Investigating The Epidemiology of Medication Errors in Adults in Community Care Settings. A Retrospective Cohort Study in Central Saudi Arabia

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Introduction

Patient safety is a public concern in healthcare systems across the world.(1) Medication errors are a major problem across care settings, including home, ambulatory, and primary care (henceforth community) settings.(1) The World Health Organization has identified medication errors as key focus areas for the enhancement of patient safety in community settings.(2)

Objectives

To investigate the period prevalence of and risk factors for clinically important prescribing and monitoring errors among adults managed in one Family Medicine in Riyadh, SA and to compare the QRESEARCH analysis of secular trends in the United Kingdom (UK) with the estimates we obtained in SA.(3)

Methods

The research protocol, data collection sheet, and waiver of informed consent were approved by the Clinical Research Committee and the Research Ethics Committee.

A phased approach was undertaken beginning with feasibility and pilot work; followed by a retrospective cohort study using electronic health record (EHR) derived data. A random sample of 2,000 adults (≥18 years old) visiting one Family Medicine was selected. Data collection took three months (01 October to 31 December 2017). Manual data extraction was performed for all records, while a second trained reviewer undertook the independent assessment of a random 10% of the sample of records.

Inclusion criteria:

1. Saudi and non-Saudi aged 18 years or over.
2. Patients recorded to be receiving at least one prescribed/Over-the-Counter (OTC) medication. These medications were checked against the SFDA list of human medications and were subsequently classified into prescription or OTC medications.(4)
3. Patients who had been registered with Family Medicine for at least 15 months prior to data extraction.

Descriptive analyses and logistic regression modelling were performed using STATA (version 14) statistical software.

Results

The agreement between the two independent data extractors was substantial (Kappa 0.8).

Medication errors

The overall period prevalence of patients with at least one medication errors over 15 months is **5.85**% (95% confidence interval [CI] 4.8 to 6.9) and the overall period prevalence of medication errors over 15 months is **8.1**% (95% CI 6.5-9.7).

Risk factors

Risk factors that significantly predicted the overall patients at risk of experiencing medications errors were:

Medication-related

1. Patients aged ≥ 65 years (OR 27.2; 95% CI 18.6 to 39.85)
2. Male gender (OR 1.9; 95% CI 1.5 to 2.25)
3. Saudi nationality patients (OR 2.7; 95% CI 2.2 to 3.3)
4. Patients taking five or more drugs (polypharmacy) (OR 4.7; 95% CI 3.8 to 5.8).

Physician-related

1. Physician's male gender (OR 1.6; 95% CI 1.3 to 2.1)
2. Saudi nationality physicians (OR 1.9; 95% CI 1.5 to 2.5).

The overall period prevalence of the first 12 clinically important errors in medicine management was 3.4% (95% CI 2.2-4.6) in this research, compared to the 0.9% in QRESEARCH analysis of secular trends estimates.

Conclusions

This is the first study to investigate medication errors in community settings in SA. Clinically important medication errors were commonly observed in relation to both drug prescribing and monitoring. Future research should replicate this work in different community contexts in SA and other countries, in order to investigate in greater depth the error-related adverse events and develop and evaluate interventions to decrease clinically important errors in medicine management.

Outcome measures	Numerator	Denominator	Proportion of errors in patients at risk (%); 95% CI
Primary outcomes			
1.Patients with a history of peptic ulcer who have been prescribed a non-selective NSAID without co-prescription of a PPI	0	4	0
(2a) Patients with asthma who have been prescribed a β-blocker	7	13	53.8; 95% CI 22.5 to 85.2
3.Patients aged 75 years and older who have been prescribed an ACE inhibitor or a loop diuretic long-term who have not had a computer-recorded check of their renal function and electrolytes in the previous 15 months	0	11	0
Secondary outcomes			
(2b) Patients with asthma [and no history of CHD] who had been prescribed a β blocker	21	241	8.7; 95% CI 5.1 to12.3
4.Proportions of women with a past medical history of venous or arterial thrombosis who had been prescribed the combined oral contraceptive pill	0	4	0
5.Patients receiving methotrexate for at least 3 months who had not had a full blood count recorded (5a), or liver function test (5b), in the previous 3 months	(5a) 0 (5b) 0	(5a) 14 (5b) 14	(5a) 0 (5b) 0
6.Patients receiving warfarin for at least 3 months who had not had a recorded check of their INR in the previous 12 weeks	4	16	25.0; 95% CI 1.2 to 48.8
7.Patients receiving lithium for at least 3 months who had not had a recorded check of their lithium concentrations in the previous 3 months	2	2	100.0; 95% CI 100.0 to 100.0
8.Patients receiving amiodarone for at least 6 months who had not had a thyroid function test in the previous 6 months	0	0	Not calculable
9.Patients receiving prescriptions of methotrexate without instructions that the drug should be taken every week	0	14	0
10.Patients receiving prescriptions of amiodarone for at least 1 month who are receiving a dose of more than 200 mg per day	0	0	Not calculable
Composite secondary outcome measures			
11.Patients with at least one prescription problem (a combination of outcome measures 1, 2, or 4)	28	259	10.8; 95% CI 7.0 to 14.6
12.Patients with at least one monitoring problem (a combination of outcome measures 3, 5, 6, 7, and 8)	6	43	13.95; 95% CI 3.2 to 24.7
Additional revised updated outcomes measures			
13.Prescription of an oral NSAID, without co-prescription of an ulcer-healing drug, to a patient aged ≥65 years	52	269	19.3; 95% CI 14.6 to 24.1
14.Prescription of an anti-platelet drug without co-prescription of an ulcer-healing drug, to a patient with a history of peptic ulceration	1	4	25.0; 95% CI -54.6 to104.6
15.Prescription of warfarin or NOAC in combination with an oral NSAID	2	32	6.25; 95% CI -2.6 to 15.1
16.Prescription of warfarin or NOAC and an anti-platelet drug in combination without co-prescription of an ulcer-healing drug	11	22	50.0; 95% CI 27.3 to 72.7
17.Prescription of aspirin in combination with another anti-platelet drug without co-prescription of an ulcer-healing drug	23	344	6.7; 95% CI 4.0 to 9.3
18.Prescription of a LABA inhaler (excluding combination products with inhaled corticosteroid) to a patient with asthma who is not also prescribed an inhaled corticosteroid	0	0	Not calculable
19.Prescription of an oral NSAID to a patient with heart failure	3	14	21.4; 95% CI -3.15 to 46.0
20.Prescription of antipsychotics for >6weeks in a patient aged ≥ 65 years with dementia but not psychosis	2	17	11.8; 95% CI -5.3 to 28.8
21.Prescription of an oral NSAID to a patient with eGFR < 45	0	38	0
Period prevalence of total number of errors	162	2000 total patients	**8.1**; 95% CI 6.5 to 9.7
Period prevalence of total number of patients with at least one error	117	2,000 total patients	**5.85**; 95% CI 4.8 to 6.9

Table 1: Cohort study proportion of errors in patients at risk of each outcome measure.

Abbreviations: ACE=angiotensin converting enzyme. CHD=coronary heart disease. eGFR=estimated Glomerular Filtration Rate. INR=international normalised ratio. INOAC=New Oral Anti-Coagulant. NSAID=non-steroidal anti-inflammatory drug. PINCER=pharmacist-led information technology intervention. PPI=proton-pump inhibitor. LABA= long-acting beta-2 agonist.

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