‘The computer says no’ - are there tools and algorithms that work?

Yoon K Loke

Clinician (Acute Medicine) & Researcher (Pharmacoepi Database)

Content of this Talk

- Current knowledge and potential progress
- Examples of well-known tools / algorithms
- How might they be implemented in practice?
- What are the major pitfalls involved?
- How can we move forward on this?

I may be biased, but….

- Pharmacist-led medication review interventions do not have any effect on reducing mortality or hospital admission in older people, and can not be assumed to provide substantial clinical benefit (December 2007)

Tools may have got better (or worse)?

- Data capture with electronic records & linkage
- Electronic Prescribing with decision support (CDS)
- New criteria (>26 tools have been published!)
- Technological advances (computing power, screening of large databases)
- More funding for electronic systems in healthcare

Beers Criteria

- Literature review with consensus panel
- Aimed at older people (>65 years)
- >40 criteria in 7 tables with different degrees of caution e.g.
  - General: digoxin not for first-line atrial fibrillation
  - Specific caution: verapamil promotes fluid retention
  - Interactions: avoid warfarin with macrolide
  - Renal: mental state changes with ranitidine eGFR< 50 mL/min
- But no recommendations on what to do next; and no RCT data on improved patient outcomes

STOPP/ START v2

- Criteria to stop drugs = 80
- Criteria to start drugs = 34
- Categorized according to organ system:
  - CVS: stop beta-blocker with verapamil
  - Endo: start aspirin in patients with diabetes with well-controlled BP
- No recommendation on replacing Stopped drug
- RCT data do not show improved patient outcomes
- Current SENATOR RCT uses BNF, SafeScript software and illness scale for hospital ADRs

NHS PINCER Intervention

- In process of being rolled out to Primary Care
- Pharmacist-led review and intervention based on several high-risk criteria, main ones are:
  - NSAID without PPI in patients with ulcer history
  - Patients with asthma on beta-blocker
  - Age >75 years on ACE-I/ diuretic without renal blood tests within past 15 months
- Mixture of prescription review and monitoring
- No RCT data regarding improved patient outcomes

Ivory Tower or Real-World?

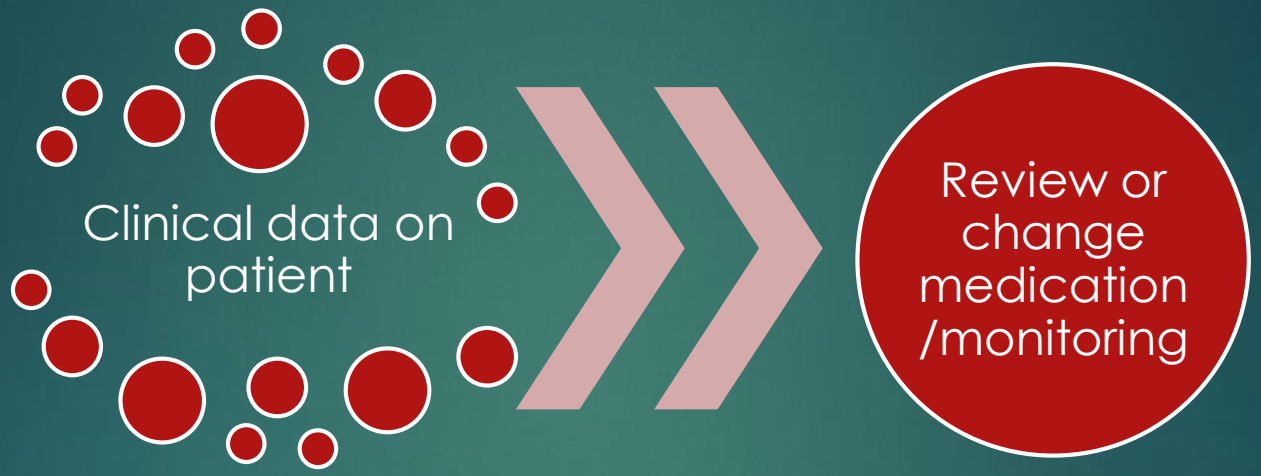
- "An environment of intellectual pursuit disconnected from the practical concerns of everyday life" (Wikipedia)
- Tools are drawn up based on:
  - Published studies of highly selected patients
  - Opinions from experts in a Delphi panel consensus
- When can they be applied to real-world settings?
  - When starting a drug? **(real-time at prescription entry)**
  - Flag up at-risk patients on potentially hazardous agents? **(screening, look back and review)**
- Many hurdles in implementing such tools
  - Automated methods?
  - Pharmacist /medical review – time-consuming task!

Same patient, two scenarios

- New patient, poorly controlled hypertension
- Admitted with new onset atrial fibrillation
- Treated with beta-blocker
- Heart rate still elevated
- Prescriber tries to add verapamil
- Alert pops-up system
- Ignore? Over-ride with reason? Try Digoxin?

- GP practice review - ongoing therapy
- Chronic AF and hypertension
- Beta-blocker and verapamil
- STOPP/START flags up alert for review
- Ignore? Call patient in? Switch to digoxin?

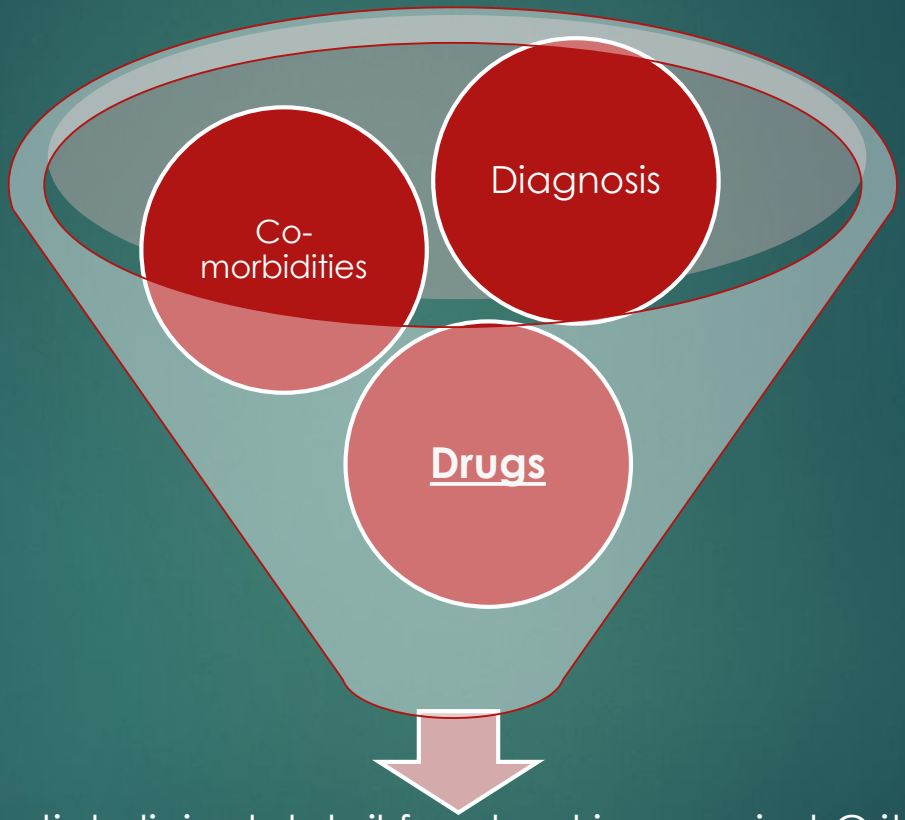
Delivery of Tool : Key Steps



Knowledge of criteria

Better Outcomes?

Clinical Data Pre-Requisites



Essential clinical detail for checking against Criteria.

(But creates impossible cognitive over-load to check clinical data against 40-80 criteria against)

Prescription Entry: Human or Machine?

- Machine works well in rigid system coded with clearly defined data e.g. interactions
- But if initiating drug for AF, how can tool know:
  - New-onset AF
  - Drug is for 1st or 2nd or 3rd line
  - Hypertension – poorly or well-controlled
  - Cautions e.g. asthma, oedema, eGFR, constipation
- Machine can't weight up clinical data in context with drugs plus Beers/ STOPP-START/ PINCER
- Imprecise alerts – irritates clinicians. Tool fails.

Tools at Prescription Entry: Pros

- Clinical Decision Support (CDS) can be built in Electronic Prescribing Systems
- Work in real-time when considering drug
- No need to bring patient back
- Can immediately avoid harm – far better not to start drug, than to struggle with stopping drugs e.g.
  - Risk of bradycardia averted in AF if CDS alert prevented verapamil from being used

Tools at Prescription Entry: Cons

- CDS is blunt tool due to following issues:
  - Cannot reliably access up-to-date patient data (*linkage between primary & secondary care*)
  - Unable to synthesize/ interpret clinical data *in holistic manner*
  - Validity of underlying pharmacology evidence in CDS (different systems, different alerts)
  - Less regulatory scrutiny– judged as device, no need for RCT evidence on efficacy and safety

Screening: Medication Review

- Interrogate healthcare database for at-risk patients
- Automated to flag patients in real-time, or to use screening criteria for groups of interest
  - Diagnostic code: Atrial Fibrillation or Hypertension
  - Drug codes: Beta-blocker and Verapamil
- But what happens next? The tool cannot:
  - Review records of each individual
  - Determine appropriateness of prescription
  - Come up with alternatives
- May generate lots of extra work for humans

Automation is not perfect

- Completely reliant on accurate coding and linkage:
  - Primary care together with Hospital Episodes
  - May or may not be real-time
  - Clinical diagnoses need to be correctly entered
  - Laboratory data available, but radiology is free-text, hard to extract
  - Hospital prescriptions not linked to GP system

Major Practical Problems in Tool Implementation

- How regularly is Tool-based search conducted?
  - Data shows initial decline of number at-risk but this goes up again after some months
  - How many criteria evaluated each time? Doing single ones easy, doing 80 criteria daily is soul-destroying
- Patient journey is dynamic, not static
  - Short-duration –may already have stopped drug
  - Switched drug – patient at-risk in another category
- Patient is not present with the prescriber
- Who takes action – pharmacist / GP/ nurse?
- What action to take (blood testing easy, switching prescriptions is not)?

Flawed Assumptions & Complex Realities in Screening

- Simple belief: we are stamping out *errors*
- But not everyone who meets criteria will suffer Serious Harm
- Tools pick up 'prevalent' users that GPs have already decided are in Green
- Value of tools should be judged against Screening Program

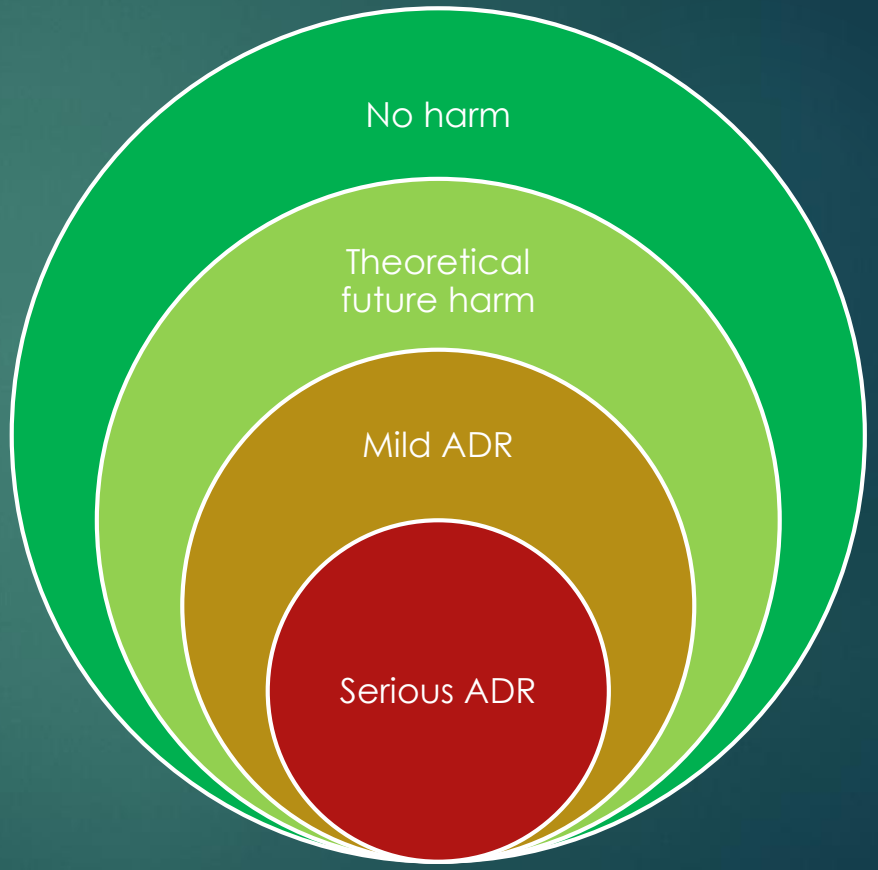


Figure. Patient cohort flagged up by criteria-based search

Fundamentals of Screening

- Defined population at risk of serious adverse reaction (but no identifiable signs of adverse effect as yet)
- Use criteria to identify susceptible patients at elevated risk of future outcome
- Implement intervention to reduce/eliminate risk of serious adverse event
- Intervention must be able to distinguish those:
  - genuinely at high risk, and separate them from
  - Those who are benefitting from drug and have low risk for adverse reaction (where stopping drug would be more harmful than continuing)

Pre-Requisites for Screening

- Condition in question should be a significant health problem (fairly common and/or severe)
- Natural history - established incidence of adverse outcomes if no preventive action
- Specified tool must reliably pick out susceptible patients from those where harm is unlikely
- There must be an effective intervention that improving outcomes
- Acceptable to clinicians and patients, with demonstrable cost-effectiveness

Best Practice in Screening as applied to Medication Review

- Must know underlying prevalence / distribution
  - Inappropriate use a common problem?
  - Widely and equally distributed across country – if not, then national roll-out of tool is pointless
- Natural history – high or low rate of harm from drug?
  - In patients flagged up by the tool, how many actually go onto suffer adverse event if no action taken?
- Performance of the tool
  - False positives and false negatives
- Cost and clinical effectiveness
  - Number needed to screen to prevent one adverse event

Lessons from Genetic Testing

- Patients with severe cardiac and liver disease
- Identified from hospitals and specialist clinics
- C282Y mutations and iron overload – treated by venesection
- But in community testing, only small fraction of those with C282Y actually develop heart disease
- Approach to prescribing criteria – very similar
  - Based on extreme phenotypes (hospitalized patients, or frail elderly in long-term care)
  - No information on diversity of risk in community
  - No data on tool performance outside selected area

Conclusions

- It's good to stop drugs…but only in those where harms outweigh benefits
- Tools and algorithms don't have ability to synthesize clinical data to estimate benefit-harm
- Current research & policy fails to meet essential pre-requisites for effective screening programme
- Impossible to recommend implementation of any particular tool until robust and comprehensive studies are conducted.