

Electronic screening of inpatients' medical records: a clinical decision support for physicians and clinical pharmacists?

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Background and Objective:

About 5% of Swiss inpatients suffer from medication errors; many of them are caused by drug related problems (DRPs) including inappropriate prescriptions [1]. Clinical pharmacists (CPs) of our institution participate weekly or bimonthly in different ward rounds. Access to the electronic medical record system (EMRS) including computerized physician orders allows them to analyze patients' medication. In a previous study, Roten et al. analyzed an approach to facilitate ward visit preparation for the CP. She developed a screening tool with 6 different queries (sensitivity of 85.1%) to identify patients with DRPs. [2]

We hypothesized that an electronic screening tool with more queries (25) could lead to a more sensitive tool and therefore identify inpatients carrying the highest risks of DRPs. Such a tool may facilitate the daily work of CPs and physicians.

Design and Setting:

25 different queries were programmed to identify potential drug related problems in the EMRs.

It was a prospective observational study conducted in the Hospital of Valais between September and November 2008. Patients identified by the screening tool because of a potential DRP or a high risk condition, were compared to those visited by the CP during the medical round (and for whom the CP suggested or not a treatment modification). The method was adapted from [2].

Main outcome measures:

The global sensitivity and specificity of the screening tool including all 25 queries were calculated and the positive predictive value (PPV) of each individual query was analyzed (see table 1). The latter helped us to classify the queries in two categories: high risk conditions and automatic safety alerts.

Results:

374 patients were included. The 25 criteria screening tool had a global sensitivity of 88.7% and a global specificity of 58.8%.

Query	PPV [%]	Nb of patients identified by the query
1 ATC code (inducers, inhibitors etc.) [2]	63	19
2 Polymedication & age > 80 years [2]	79	101
3 Creatinine clearance < 60 ml/min [2]	18	126
4 Digoxin & serum potassium out of range [2]	NA	0
5 Intravenous antibiotics > 3 days [2]	50	20
6 Intravenous acetaminophen >3 days [2]	71	17
7 Oral anticoagulants & INR out of target	62	29
8 Serum digoxin out of range	67	3
9 Heparin/LMWH & thrombocytopenia	22	18
10 Hyperkalemia & potassium sparing diuretics / ACEI	56	9
11 Metformin & lactic acidosis	NA	0
12 Metoclopramide & Parkinson's Disease	80	5
13 Enoxaparin & low body weight	29	17
14 Diabetes & microalbuminuria without ACEI or ARB treatment	75	4
15 Diabetes & hypercholesterolemia without HMG-CoA reductase inhibitor treatment (statin)	NA	0
16 Opiates without laxative agent	22	58
17 Bisphosphonates without calcium supplementation	100	1
18 Parenteral nutrition without vitamin & trace elements supplementation	100	2
19 Parenteral nutrition > 3 days without vitamin K supplementation	100	3
20 Glucocorticoids & fluoroquinolones & age > 60 years	100	3
21 Oral anticoagulants & thyroid drugs <7 days	NA	0
22 Oral anticoagulants & amiodarone <7 days	NA	0
23 Macrolides & HMG-CoA reductase inhibitors (not including pravastatin)	NA	0
24 HMG-CoA reductase inhibitors & fibrates	NA	0
25 Verapamil & beta-blockers	NA	0

NA: not available

Table 1 : Number of patients identified by each query and PPV

Discussion and Conclusion:

Our analysis showed that some queries (1,2,3) identified high risk patients or conditions needing a manual check, some queries (9,13,16) were often false positive (low PPV) and need to be refined. The others may be used as medication safety alerts because of their adequate PPV (arbitrarily fixed at >50%) (5,6,7,8,10,12,14,17-20) or because they identified relevant DRPs even if no patient was identified within our study (4,11,15,21-25). Those alerts could be sent automatically to prescribers.

The developed electronic screening tool is a trade-off between pharmacotherapy issues, the feasibility of programming and the availability of the data in the EMRs. It allows an efficient identification of patients at risk of DRPs and therefore helps to prioritize the medication review and to optimize the workload of CPs.

References:

- [1] Oertle M, Mouton WG. Prescribing practice in a Swiss primary and secondary acute care hospital. SMW. 2006;136:769-775
[2] Roten I, Marty S, Beney J. Electronic screening of medical records to detect patients at risk of drug related problems, presented at the 37th ESCP symposium in Dubrovnik, 2008, submitted for publication in PWS.

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