

**INTEGRATED ELECTRONIC PRESCRIBING AND ROBOTIC
PHARMACY DISPENSING**

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- Declarations of interest
- Employee of City Hospitals Sunderland
- No other declarations

- Three questions.
- 1: What year did Sunderland start using EP?
- 2: From DEAS study, which was the most frequent dispensing error?
- 3: Individually, would you expect EP or Robot to prevent this type of error?

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- Sunderland is an Anglo-Saxon word and means

Land set asunder, or a special place.

c.f. German: sonder or besonders

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- 1000 beds (EP to all)
- Have used integrated Electronic prescribing system since 2001
- (integration means direct electronic link between prescribing and pharmacy modules.....more later)
- Installed robot for main dispensary in September 2009
- Serves 350,000 population
- 5,000 staff work at Sunderland

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Electronic prescribing (EP)

- Literature conflicting on best features.
- Different Terminology used synonymously.(see Cantrill, Tully and Qader Pharm.World.Sci. (2010) 32: 581-593)
- Context of EP important.
- Reifsteck M, Swanson T, Dallas M, 2006 Driving out errors through tight integration between software and automation. Journal of Healthcare Information Management. 20 p35-39

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Electronic prescribing

- Level of integration is key (“dockside to bedside”)
- Higher level of integration, greater the efficiencies
- Integration of prescribing, pharmacy systems, PAS, pathology, radiology, drug administration records

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City Hospitals | chs Sunderland Suggested taxonomy (EP)

- Level 1: Basic messaging system from ward to pharmacy (Cantrill paper)
- Level 2: EP system + e-medication administration record
- Level 3: Levels 1 +2 + safety alerts
- Level 4 : Level 3 +Patient database links (Hospital patient administration system) (more integrated)
- Level 5: Level 4 +Link to pharmacy STOCK and automatically adjusting it when prescriptions are authorised (more integration) (Sunderland)
- Level 6: Level 5 + Links to other departments (e.g. Pathology) for monitoring

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Level 1: 'mechanical shelf.' Products retrieved and put onto conveyor (or channel) to be moved to requestor (May include a fridge)

Level 2: level 1 + automatic refilling (e.g. Hopper) Significant efficiencies if refill is automated.

Level 3: Level 2 + automatic labellers. Label applied at point of picking to avoid mis-labelling of product.(more complex system)

Level 4: level 3 + direct link with EP system. Stock is automatically picked from robot, labelled, and stock adjusted, from anywhere in hospital, not just dispensary. Completes final link to make dispensing error free

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Electronic prescribing: benefits

- Greater formulary control: lower rate of rising of drug expenditure.
- More control of medicines processes: less iatrogenic illness, greater patient throughput.
- Easily identifies missed doses
- Information flows: efficiencies in handling information: staff call down information

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- Interface between EP and robot vital
- For business case, little in literature to identify benefits of EP and Robot
- Literature does not make clear what features give best value, efficiency of safety
- Literature uses different nomenclature reflecting local (or national) experience.

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Medication errors

- Department of Health report 2005
- Dispensing error analysis scheme
- Cardiff and Vale trust
- Biggest survey of its type in UK
- 66 hospitals surveyed from 1991 to 2001
- 7,000 dispensing errors analysed.

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Dispensing error analysis scheme (DEAS)

Type of error	Proportion %
wrong drug supplied	23%
wrong strength of correct drug	22%
wrong quantity	10%
wrong warnings or directions	10%
wrong drug name on the label	9%
wrong strength on label	8%
wrong formulation	7%
wrong patient name on label	7%

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Types of error, EP and robots

Error Type	EP stops	Robot stops	EP+Robot stops
Wrong drug (picking error)		Y	Y
Wrong strength		Y	Y
Wrong quantity		Y	Y
Wrong labelling	Y		Y
Wrong drug name (on label)	Y		Y
Wrong strength (on label)	Y		Y
Wrong formulation	Y		Y
Wrong patient name	Y		Y

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- *Aoccdrnig to rscheearch at an Elingsh uinervtisy, it deosn't mtttaer in*
- *waht oredr the ltteers in a wrod are werttin, the olny iprmoetnt tihng is*
- *taht the frist and lsat ltteer are at the rghit pclae. The rset can be a*
- *toatl mses and you cluod sitll raed it wouthit a peblrom. Tihis is bcuseae*
- *we do not raed ervey lteter by it slef but the wrod as a wlohe.*

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Conditions for benefits

- Integration: when doctor prescribes, also writes label
- Because label is always accurate, no transcription errors
- Drugs can only be stored in robot by bar code. Integration means there is a direct electronic link between prescription, bar code medicine AND the label that the robot applies.
These are the crucial links for safety benefits of the technology
- This system allows 60% of dispensing to be started outside of the pharmacy
- The links make dispensing **instantaneous**

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Conditions for benefits

- Designing in the links designs out potential errors
- A critical feature is the automatic labeller
- In achieving 'instantaneous dispensing' it starts to change pharmacy professional model.

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Other benefits

- *Significantly, zero errors for the robot plus EP system combined, based on around 800,00 items per annum.*
- Potentially a huge benefit in safety. However, dispensing is not risk-free, since not all items are supplied and labelled from the robot.
- **Turn around time for prescriptions** Speed of turnaround time is from clinical check *is nearly instantaneous.*
- Normally dispensing times can often be up to 4 hours for non-urgent dispensing. (Beard J. and Wood D 2010).

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Measuring benefits

- **Dispensing rate** Whittlesea quotes a Welsh benchmark of 10 items per person per hour.
- Sunderland dispenses a maximum of 360 items per hour, equating to 36 dispensing staff. (actual 7-10 staff)
- 36 items per hour per staff = 1 item each every 2 seconds
- Not a directly comparable situation (ward effects)
- 360 items an hour the pharmacy can dispense, it has therefore a capacity of 57,000 items per month, based on a 40 hour week.
- Stockholding value fell from 6 weeks to 3 weeks (£1m saving)

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Conclusion

Clear benefits in using electronic prescribing and robotic dispensing, and these will be realised so long as the following conditions are met:

- The EP system used is integrated with all the other hospital software systems
- The robotic dispenser is integrated to the EP system
- There are automated labellers for those items robotically dispensed.
- When the above conditions are applied several advantages become apparent:
 - For items in the robot, there is no scope to make a dispensing error, improving patient safety.
 - The process is much more efficient, and the skill mix of staff can be adjusted within the dispensary
 - The speed of the prescription process increases dramatically.

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Pharmacist's views of EP-RD

- Qualitative survey using standard thematic analysis methodology
- 26 out of 35 responded.
- 4 main themes came out of the study
- Pharmacists preferred using the technology. They perceived significant benefits. EP-RD reduces dispensary work (10% of time at Sunderland)

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Benefits for pharmacists

- Information
- Empowerment
- Ward relationships
- Policy enforcement

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Information

- Scale and quantity of information .
- Clinical results, pathology tests, etc.
- Access to missed doses data
- Nursing notes
- Tidiness of medication screen compared to kardexes

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Policy enforcement

- EP removes task of policing the formulary
- Access to relevant clinical information removes communication barriers
- Identified by more senior pharmacist managers as an aid to recruitment

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Empowerment

- 87% felt more empowered at ward level.
- 'system lets pharmacists cover more ground'
- 'doctors feel we are omnipresent'
- Contrasts with Smith and Preston study (1996) which identified barriers to communications
- Absence of mention of dispensing errors....regarded as being 'solved', in contrast to literature.

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Ward relationships

- Enhanced ward relationships (more available)
- No need to do policing of formulary.
- 3 months training for pharmacists, much less for doctors
- Consequence is change in power relationship, hence feeds into empowerment, ward relationships,
- ***This change in power relationship is the nub of the technology.***

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Why is this important?

	BLOOM (1956)	ACKOFF (1981)	CHS PHARMACY
HIGH	CREATING	WISDOM	SPECIALIST CLINICAL
	EVALUATING	UNDERSTANDING	CLINICAL
	ANALYSIS	KNOWLEDGE	MANAGEMENT
	APPLYING	INFORMATION	DISPENSING
LOW	UNDERSTANDING	DATA	PROCUREMENT-DISTRIBUTION

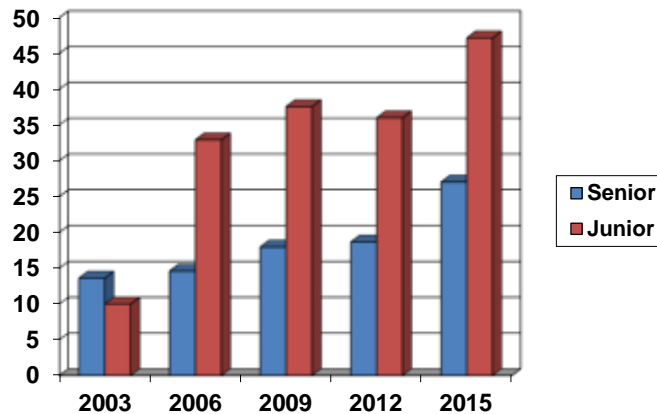
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TIME SPENT OF HIGHER FUNCTIONS

CHS PHARMACY	% STAFF TIME
SPECIALIST CLINICAL	15
CLINICAL	45
MANAGEMENT	12
DISPENSING	19
PROCUREMENT-DISTRIBUTION	9

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Pharmacist numbers wte



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- 1: What year did Sunderland start using EP?
2001? 2003?
- 2: From DEAS study, which was the most frequent dispensing error?
Wrong drug ? Wrong strength?
- 3: Individually, would you expect EP or Robot to prevent this type of error?
EP? Robot?

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