OPTIMISING COMPUTERISED ALERTS WITHIN ELECTRONIC MEDICATION MANAGEMENT SYSTEMS:
A SYNTHESIS OF 4 YEARS OF RESEARCH

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COMPUTERISED ALERTS

Embedded within electronic medication management systems
Triggered at the point of prescribing
Designed to warn doctors about possible errors in orders
Paracetamol (500mg) Tablet

Substance Duplication

The patient has recently been prescribed or given Paracetamol (500mg) Tablet.

<table>
<thead>
<tr>
<th>Action</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Override</td>
<td></td>
</tr>
<tr>
<td>Remove</td>
<td></td>
</tr>
</tbody>
</table>
Alerts can result in substantial changes in prescribing behaviour

BUT

Many studies also report that doctors override alerts, sometimes up to 95% of the time
ALERT FATIGUE

A consequence of too many alerts being presented

A significant problem for hospitals because it

results in user frustration & annoyance

leads to prescribers learning to ignore all alerts, even those that present useful & sometimes safety critical information
Are computerised alerts having an impact on prescribing behaviors and why/why not?
# ALERTS IN EMMS (MEDCHART)

<table>
<thead>
<tr>
<th>Alert type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duplication</td>
<td>Displays when a patient is prescribed a medication containing a generic component that is identical to, or belongs to the same therapeutic class as a generic component that has already been prescribed. <em>Alert displays if first order is active on a patient’s chart, or if the first order is no longer active, but was ceased less than 24 hours previously</em></td>
</tr>
<tr>
<td>Pregnancy</td>
<td>Displays when a medication contraindicated in pregnancy is prescribed for a female patient aged 12-55 years</td>
</tr>
<tr>
<td>Allergy</td>
<td>Displays when a patient is prescribed a medication containing a generic component that is identical to, or belongs to the same therapeutic class as a generic component to which the patient has a recorded allergy or intolerance</td>
</tr>
<tr>
<td>Local message</td>
<td>Displays when a patient is prescribed a medication linked to a local message Example alert: “Haloperidol Deconoate (Haldol) is a long acting anti-psychotic used monthly by deep IM injection into the gluteal muscle. Haloperidol (Serenace) is short acting and can be given by deep IM, subcut or IV routes. Please check you have prescribed the correct drug”</td>
</tr>
</tbody>
</table>
METHOD 1: OBSERVATIONS

14 specialty teams observed on 1-3 ward rounds (58.5 h)
12 junior doctors observed after-hours (5pm-10pm; 65 h)

Observer noted:
All interactions with MedChart
Alerts generated
Prescriber responses to alerts
Any changes to orders following alerts
METHOD 2: INTERVIEWS

16 prescribers participated in a semi-structured interview

Participants were asked about:

Usefulness of alerts
The impact of alerts on their prescribing
What improvements could be made to alerts
METHOD 3: CHART AUDIT

180 patient charts reviewed

Pharmacist noted:

Total number of orders
Total number of orders with an alert
Alert types

For all duplication alerts, pharmacist determined if alert was ‘technically preventable’ – the result of a prescriber not using a short-cut function in the eMMS
EXAMPLE SHORT-CUT

To make a change to an order on a patient’s chart, a doctor should click on the order and edit the parameter (e.g. change the dose), instead of ceasing and re-ordering the medication.
METHOD 4: DELPHI SURVEY

To reach consensus among prescribers on appropriate strategies for reducing alert numbers

47 prescribers participated in a 2-round Delphi survey (10 Qs)

Feedback about Round 1 responses were incorporated into Round 2 questions
SAMPLE ROUND 2 QUESTION

The percentages beside each option below indicate the proportion of doctors who selected that option in round 1.

Q2. If you could remove only one alert type from the current alert set in MedChart, which type would you remove?

In round 1, you selected ‘Pregnancy’.

☐ Allergy & intolerances (2%)
☐ Pregnancy (34%)
☐ Therapeutic duplication (28%)
☐ Local rule (13%)
☐ None, I’d not remove any alert type (23%)
Based on this research we learnt some key things…
Lesson 1:
The fewer alerts the better
ALERT NUMBERS

600/2209 orders had 1 or more computerised alerts
27.2% of orders

934 alerts in total, mean 1.6 alerts/alerted order
**ALERT TYPES**

<table>
<thead>
<tr>
<th>Alert type</th>
<th># (% of total alerts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duplication</td>
<td>572 (61.2)</td>
</tr>
<tr>
<td>Local messages</td>
<td>241 (25.8)</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>100 (10.7)</td>
</tr>
<tr>
<td>Allergy</td>
<td>21 (2.3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>934</strong></td>
</tr>
</tbody>
</table>

*20 patients met the criteria set within the eMMS for pregnancy alert triggers (female, 12-55 years old). Of the 119 medications ordered for these patients, 43.3% triggered a pregnancy alert.*
PREScriber Views

Registrar: It pops up so often which can be a very bad thing because you’re dismissing it so often that you develop this sort of mechanism so it can be bad in a sense that sometimes you might miss some important things.

Registrar: I at least scan them and work out what it is that they’re trying to tell me. Often it’s saying you’ve just prescribed, do you want to prescribe it again, and I’m like well yes, I do.

Resident: I don’t have a problem with all the alerts because I know what they say now before they even come up.
Lesson 2: Context of use matters
### Ward-rounds vs. After-hours

<table>
<thead>
<tr>
<th></th>
<th>Ward-rounds</th>
<th>After-hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>17% of alerts read</td>
<td>78% of alerts read</td>
<td></td>
</tr>
<tr>
<td>No orders changed</td>
<td>5% of orders changed</td>
<td></td>
</tr>
<tr>
<td>following alert</td>
<td>following alert</td>
<td></td>
</tr>
</tbody>
</table>

**Alerts were not targeting the decision-makers on ward-rounds**

Senior doctors made the prescribing decisions but rarely used the system.

**Alerts are of greater value to less experienced doctors working independently than those working in formal ward-round situations**
Lesson 3:
People use systems in expected ways
SUB-OPTIMAL USE OF EMMS

189 alerts were technically preventable
= 1/3 of duplication alerts
= 20% of all alerts

Prescribers did not use the eMMS functions as intended, despite the functions’ potential to improve efficiency of work

As a consequence, clinically unnecessary alerts were generated (→ increased frustration, time saving lost)
WHY?

Several eMMS functions designed to improve efficiency require clinicians to think about their prescribing task in different ways than when prescribing on paper.
Lesson 4:
User feedback is invaluable
To improve alert effectiveness:

Shorten the alert text

Make different alert types more distinguishable from one another

Indicate the level of risk associated with each warning
Prescribers agreed on what alert type should be retained

81% rated Allergy & intolerance alerts as the most useful alert type

No participant believed this alert type should be removed

All participants rated this alert type as ‘often’ or ‘sometimes’ useful

Prescribers varied in their views on what alert types should be removed

76.2% indicated that Pregnancy alerts were ‘never’ or ‘rarely’ useful
CONCLUSIONS

Getting alerts right within eMMS is a challenge

**Best approach:** include only a small # of alerts and provide alternative forms of decision support (pre-written orders)

Based on this research, pregnancy alerts were removed from MedChart and many local messages were replaced with pre-written orders

Ongoing evaluation (quantitative & qualitative) is vital to ensure alerts remain relevant & effective
THANK YOU

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