

Improving the Safety of
Medication Use in the Long-term
Care Setting:
Potential Impact of Computerized
Clinical Decision Support

Terry Field, James Judge, Martin
DeFlorio, Jane Laprino, Jill Auger, Paula
Rochon, David Bates, Jerry Gurwitz

Objectives

- To determine opportunities for improving the safety of medication use in the long-term care setting
- To assess the likelihood that computer-based alerts will have an impact on prescribing and lab test monitoring

Study Setting

- Large, academically-affiliated long-term care facility
- 4 years of experience using CPOE without clinical decision support
- Randomized trial of computerized clinical decision support
- 3 intervention units; 4 comparison units

Clinical Decision Support System

- Design principles
- Types of drug orders triggering alerts
 - high severity drug interactions
 - problematic lab test results
 - potential side effects requiring monitoring
 - dose recommendations for frail elders
 - need for prophylactic measures
- Limitations of the CPOE software

Alert Categories

- CNS side effects
- Constipation side effects
- Anticholinergic side effects
- Warfarin orders
- Phenytoin orders
- Potential renal insufficiency
- Hypokalemia
- Hyperkalemia
- Drug dose recommendations
- Hyperglycemia
- Multiple drugs with antiplatelet effects
- Drug interactions

Data Collection

- Alerts (whether displayed or not) triggered computerized audit trails
- Audit trails linked with computer output of additional information via encrypted resident ID:
 - laboratory test orders
 - all medications resident was currently taking
 - all actions during the medication order

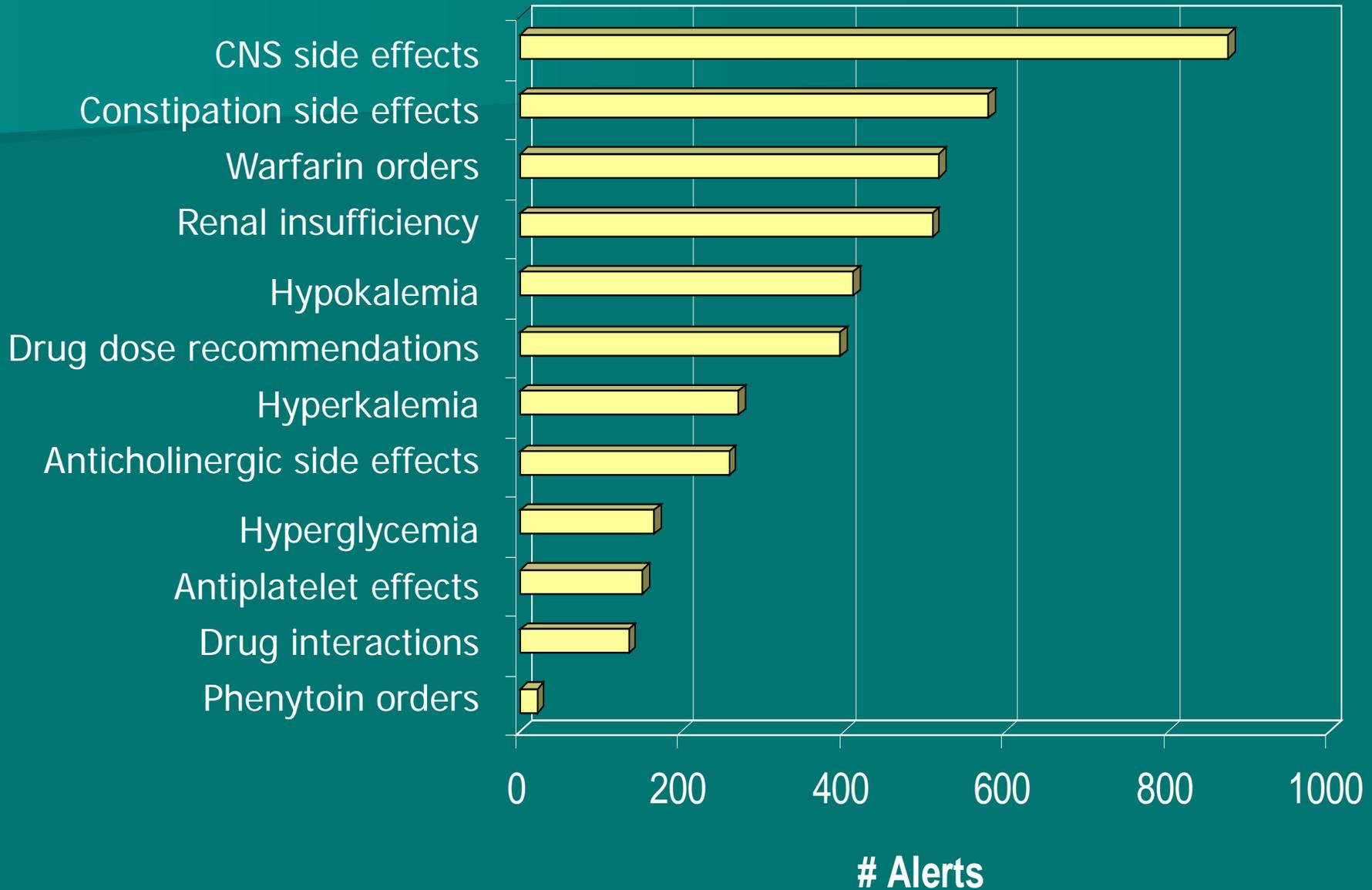
Analysis

- Clinical pharmacist reviewed each alert and associated information and determined if any action by the prescriber could be considered a response to the alert
- Calculated:
 - frequency of drug orders triggering categories of alerts
 - proportion of categories of alerts followed by appropriate actions in intervention and comparison units
 - relative risks of appropriate actions in intervention vs. comparison units

Results

- 445 residents, 3726 resident-months of observation
- 47,997 medication orders processed
- 9414 alerts triggered (2.5 per resident-month)
- 54% of alerts not relevant to the drug order
 - dose recommendations
 - drug interactions
 - opioid orders

Relevant Alerts Triggered



Results –Prescriber Actions

Alert category	% appropriate		RR (95% CI)
	Intervention	Comparison	
CNS side effects	17	12	1.4 (1.0, 1.9)
Constipation	22	24	0.9 (0.7, 1.2)
Warfarin orders	25	7	3.5 (2.1, 5.7)
Renal insufficiency	51	60	0.8 (0.7, 1.0)
Hypokalemia	65	66	1.0 (0.8, 1.1)
Dose recommendation	11	8	1.3 (0.7, 2.4)
Hyperkalemia	38	46	0.8 (0.6, 1.1)
Anticholinergic	24	25	1.0 (0.5, 1.8)
Antiplatelet effects	17	33	0.5 (0.2, 1.2)
Drug interactions	24	13	1.8 (0.6, 5.2)
Phenytoin orders	29	93	0.3 (0.1, 1.0)

Summary

- 2.5 alerts generated per resident-month;
1.15 relevant
- 31% of relevant alerts followed by appropriate action in intervention units;
28% in comparison units
- Alerts affected medication management significantly in two domains:
 - potential CNS side effects
 - warfarin orders

Conclusions

- There are many potential opportunities to improve medication safety in the long-term care setting
- Computerized alerts can improve medication management
- Relevancy of alerts must be improved
- CPOE software should be designed to support more sophisticated alerts

Full report is now available from the Journal of American Medical Informatics directly from their website or through pubmed

Judge J, Field TS, Deflorio M, Laprino J, Auger J, Rochon P, Bates DW, Gurwitz JG. Prescribers' responses to alerts during medication ordering in the long term care setting. J Am Med Inform Assoc. 2006 Apr 18 [Epub ahead of print]