

# Why ePrescribing should be supporting patient care

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# Why electronic prescribing?

- We have a major problem in terms of medication errors and dangerously inadequate communication about medicines
- There is evidence of benefit from electronic prescribing systems
- While electronic prescribing has been the norm in UK general practice for many years, it will be introduced to increasing numbers of NHS hospitals in the coming years
- There are still challenges ahead and much to learn in terms of a successful design and implementation of new systems

# What is electronic prescribing?

- The utilisation of electronic systems to:
  - facilitate and enhance the communication of a prescription or medicine order
  - aid the choice, administration and supply of a medicine through knowledge and decision support
  - provide a robust audit trail for the entire medicines use process

Connecting for Health Electronic Prescribing Baseline Specification

# Getting to the heart of the matter...

- What do we now know about medication-related morbidity?
- What is the potential for electronic prescribing to improve patient safety?
- What is the evidence for the benefits (and harms) of electronic prescribing?
- What are the challenges for introducing high quality electronic prescribing into hospitals?
- Overall, will electronic prescribing improve quality and safety for patients?

# Professor David Bates

- Professor of Medicine, Harvard University
- Chief of Division of Internal Medicine, Brigham and Women's Hospital



# What do we know about medication related morbidity?

- A meta-analysis of studies from the USA estimated that 100,000 deaths per year were due to adverse drug events making this the 4<sup>th</sup>-6<sup>th</sup> leading cause of death
- A systematic review has shown that one in 15 hospital admissions is drug-related and 60% of these are preventable
- A UK study of 18,820 patients admitted to hospital suggested 6.5% were related to ADRs accounting for 4% of bed days and costs (in 2004) of £466m per year

# Drugs associated with preventable hospital admissions

- The following drug groups are associated with over 50% of preventable medication-related admissions
  - Antiplatelets
  - Diuretics
  - Non-steroidal anti-inflammatory drugs
  - Anticoagulants
- A further 8 groups of drugs are associated with an additional 30% of admissions
- BJCP 2007; 63: 136-147

# Preventable adverse drug events in secondary care

- The following drug categories are associated with 66% of preventable adverse events
  - Cardiovascular drugs 18%
  - Psychoactive and CNS drugs 15%
  - Analgesics 13%
  - Anticoagulants 10%
  - Drugs used for infections 10%
- A further five groups of drugs are associated with an additional 17% of adverse events

# Do we need e-prescribing when we already know which drugs are associated with harm?

- While an argument can be made for improving prescribers' knowledge of the drugs most commonly associated with harm:
  - There are multiple underlying causes and lack of knowledge is not the most important of these
  - Many of the underlying problems lend themselves to a computerised solution
    - But remember that communication problems contribute to many adverse events and not all of these can be tackled by computers!

# Medication-related morbidity – how might e-prescribing help?

- We have identified 20 different types of computer function that might prevent the most common and serious medication-related adverse events:
  - Getting the right dose
  - Preventing:
    - contraindicated prescribing
    - hazardous drug-drug interactions
    - prescribing a drug that a patient is known to be allergic to
  - Prompting for the need to:
    - undertake tests (or check tests that have been done) prior to the initiation of treatment
    - undertake essential monitoring
    - co-prescribe medication to reduce risks to patients

# Main strategies for preventing errors and adverse events using IT

- Tools to improve communication
- Making knowledge more readily accessible
- Requiring key pieces of information
- Assisting with calculations
- Performing checks in real time
- Assisting with monitoring
- Providing decision support

# What is the evidence for the benefits and harms of electronic prescribing?

- Numerous studies, and several systematic reviews, suggest benefits
- Some studies, and reports, have suggested harm

# What evidence supports the use of computerised alerts and prompts to improve prescribing behaviour?

- Systematic review for NHS Connecting Health: JAMIA 2009; 16 (4): 531-538
- Collaboration between Nottingham, LSP and Harvard
- Search identified 14,137 publications and 20 of these were considered suitable for the review
- The 20 publications included 27 assessments of the effectiveness of different types of alert and prompts

# Location and types of study

- 18 of the studies were from the USA
- Five studies took place in primary care or outpatient settings; the remaining 15 in hospitals
- Four studies evaluated clinical outcomes
- Cost savings were reported in two studies
- Only four of the studies were randomised trials

# Results

- There was statistically significant improvement in prescribing behaviour (or reduction in errors) for 23 of the 27 alerts assessed
- In some cases the reductions in error rates were substantial
- There was no evidence of harm from the other four alerts assessed

# Comprehensive systems of alerts and prompts

- All four evaluations showed statistically significant improvements
  - Two large studies showed reductions in serious medication errors of 55% and 86%

# Basic alerts

- Drug allergy warnings decreased allergy error events by 56%
- Providing default dosing reduced dosing errors by
  - 23% in one study
  - 71% in another
- There was a 40% reduction in error rates achieved by drug-drug interaction warnings, but this did not reach statistical significance

# Drug-condition alerts

- Increased rates of prescribing for venous thromboembolism prophylaxis in patients at risk
- Reduced the prescription of non-recommended drugs in older people

# Drug-lab alerts

- Reduced the use of contraindicated medication in renal failure
- Reduced hazardous prescribing by 50%
- Enhanced prescribing of appropriate electrolyte supplements

# Comments on the review

- Few RCTs
- Findings most relevant to:
  - Secondary care
  - USA (where 11% of medication errors come from transcribing physicians' clerking notes onto the drug chart)
- Publication bias likely
- Nevertheless:
  - Some of the improvements demonstrated were substantial
  - Appears to be a link between careful design and implementation of systems and their success in improving patient safety
  - Latter point is backed up by other systematic reviews and descriptive studies

# What about harmful effects from e-Prescribing?

- No studies fulfilled inclusion criteria for our review but...
  - Bates 1999: in early stages of implementation there were problems with potassium ordering
  - University of North Carolina 2005: increased errors, partly due to staff being unfamiliar with the new system, but mainly due to better data capture
  - Koppel 2005: found that a commercial EP system facilitated 22 error types due to:
    - fragmentation of data
    - lack of integration of the components of the system
    - Poor design of the human-computer interface
- Bottom line: if the system is not well designed and is poorly implemented then there are likely to be risks to patients:
  - Every system is designed perfectly to achieve the results it gets
    - Don Berwick

# Cedars-Sinai ePrescribing Implementation

- One of the leading hospitals in U.S.
  - Deep experience with IT, and talent, especially ICU
  - Many providers—about 700 physicians on the private staff
  - Care for many of the wealthiest patients in Beverly Hills area
- Co-developed own CPOE application with a small vendor
- Had extensive preparation

# Results of Implementation

- Implementation failed
  - Application had to be turned off, even though it was working
- Physicians complained bitterly
  - Said that too much unnecessary decision support was being displayed
  - Was slow
  - Didn't fit workflow

# Some Key Decisions

- Drug-drug interactions were set up as 0-1, so that they had to be all on, or off
  - Couldn't change how many were displayed
  - Physicians felt far too many were being shown
- Leadership told team they would fix problems as they went, while leaving system live

# Post-Mortem Analysis

- If Cedars could fail, anyone can
  - Tremendous resources, great team
  - At the same time, several key decisions probably should have been made differently
  - Environment very challenging with so many private staff physicians
- Highly desirable to avoid a failure like this!

# What are the challenges of introducing high-quality electronic prescribing into hospitals in the UK?

- Many hospitals have relatively little experience of use of IT in clinical care
- Introducing electronic prescribing effectively is going to be a major complex process for these hospitals
- Clinicians may be sceptical about the:
  - suggested benefits
  - ability of IT providers to deliver
  - chances of successful implementation in their hospital

# Facing the challenges

- What has NHS connecting for health been doing?
- What are the experiences of other hospitals in the UK that have introduced electronic prescribing?
- Lessons from the US

# What has NHS Connecting for Health been doing?

- Draft design specification for safety features required by NHS electronic prescribing systems
  - Systematic reviews
  - Expert panel
  - Delphi consensus process
  - National consultation...
- ePrescribing functional specification for NHS trusts, 2007
- Electronic Prescribing Systems Evaluation, 2009
- Strategy to support successful implementation of decision support for ePrescribing systems
- Assessment of lessons learnt from implementation of ePrescribing systems in the UK, 2009
- Dose Range Checking Guidance, 2009
- Hazard Framework for ePrescribing Decision Support, Feb 10

# Experiences of UK hospitals that have implemented eP

- CfH Report due out in May 09
- Based on experiences of UK hospitals that implemented ePrescribing:
  - Home-grown: University Hospital Birmingham
  - Components of large hospital information system packages: Queen's Hospital Burton upon Trent using Meditech
  - Developments of pharmacy based systems: JAC and Ascribe
  - Clinical speciality based systems: systems used for ICU, oncology, parental nutrition

# Perceived benefits

- Allowing prescribing from remote terminals/sites as well as at the bedside
- Providing prescribers with access to decision support
- Helping to support the use of a trust formulary
- Allowing access to electronic patient records (as well as medication records)
- Removing the need to rewrite medication charts, and the associated potential for transcription errors
- Supporting direct communication of prescribing information to pharmacy and other departments
- Allowing the easy and direct production of discharge prescriptions.

# Challenges for implementation

- Overall, the introduction of eP needs to take account of how people interact with technology ("sociotechnical" approach)
  - Treating eP as a technical solution without addressing human factors is likely to result in failure
- Strong and committed multidisciplinary implementation team required
- 1-2 years required to make necessary preparations
- Need to engage with all relevant staff:
  - Changes in work practices will be required
  - An active and open approach is needed to learn how the system can be used to maximum benefit
- Do not underestimate:
  - How long procurement and installation of equipment and setting up software takes
  - The potential for the technology to fail!

# Challenges for implementation

- The sequence and pace of rollout of eP into clinical areas needs careful consideration
  - After successful piloting, rollout to the rest of the hospital should be as fast as is compatible with safety
- After roll out the implementation team will need to be transformed into a support service

# Challenges for implementation

- eP systems need to be managed throughout their lifetime:
  - Training of new staff
  - Maintenance and upgrade of software
  - Managing further innovation
- As people start to use an eP system it will result in various “work arounds”
  - The eP support team needs to monitor these and assess the extent to which they may be desirable and useful or may be dangerous

# Lessons from the US

- 10 pitfalls from David Bates:
  - Preparation
  - Implementation
  - After implementation

# Ten Pitfalls: Preparation

1. Don't recognize how big a change this truly is
  - Expensive
  - Huge process change!
2. Failure to sufficiently engage both administrative and clinical leadership
3. Failure to do necessary preparation with key stakeholders
  - Often takes 2 years to have all the key groups meet

# Ten Pitfalls: Implementation

4. Going too fast early on—e.g. turning on whole hospital at once
5. Trying to fix previously existing policy problems at the time you implement
  - Easy to get stuck
6. Turning on too much decision support early on
  - Much better to phase in

# Ten Pitfalls: After Implementation

7. Failure to provide users an easy mechanism for reporting on-going problems
8. Failure to make sufficient changes to application
9. Failure to devote sufficient resources to making changes to the application
  - Won't get value
10. Insufficient support for the underlying system
  - Keeping network up to speed
  - Having enough terminals

# Summary

- ePrescribing has great potential to support in the provision of safe and effective patient care
- Overall the balance of evidence is in favour of the benefits of ePrescribing
- Nevertheless, considerable attention is needed to get the design, preparation, implementation and maintenance right!