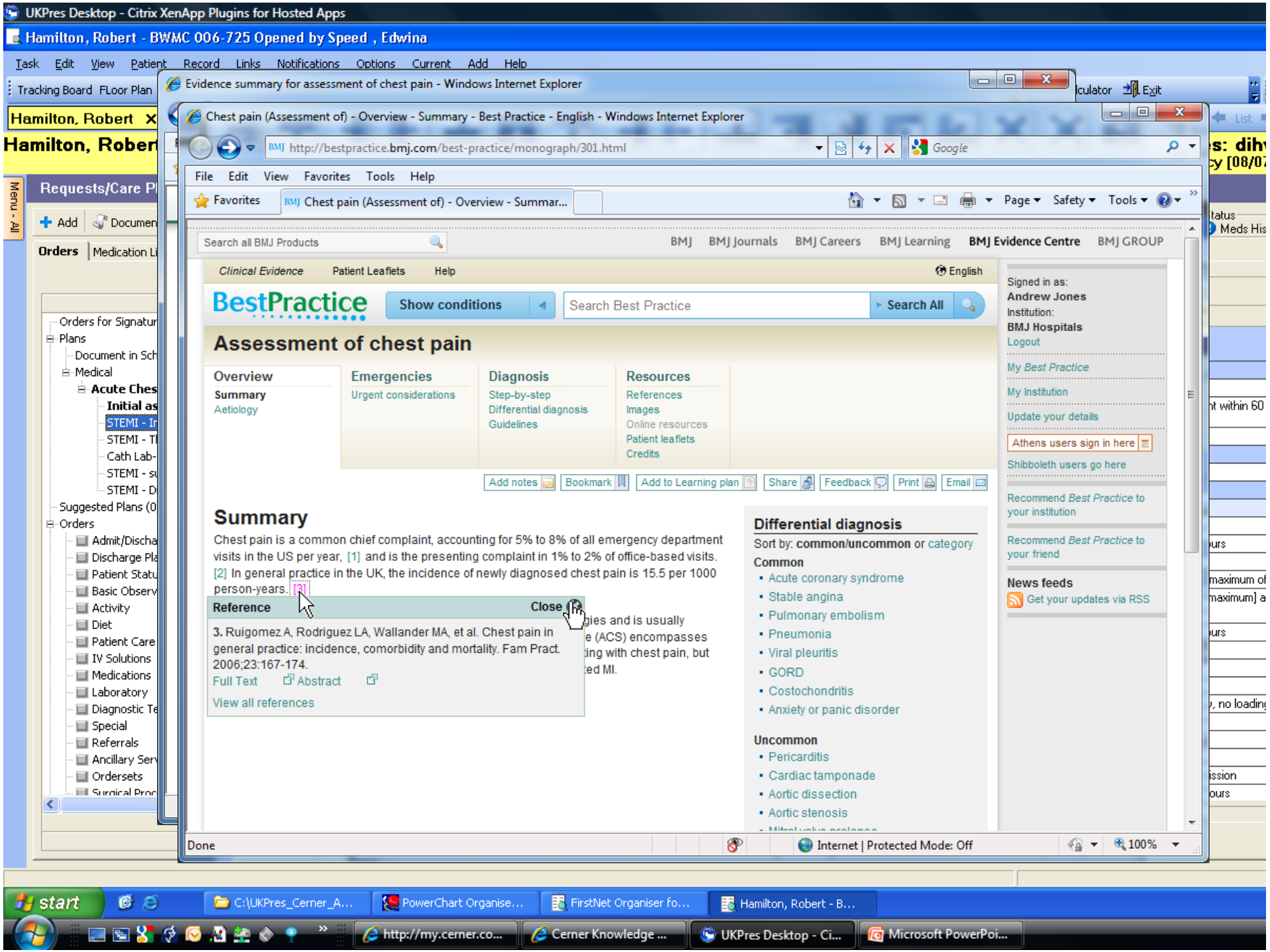
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Reference
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3. Ruigomez A, Rodriguez LA, Wallander MA, et al. Chest pain in general practice: incidence, comorbidity and mortality. Fam Pract. 2006;23:167-174.
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Differential diagnosis
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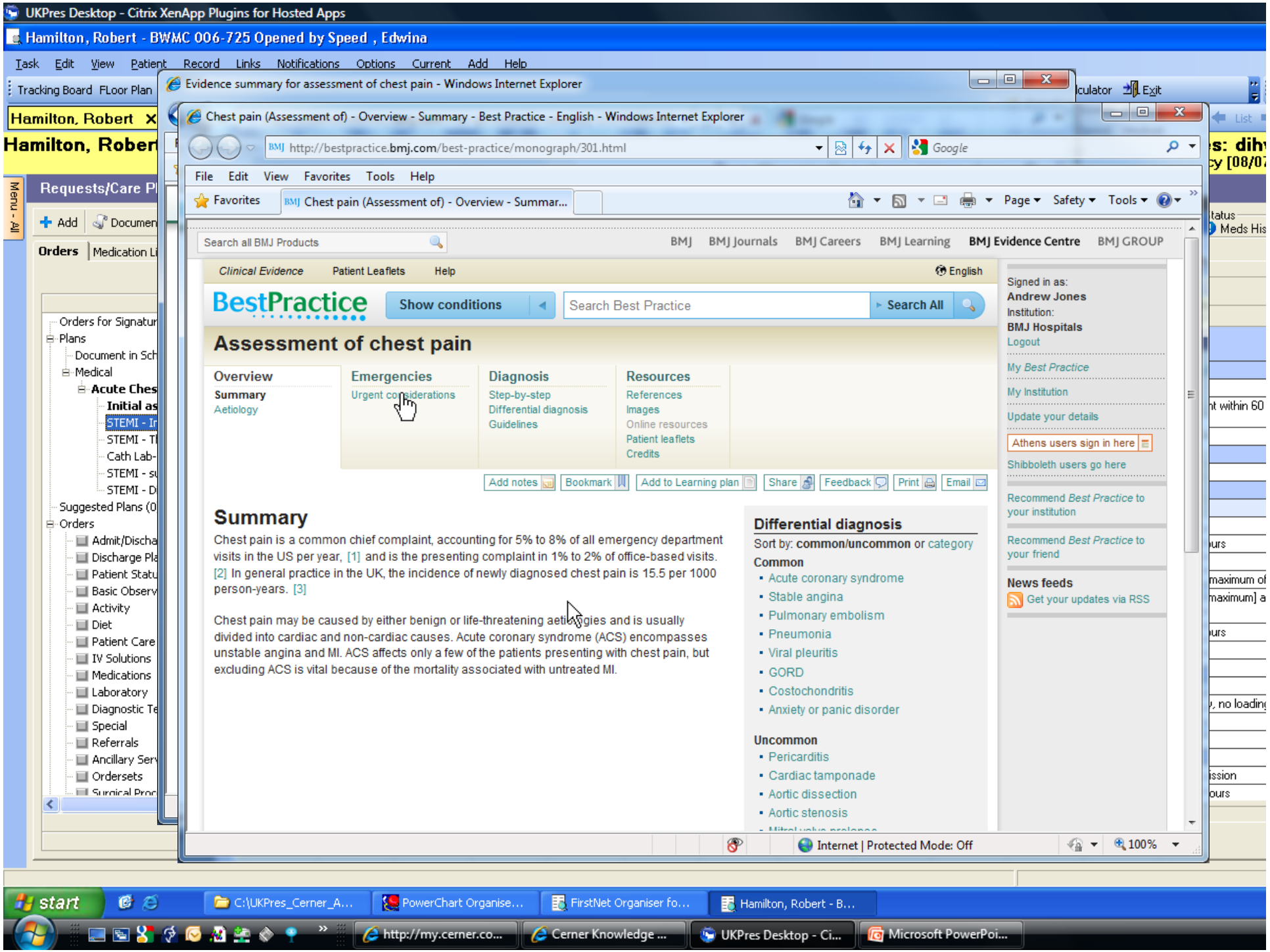
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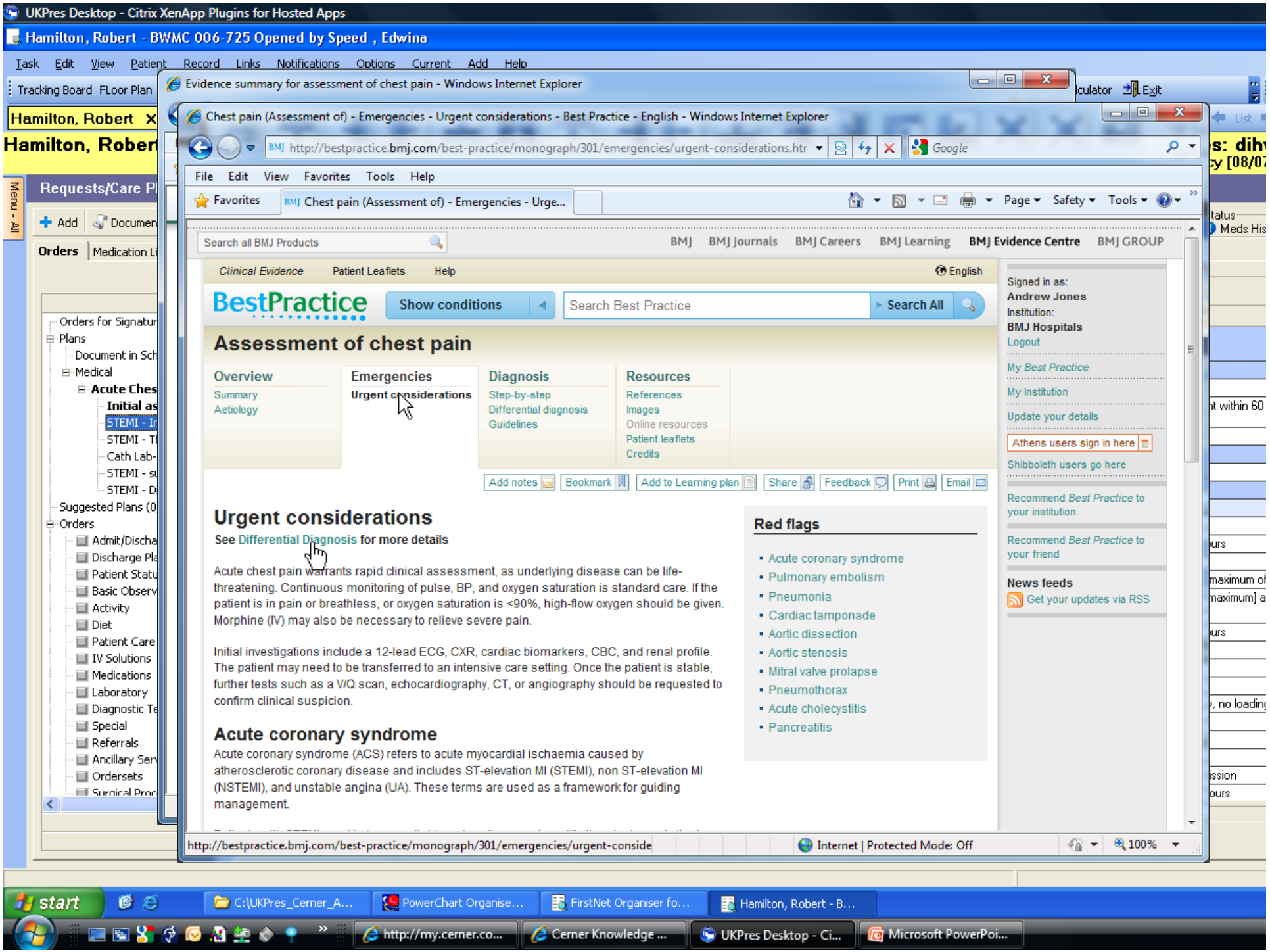
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Urgent considerations
See Differential Diagnosis for more details
Acute chest pain warrants rapid clinical assessment, as underlying disease can be life-threatening. Continuous monitoring of pulse, BP, and oxygen saturation is standard care. If the patient is in pain or breathless, or oxygen saturation is <90%, high-flow oxygen should be given. Morphine (IV) may also be necessary to relieve severe pain.
Initial investigations include a 12-lead ECG, CXR, cardiac biomarkers, CBC, and renal profile. The patient may need to be transferred to an intensive care setting. Once the patient is stable, further tests such as a V/Q scan, echocardiography, CT, or angiography should be requested to confirm clinical suspicion.
Acute coronary syndrome
Acute coronary syndrome (ACS) refers to acute myocardial ischaemia caused by atherosclerotic coronary disease and includes ST-elevation MI (STEMI), non ST-elevation MI (NSTEMI), and unstable angina (UA). These terms are used as a framework for guiding management.
Red flags
Acute coronary syndrome
Pulmonary embolism
Pneumonia
Cardiac tamponade
Aortic dissection
Aortic stenosis
Mitral valve prolapse
Pneumothorax
Acute cholecystitis
Pancreatitis
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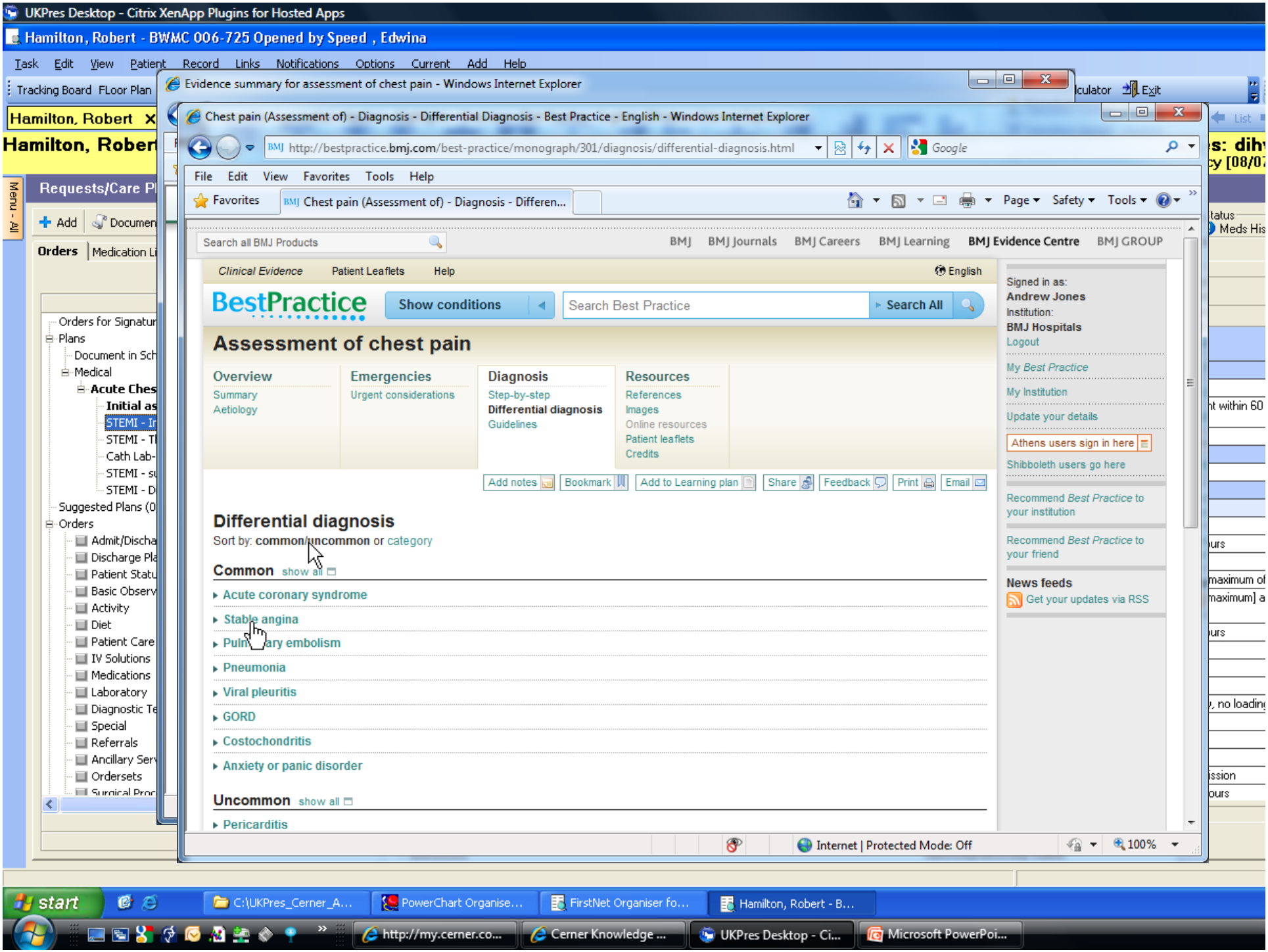
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Pulmonary embolism
Pneumonia
Viral pleuritis
GORD
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Anxiety or panic disorder
Uncommon show all
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The aim is to deliver:

- Consistent evidence based care
- That can be delivered by every member of staff
- Rapid dissemination of new evidence
- And practice based knowledge
- While learning at the same time

Properly implemented can reduce mortality, length of stay, costs and readmissions

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The Evidence

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- Quantitative study into the impact of care bundles in a north west London NHS trust [1]
- Eight care bundles implemented which targeted 13 diagnoses
- Over one year period admissions increased 5.7%
- Deaths would have been expected to rise by 7.9%
- There was a 14.5% decrease in actual deaths which represented 255 fewer deaths

1. *Robb E, Jarman B, Suntharalingam G, Higgens C, Tennant R, Elcock K.* ***Using care bundles to reduce in-hospital mortality: quantitative survey.*** *BMJ. 2010 Mar 31;340:c1234*

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- Journal General Internal Medicine, 2010. Chang et al [1]
- Systematic review of studies relating to order sets
- June 1999 – June 2009
- 23 studies identified: 16 examined the effect of order sets on outcomes
- Outcomes measured included mortality, length of stay, appropriate medication use, medication errors, glucose control, and increased adherence to recommended care

1. *Chang J, Langberg M, Silka P, Dietrich A.* ***Improving outcomes through the use of inpatient order sets: a systematic review.*** *J Gen Intern Med. 2010 Jun; 25(Suppl 3): S308-S309*

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- Of the 16 that measured outcomes, 14 (88%) demonstrated improved clinical outcomes or adherence to guidelines
- 4 studies showed reduced mortality
- 4 studies demonstrated a reduced length of stay or costs
- Various conditions studied including acute myocardial infarction, pneumonia, sepsis, venous thromboembolism (VTE) prophylaxis, diabetes, and immunizations

1. *Chang J, Langberg M, Silka P, Dietrich A.* ***Improving outcomes through the use of inpatient order sets: a systematic review.*** *J Gen Intern Med. 2010 Jun; 25(Suppl 3): S308-S309*

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RFH Pilot

- Royal Free Hospital pilot of BMJ Action Sets targeting the management of upper GI bleeding
- Examined two quality indicators in the initial management
  - Rockall Scores and use of i.v. proton pump inhibitors
- Rockall scoring is a simple risk assessment tool which takes account of age, signs of shock and co-morbidity [1]
- Patients with a score of 0 or 1 have <1% mortality [2]

1. ***Risk assessment after acute upper gastrointestinal haemorrhage: implications for resource utilisation.*** *Rockall TA, Logan RF, Devlin HB, North field TC, Gut, 1996 Mar;38(2):316-21.*
2. ***Risk assessment in upper gastrointestinal haemorrhage: implications for resource utilisation.*** *Hang TS, Tornik V, Stubbs R, N Z Med J. 2000 Aug 11;113(1115):331-3.*

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RFH Pilot - data

- 0% of acute clinicians calculated a Rockall score on admission
- 0% of gastroenterology clinicians calculated a Rockall score on admission
- 50% of inpatient endoscopy patients had a Rockall score of 0 (length of stay 3-5 days)
- 65% of patients received i.v. pantoprazole pre-endoscopy

1. ***Unpublished data from the Royal Free Hospital**, presented at the Cerner Health Conference by Dr James O'Bierne, September 2010*

BMJ Group

- RFH implemented the BMJ upper GI bleed Action Set in Cerner Millennium system
- Adapted it to their organisation
- Recent data presented at the BSG:
  - Rockall score recorded – 33%
  - Discharge from A&E if Rockall score 0 – 100%
  - Inappropriate PPI use – 67% reduction

1. ***THERE WILL BE BLOOD… A COMPLETE AUDIT CYCLE.*** *M. Pericleous, C. Murray, M. Hamilton, O. Epstein, R. Negus, J. O'Beirne. BSG 2011 - Abstract Submission, Health Service Research and IT BSG11-ABS-2046*

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- Properly implemented order sets have the potential to:
  - Improve outcomes
  - Standardise care
  - Reduce costs
  - Improve Patient Safety
  - Deliver evidence based practice more quickly

BMJ Group

ActionSETS

CARE PROTOCOLS

FROM THE BMJ EVIDENCE CENTRE

Medicines Optimisation

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Medicines Optimisation

Derived from FirstDataBank's Product Definition

* Encompasses:
  * Provision of medicines usage in order to identify deviations from best practice and the cost of those deviations, long term conditions which require interventions, and opportunities for further medicines swapping and cost savings
  * Support Prescribers to make effective medicines choices depending on patient characteristic, optimal pricing and current NHS best practice guidelines
  * Enable the health service to make the best use of available medicines budgets

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The Fourth Hurdle

Sir Mike Rawlins

* Treatment comparisons previously dominated by quality, safety and efficacy
* Financial climate requires priority setting in the NHS
* Decision making encompassing Financial Efficiency can benefit from ePrescribing

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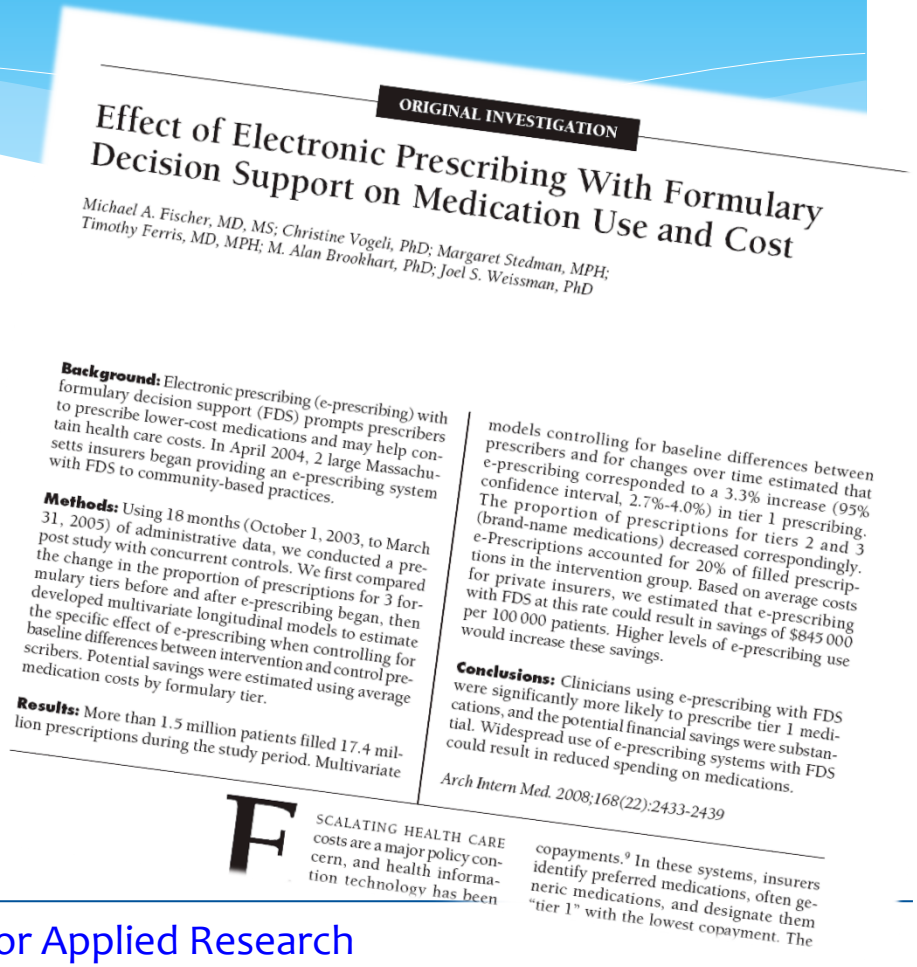
Formulary Decision Support:
The Evidence

* US study examining community prescribing systems
* Adjusted 3.3% increase in tier 1 (more cost effective) medication due to ePrescribing
* Savings of $845,000 per 100,000 patients



ORIGINAL INVESTIGATION

Effect of Electronic Prescribing With Formulary Decision Support on Medication Use and Cost

Michael A. Fischer, MD, MS; Christine Vogeli, PhD; Margaret Stedman, MPH; Timothy Ferris, MD, MPH; M. Alan Brookhart, PhD; Joel S. Weissman, PhD

Background: Electronic prescribing (e-prescribing) with formulary decision support (FDS) prompts prescribers to prescribe lower-cost medications and may help contain health care costs. In April 2004, 2 large Massachusetts insurers began providing an e-prescribing system with FDS to community-based practices.

Methods: Using 18 months (October 1, 2003, to March 31, 2005) of administrative data, we conducted a pre-post study with concurrent controls. We first compared the change in the proportion of prescriptions for 3 formulary tiers before and after e-prescribing began, then developed multivariate longitudinal models to estimate the specific effect of e-prescribing when controlling for baseline differences between intervention and control prescribers. Potential savings were estimated using average medication costs by formulary tier.

Results: More than 1.5 million patients filled 17.4 million prescriptions during the study period. Multivariate models controlling for baseline differences between prescribers and for changes over time estimated that e-prescribing corresponded to a 3.3% increase (95% confidence interval, 2.7%-4.0%) in tier 1 prescribing. The proportion of prescriptions for tiers 2 and 3 (brand-name medications) decreased correspondingly. e-Prescriptions accounted for 20% of filled prescriptions in the intervention group. Based on average costs for private insurers, we estimated that e-prescribing with FDS at this rate could result in savings of $845 000 per 100 000 patients. Higher levels of e-prescribing use would increase these savings.

Conclusions: Clinicians using e-prescribing with FDS were significantly more likely to prescribe tier 1 medications, and the potential financial savings were substantial. Widespread use of e-prescribing systems with FDS could result in reduced spending on medications.

Arch Intern Med. 2008;168(22):2433-2439

ESCALATING HEALTH CARE costs are a major policy concern, and health information technology has been

copayments.[9] In these systems, insurers identify preferred medications, often generic medications, and designate them "tier 1" with the lowest copayment. The

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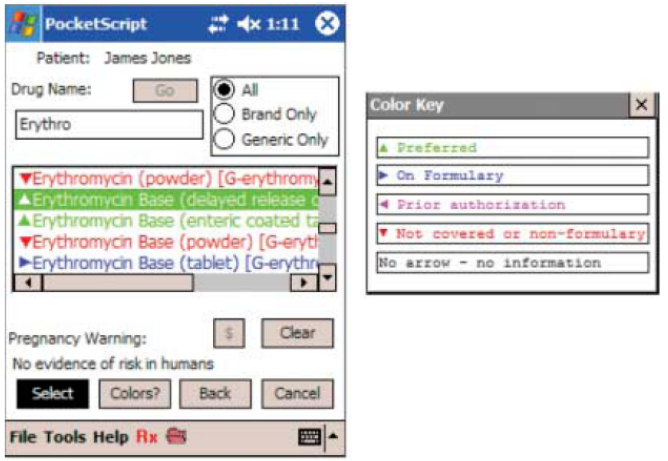
Formulary Decision Support:
The Practice

* **Limited formulary medications in ePrescribing drug index**
* **Mark non-formulary or restricted options in CDS**
* **Pop-up alert when non-formulary option is chosen**



PocketScript (Zix corporation, Dallas, Texas)

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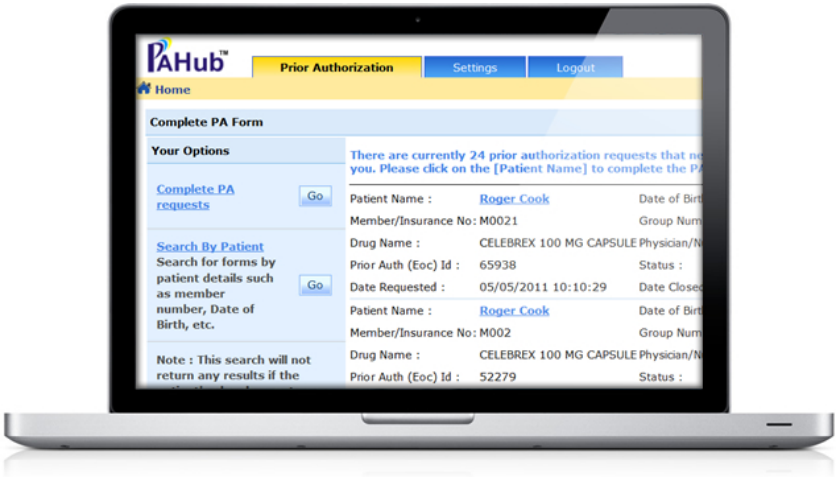
Electronic Prior Authorisation:
Formulary CDS in Hospitals?

* Mostly used for Health Insurance
  * Cost containment measures that only provide payment if treatment approved in advance
* May automate the non-formulary / reserved drugs used in hospitals



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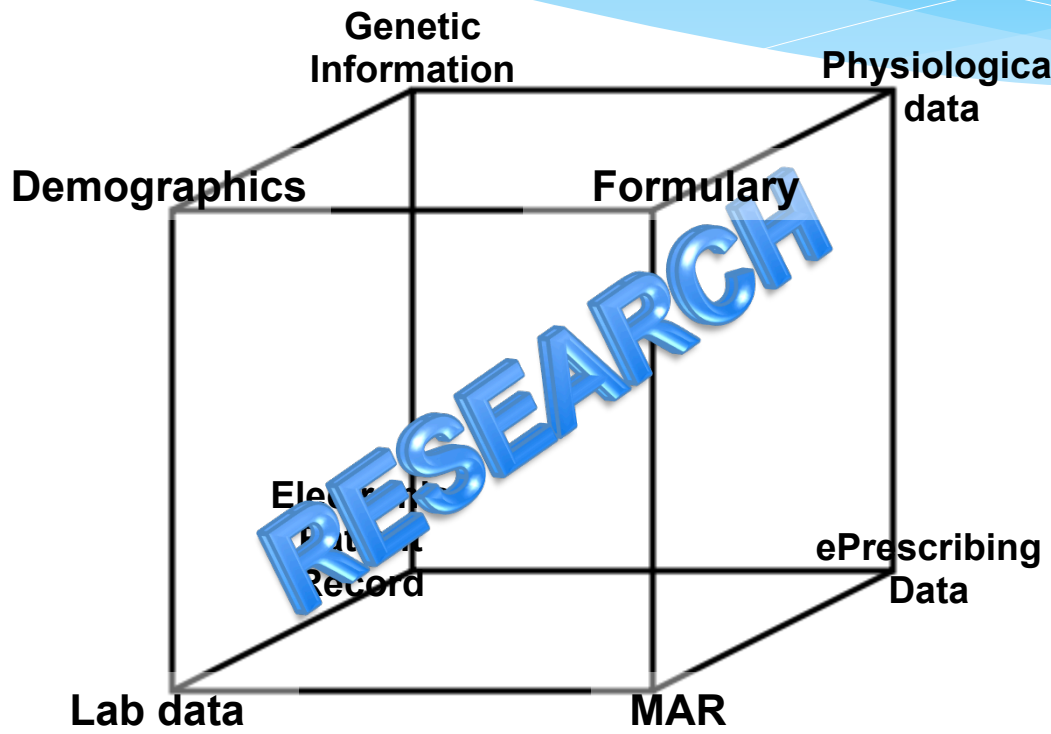
Data is Power

* *"The Science of Medicine is enhanced when data becomes a regular tool of both medical practice and medical research"*
  George C. Halvorson, CEO Kaiser Foundation Health Plan

* ePrescribing Systems can produce a lot of data to help audit and research → Medicines Optimisation

Bringing data together



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* Suddenly Snapshot data becomes moving data

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Continuous Improvement Process

* New Medicines Datasets will help operational performance (not just saving £)
* Lead to better and more focussed day-to-day care
* Incremental improvements rather than giant leaps
* By the identification, reduction, and elimination of suboptimal processes

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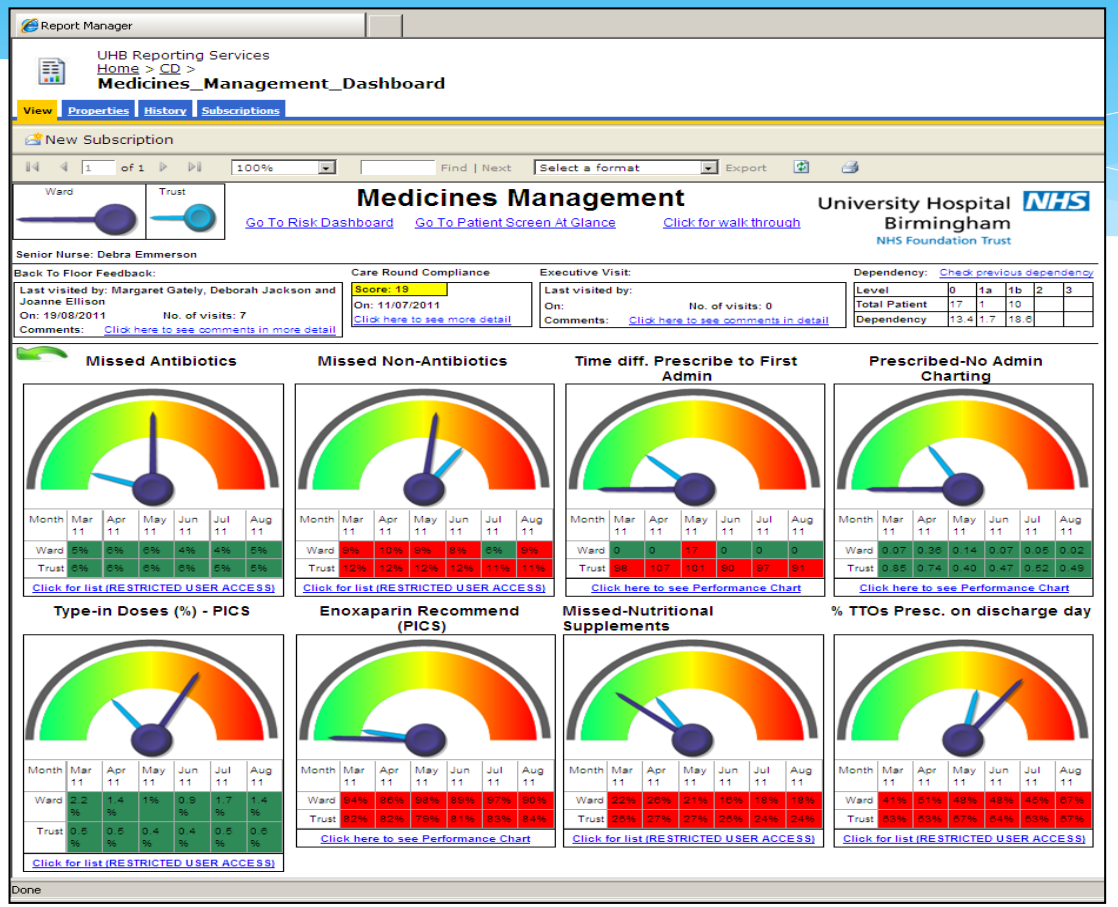
The Clinical Dashboard

University Hospitals Birmingham NHS Foundation Trust



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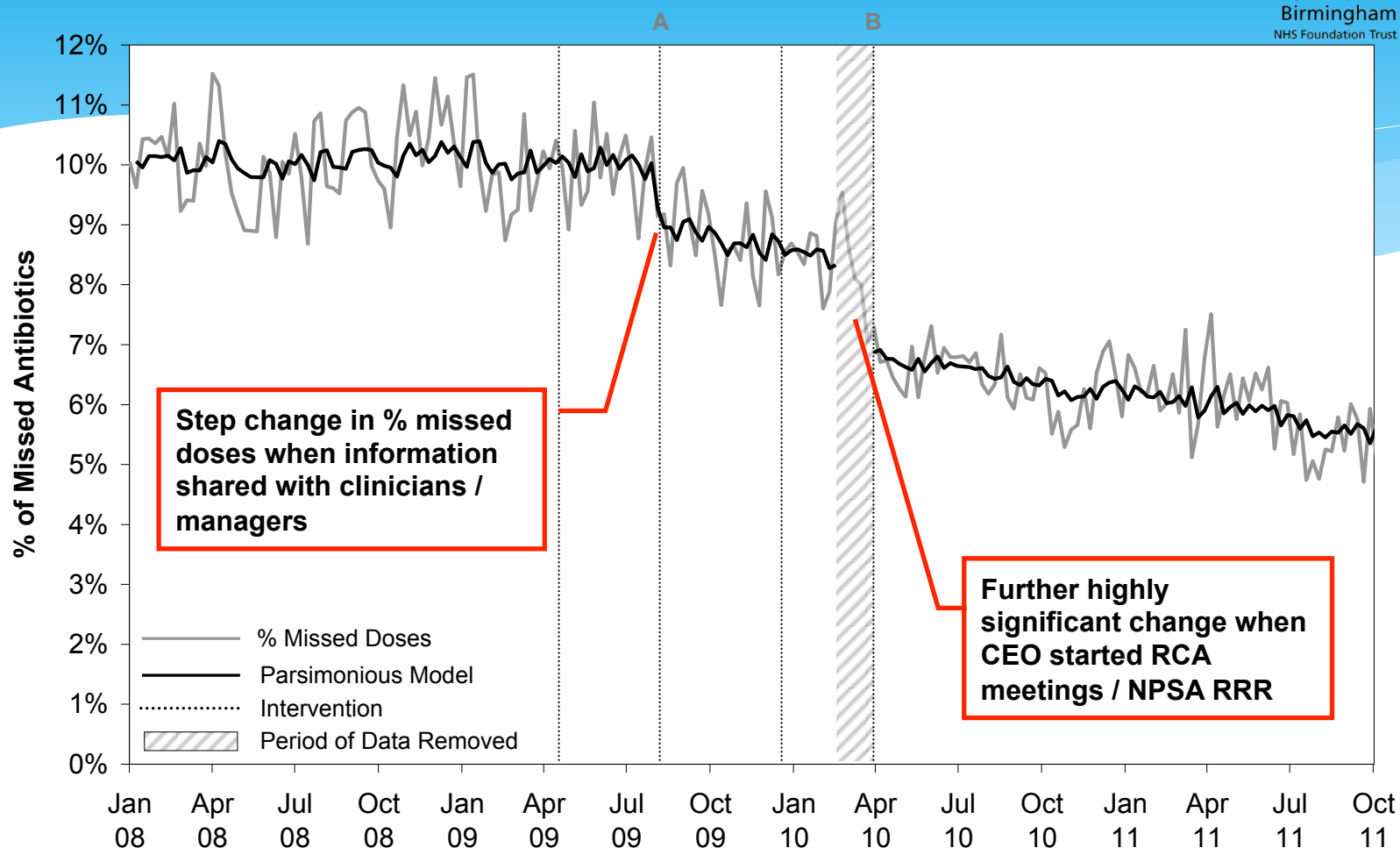
Missed Antibiotics – Time Series Analysis

University Hospitals Birmingham NHS Foundation Trust



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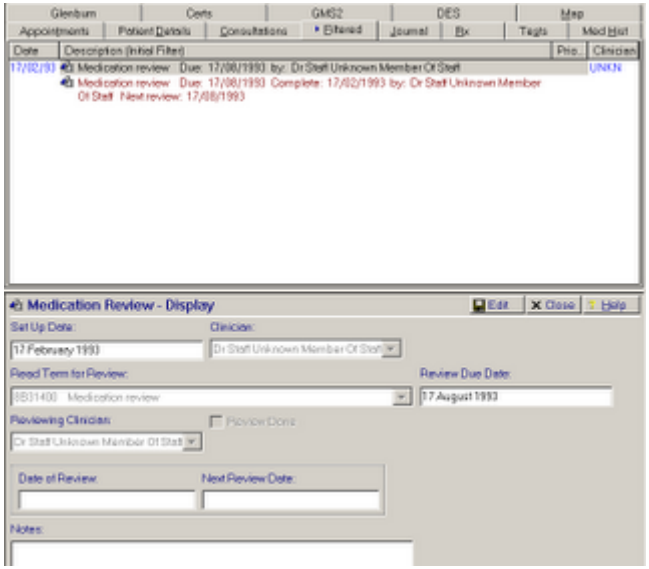
Improving Care Processes

* Prompts and reminders re quality measures
* Exist in GP systems re QOF indicators
* Hospital Trusts face lots of quality management
  * NICE quality indicators
  * CQuInS



GP QOF prompt re medication review

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Connecting with Patients / Sharing Information

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QUESTIONS

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Thank you for your time

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*Osheroff J (Ed.) Improving Outcomes with Clinical Decision Support: An Implementer's Guide 2nd Edition. Healthcare Information and Management Systems Society; Chicago, 2012.

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