Tools to stratify patients for clinical pharmacy interventions

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47th ESCP Symposium, Belfast

24th October 2018

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THE BIG CHALLENGE – SUB-OPTIMAL OUTCOMES FROM MEDICINES

- 3-6% of hospital admissions due to adverse effects, rising to 30% in the elderly
- 1 in 15 hospital admissions are medicine related with two thirds being preventable
- 1 in 20 of GP prescriptions contain an error
- 30-50% non-adherence to prescribed medication
- 2.5 million doses are administered in the average acute hospital (215,000 errors)
- In the UK (2007) it is estimated that such errors cost £770M
- Variance in practice

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EU Population is getting older

Year	2016	2070
Total Population	511 million	520 million
Working age	333 million	292 million
Old age dependency ratio(>65/45-64)	29.6%	51.2%
Working age ratio	3.3	2.0

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Medicines Related Statistics

- 8.6 million unplanned hospital admissions are caused by adverse drug events in Europe each year

- 50% of hospital admissions due to adverse drug events are preventable

- 75% of these are in patients over 65 years of age and on 5 or more medicines

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Multimorbidity

- Increases with age
- Almost two thirds of people over 80 have multimorbidity
- On average they have three long term conditions with
  - Cardiovascular (87.7%)
  - Metabolic (62.2%)
  - Rheumatology (40.2%)
- The number of people over 85 is set to increase at the fastest rate more than doubling to 3.6 million between 2014 and 2039
- In 1960 8.6% of the OECD population was >65 today it is 15.4%
- By 2050 set to be 27.2%

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UK DATA

- 15m people in England now have a long term condition
- 14% of people under 40 and 58% of people aged 60 and over have at least on LTC
- In 2008 the number of people with multimorbidity was 1.9m but will be 2.9m by 2018
- 25% of people over 60 have 2 or more LTCs
- Between 2003 and 2013 the average number of prescription items per year for any one person in England increased from 13 to 19

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Polypharmacy

- There a number of definitions but it is generally understood as the concurrent use of multiple medications by one individual

- Polypharmacy management is a whole systems approach which optimises the care of multimorbid patients through maximising benefit while reducing the risks of inappropriate polypharmacy

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Polypharmacy in Older People

- 20.8% of people with two clinical conditions were prescribed 4-9 medicines
- 10.1% of people ten or more medicines
- In patients with six or more comorbidities the respective values were 47.7% and 41.7% respectively
- In USA between 1999 and 2012 polypharmacy (>5 meds) increased from 24-39%

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Sweden primary care

- 9,219,637 people

- Total population >10 medicines 2.4%

- 60-69 years of age >10 medicines 4.1%

- >80 years of age >10 medicines 15.5%

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Drug Related Problems (DRPs)

"An event or circumstance involving
drug therapy that actually or potentially
interferes with desired health
outcomes"

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DRPs

Patient Safety Incident

"Any unintended or unexpected incident which could have or did
lead to harm for one or more patients receiving NHS care"

Medication Error

A PSI where there has been an error in the process of prescribing
preparing dispensing administering monitoring or providing
advice on medicines

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DRPs

- Adverse drug reaction (EU)

- A response to a medicinal product that is noxious and unintended effects resulting not only from the authorised use of a medicinal product at normal doses but also from medication errors and use outside the terms of the marketing authorisation including the misuse ,off-label use and abuse of the medicinal product

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DRPs

Adverse drug event (ADE)
"any injury due to medicine" (Defined by the Institute of Medicine)

WHO definition (also used by IHI)
"noxious and unintended and occurs at doses used in man for prophylaxis, diagnosis, therapy or modification of physiologic functions"
ADRs are under this umbrella

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DRPs

- Frequent issue among hospitalised patients leading to patient harm and increased healthcare costs

- Many unplanned admissions are medication related

- Significant number are preventable

- Due to complex and poorly designed systems

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Medicines causing errors

- The review found 623 medication errors in 507 patients

- Ten medicines accounted for 73% of all medicines causing fatal events

- 20 medicines accounted for 84% of all medicines causing non fatal events

- Combining the two lists gave 23 different medicines or classes accounting for 82% of all serious errors

Ref. Saedder E. et al. Eur. J.Clin. Pharmacol.;70 :637-45 (2014)

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TOP TEN

1. Methotrexate 26%
2. Warfarin 9%
3. Opioids 6%
4. Digoxin 6%
5. Theophylline 6%
6. Other anticoagulants 5%
7. Aspirin 4%
8. NSAID 4%
9. Beta blockers 4%
10. Antibiotics 3%

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Prevalence and economic burden of medication errors in England

- 237 million medication errors per year
- 72% have little or no potential for harm
- 66 million potentially clinically significant
- 71% of these are in primary care
- Primary care accounts for 33.9% of all potentially significant errors
- Error rates are similar to US and other EU countries

Ref Elliott R.A. et al. Policy Research Unit in Economic Evaluation of Health and Care Interventions (EEPRU) (2018)

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Prevalence and economic burden of medication errors in England

- Estimated costs of definitely avoidable ADRs:
  - £98.5 million per year
  - Consumes 181,626 bed days
  - Causes 712 deaths
  - Contributing to 1708 deaths
- Primary care ADRs leading to admission (£83.7m, 627 deaths)
- Secondary care ADRs leading to longer stay (£14.8m, 85 deaths, contributing to 1081 deaths)

Ref. Elliott R.A. et al. Policy Research Unit in Economic Evaluation of Health and Care Interventions (EEPRU) (2018)

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Risk model for adverse drug events in the elderly

- Prescribed digoxin
- Prescribed anti depressants
- Gastro-intestinal disorders
- COPD
- Angina
- Abnormal potassium levels
- Patient beliefs about their medicine being responsible for their admission

Ref. McElnay et al. Clin. Drug Invest. 13;(1):47-55(1997)

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Adverse drug reaction risk in older persons (ADRROP) prediction scale

- Female gender
- Age >70
- Estimated GFR < 30ml/1.73m2
- Assistance required for > 1 daily activity
- > 4 co morbidities
- Liver disease
- Presence and number of STOPP criteria defined potentially inappropriate medications
- > 1 fall in the previous year
- **Did not predict ADRs to a high level**

Ref O,Mahoney D. Eur.Ger.Med. Doi.org/10.1007/s41999-018-0030-x 2018

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Integrated Medicines Management (IMM)

- Prescribed 4 or more regular medicines

- Prescribed high risk medicines

- Prescribed intravenous antibiotic on admission to hospital

- Taking antidepressants and over 65

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- Previous hospital admission in the last six months

Ref Scullin et al. J Eval. Clin. Pract.;13 :781-788 (2007)

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Early in–hospital medication review by pharmacists nurse triage

- Have you taken any medications in the last two weeks
- Have you any pre existing medical problem OR
- Have you taken any antibiotics in the last 7 days
- Are you age 80 or older
- Have you stopped ,started or changed any of your medications in the last 28 days

Ref. Hohl et al. PLOS ONE DOI:10.1371/journal.pone.0170495 (2017)

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DRPs of elderly patients discharged from hospital

- No drug prescribed but a clear indication
- Unnecessarily long duration of therapy
- Dose too low
- DRP related to the number of drugs prescribed
- Patient fear of side effects and lack of knowledge of drug use
- Patients form the pulmonary department and with type 2 diabetes most associated

Ref.Ahmad et al. Patient Preference and Adherence 8; 155-165: 2014

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Hospital readmission of elderly patients

- After controlling for age and gender;
- Unplanned admission at the index hospitalisation
- Prescribed nervous system drugs at discharge from the index admission
- Have a history of unplanned readmission within 30 days
- Return home after discharge

Ref.Schwab et al. J Clin Pharm. Ther . ; 00 1-8 :2018

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Hospital re admission predictive model

- Single marital status
- Former cigarette smoker
- More than 4 medications
- Confused on admission (protective)
- History of hypertension
- History of cancer
- One or more hospital admissions in the last twelve months
- Active endocrine disease
- Nicorandil prescribed (protective)

Ref.Morrisey et al. Clin Drug Invest. 23;(2) : 119-128 (2003)

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Prediction of DRPs in diabetic outpatients

- Male gender
- Number of medications
- Prescribed gastro intestinal medications
- Non adherence to self care and non pharmacological recommendations

Ref Al-Taani et al.Drug Healthcare and Patient Safety ;9 :65-70 (2017)

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Prevalence and Preventability of drug related re-admissions

- Median prevalence of drug –related re admissions was 21% (IQR 14-23%)

- Preventability 5-87% with a median of 69% (IQR 19-84%)

- Evidence regarding risk factors for drug related re admissions and drugs causing was inconsistent

Ref Morabet N.El et al. J.Am.Geriatr.Soc. Doi:10.1111/jgs.15244 (2018)

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ASSESSMENT TOOLS

- Renal impairment

- Geriatric patients

- Cardiovascular disease

- Emergency department

- Primary care

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Screening Tools for Potentially inappropriate prescribing

- Beers
- McLeod list Canada (1997)
- Malone s List (2004)
- Hanlons List (2005)
- Lindblad list USA (2006)
- French consensus panel (2007)
- Combined Europe and North America

Ref Matanovic S.M. &Vlahovic-Palcevski V. Eur.J. Clin.Pharmacol. ;68 :1123-1138 (2012)

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Medicines Appropriateness Index (MAI)

- Uses explicit structured review criteria

- Implicit judgement

- Based on the evaluation of ten elements of prescribing

Ref.Hanlon J.T. et al. J Clin.Epidemiol. ;45 :1045-1051 (1992)

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Tools for inappropriate prescribing

- MAI –medicines appropriateness index

- Beers criteria

- Improving prescribing in the elderly tool (IPET)

- Health plan employer data and information set (HEDIS)

Ref.Luo et al. J Eval. Clin Pract. 18(6) 1196-1202 (2012)

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STOPP and START

- STOPP-screening tool of older peoples prescriptions
- Measures potentially inappropriate medicines

- START- screening tool to alert doctors to right treatment
- Measures potentially prescribing omissions

Ref.Gallagher P. Int.J.Clin.Pharmacol. ;46 :72-83 (2008)

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DART Drug–Associated Risk Tool

- A self –assessment screening tool to identify patients at high risk for DRPs

- To identify such patients to enable the optimisation of targeted pharmaceutical care during the hospital stay and on discharge

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DART Drug–Associated Risk Tool

- State of Health e.g. kidney function, liver disease, diabetes

- My medicine more than 5 drugs per day, digoxin, insulin

- Adherence e.g. do you forget some times to take, interferes with my life

- Application of my medicine, cant identify, done by a carer, inhaler

Ref.Kaufmann et al.dx.doi.org/10.1136/bmjopen-2017-016610

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Assessment of Risk Tool (ART)

- Flags associated with at least 4 unintentional medication discrepancies;

- More than 8 regular admission medications

- Enrolled in a chronic disease programme

- At least one antidiabetic medication on admission

- English difficulty

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Assessment of Risk Tool (ART)

- Poor medication adherence

- Patients re admitted within 7 days of discharge

- Patients re admitted within 30 days of discharge

Ref.Falconer N. et al. Eur. J .Hosp.Pharm.;24:320-326 (2017)

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Prevent Tool–medicines related readmissions

- Physical Impairment
- Risk from specific medicines
- Adherence issues
- Cognitive impairment
- Exacerbation of disease
- Compliance support
- Social aspects

Ref Barnett N. North West London Hospitals (2016)

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AT-HARM10
(Assessment tool for identifying hospital admissions)

- Ten question screening tool

- First three questions are used to identify admissions that are unlikely to be medication related

- The remaining questions are used to identify possibly medication related admissions

- The assessment is finished when a "yes" is given to any question

Gillespie Uppsala University Hospital

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Electronic prioritisation tool

- High risk patient groups including those with dementia, multiple co-morbidities, renal impairment, recent hospitalisation, significant polypharmacy or over 70

- High risk medications eg anticoagulants

- High risk hospital settings

- High risk social settings eg multiple prescribers/pharmacies

Ref Falconer et al. Am.J.Health-Syst.Pharm.;71 :Feb 15 2014

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Drug Related Hospital Admissions (DRA) Adjudication guide

- A standardised chart review method to identify drug-related hospital admissions in older people

- Caused by non preventable ADRs and preventable medication errors including overuse,underuse and misuse of medications

- Useful method as an outcome measure for interventions

- Time consuming for routine practice

Ref Thevelin S. Br.J. Clin.Pharmacol.DOI.10.1111/bcp.1376 (2018)

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Medicines Optimisation

"a person centred approach to safe and effective medicines use to ensure the best possible outcomes from their medicines"

Definition by NICE

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Therapeutics
European Association for Personalised Medicine (EAPM)
from here to 2025

Personalised medicine:

"referring to a medical model using characterisation of individuals phenotypes and genotypes(eg molecular profiling, medical imaging, lifestyle data) for tailoring the right therapeutic strategy for the right person and at the right time and/or to determine the predisposition to disease and/or to deliver timely and targeted prevention"

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Clinical Pharmacy Services

- Improved patient safety
- Decreased medication errors
- Decreased adverse events
- Improved medication appropriateness
- Improved patient knowledge about their medicines
- Decreased length of stay
- Decreased re admission rate

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Eadon Grading System

Intervention Grade Analysis: 1 Jan 13 to 30 Sept 15

Intervention Grade	Definition	2013		2014		2015 (year to date)	
		Number	% of Total	Number	% of Total	Number	% of Total
1	Detrimental to patient care	0	0.00%	1	0.00%	0	0.00%
2	Of no significance to patient care	20	0.04%	4	0.01%	4	0.01%
3	Significant but does not improve patient care	2,859	5.74%	2,026	3.69%	1,991	4.85%
4	Significant and improves the standard of care	45,190	90.78%	51,471	93.87%	38,099	92.76%
5	Very significant; prevents major organ failure or similar	1,513	3.04%	1,241	2.26%	957	2.33%
6	Potentially life-saving	17	0.03%	7	0.01%	18	0.04%
Ungraded		182	0.37%	85	0.16%	4	0.01%
	TOTAL	49,781		54,835		41,073	

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Enhanced clinical pharmacy service targeting tools

- Number of previous emergency admissions
- Number of admission medicines
- Age adjusted co–morbidity
- On diuretic therapy
- Formed a 12 month post discharge and/or readmission risk algorithm

Ref Elhajji F.W.D. et al. J Eval.Clin.Pract.;21 :187-97 (2015)

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Small Business Research Initiative (FAST)

- Automated staff deployment
- Linked to patient journey stage
- Linked to staff available
- Linked to tasks required
- Predictive algorithm development

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What is needed?

- The pharmacy team
  - Improves medicine use
  - Improves patient outcomes
  - Improves resource use

BUT

- Patient complexity and throughput is increasing
- Length of stay is reducing so less time to resolve issues
- Therefore need more staff and optimised use of current staff time
- Real time data access and use is essential coupled with
- **REAL TIME ROBUST PRIORTISATION TOOL /ALGORITHM**

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Integrated medicines management to medicines optimisation in
Northern Ireland (2000-2014): A review. July 2015
Ref.Scott et al. Eur J .Hosp . Pharm.;22:222-228(2015)

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