HHS Public Access

Author manuscript

Acad Emerg Med. Author manuscript; available in PMC 2021 February 24.

Published in final edited form as:

Acad Emerg Med. 2021 February ; 28(2): 248–252. doi:10.1111/acem.14032.

How accurately do older adult emergency department patients recall their medications?

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Keywords

Medication safety; geriatrics; adverse drug events; emergency department

Adults 65 years old and older are seven times more likely to experience an adverse drug event (ADE) each year than younger adults.[1] ADEs were implicated in 660,000 US Emergency Department (ED) visits in 2018.[2] One in three older adults (OAs) are on 5 or more medications (polypharmacy), making ADEs more common in this population.[1,2] By reducing or stopping inappropriate medications, $62 billion could be saved in hospitalizations over the next decade.[2]

Attempts to reduce ADEs in the ED have focused on decreasing new prescriptions for potentially inappropriate medications using the American Geriatric Society Beers Criteria[3] and identifying medications and ED factors that increase the risk of ADEs.[4,5] There is limited research assessing the accuracy of patient-provided medication lists when compared to pharmacy records.

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Author Contributions

Study concept and design – EG, FB, SM, RM

Acquisition of the data – FB

Analysis and interpretation of the data – EG, SM

Drafting of the manuscript – EG, SM

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Statistical expertise – SM

Acquisition of funding – FB

Conflict of Interest Disclosure

EG, FB, SM, RM, JN, JA report no conflicts of interest.

Asking OAs to provide an accounting of their medications under the stress of an acute illness or injury in the ED likely leads to errors, which could result in patient harm. OA ED patients have many risk factors for poor medication recall: ED visits are unscheduled, and patients may not have the time, ability or knowledge to bring their medications with them. Also, cognitive impairment becomes more prevalent with age which reduces recall. Therefore, we assessed how accurately OA ED patients report their medications, as compared to the "gold standard" of pharmacy-dispensing records.

This is a secondary analysis of a cross-sectional study,[6] which included non-institutionalized patients ≥50 years old without cognitive impairment (Six Item Screener score of 4 or greater)[7] recruited from Sept. 2013 to Aug. 2014 at two urban academic EDs in Rhode Island. Trilingual research staff (English, Spanish, Portuguese-speaking) screened potentially eligible participants seven days a week between 8am and midnight. They used a computer-based (random.org) random sampling technique to randomize participants for screening. After EHR screening, potentially eligible patients were approached and, if eligible, asked to sign written consent. The study was approved by the hospitals' institutional review board.

Research staff collected patient-reported medication histories using a structured interview. Patients were allowed to use family members, medication lists, or refer to pill bottles. Research staff called the participants' pharmacy(ies) to obtain a list of dispensed medication and obtained a list of medication documented in the EHR. Research staff blinded to the study outcome coded medication from all sources (patient, pharmacy, and EHR) based on the World Health Organization's Anatomic Therapeutic Classification (ATC) System. The ATC classifies medications based on the active ingredient's effect on specific organ systems. Medication were considered current if the patient was expected to have had a supply on hand within the past seven days. Medication that were available over-the-counter or taken as needed, as determined by licensed pharmacists (JA and JN) and a board-certified emergency physician (EG), were not included in analyses. Because this is a secondary analysis, we did not do a sample size calculation.

We considered a patient to have "complete agreement" between patient and/or EHR lists if all ATC codes on the patient/EHR list matched the "gold standard" of pharmacy-dispensed medication. We hypothesized that different factors might lead to omitted/additional medications, so we used multinomial logistic regression model to examine demographic factors and recall methods associated with omitted or added medications, comparing both patient and EHR lists to the pharmacy record. All analyses were completed in R (R Core Team, 2020) and SAS 9.4.

We found that of the 168 participants, mean age was 65, 56% were female, and 75% were White (Table S1). The accuracy of patient-report was poor with only 23% of patients having complete agreement between self-report and pharmacy-dispensing records and only 21% having complete agreement between EHR and pharmacy-dispensing records (Table S2). 40% of participants reported taking additional medication not dispensed by the pharmacy, 9% of participants omitted medication that were dispensed. 27% reported both additional and omitted medications. Patients most commonly omitted antibiotics (53%), followed by

urologicals (40%), drugs for obstructive airway disease (31%), and cardiac therapy medications (27%) (Figure S1). Cardiac therapy medications included cardiac glycosides like digitalis, antiarrhythmics, and vasodilators.

Participants who relied on mesmory alone (p=0.01) or who were on more medications (p<0.001) were significantly less likely to have agreement with pharmacy-dispensing records (Table 1). Age, gender, education, and type of insurance were not associated with agreement. Compared to Blacks, non-Hispanic Whites were less likely to have both additional and omitted medications.

In this cross-sectional study of 164 ED patient encounters, we found that only one in five OAs reported all of their medications accurately when compared to pharmacy-dispensing records. Furthermore, discrepancies varied by drug classes and patient factors such that patients were more likely to recall their medication accurately when they were on fewer medications and used multiple sources (not memory alone). This work is important because awareness of recall errors could improve reconciliation efforts. ED physicians fail to recognize a medication-related cause in 50% of ADEs.[5] This leads to prolonged harmful medication use and contributes to the morbidity and costs associated with ADEs.

Little is known about the accuracy of patient-reported medication recall, but we know that EHR medication lists are inaccurate. A study by Hohl et al. examining an ADE screening tool found that nurses misclassified 45.4% (465/1023) of patients taking four or more regular medications as taking fewer medications and 40.7% (319/783) of patients with recent medication changes as having not had changes to their medications when they did.[4] Another study by Mazer et al. found little concordance between nurse documentation and patient self-report with a 37% discrepancy rate (95% CI = 35% to 40%).[8]

We identified medication that patients often omit, which could lead to ADEs. A 2011 study by Budnitz et al. of over 5077 ADE cases found that 2/3 of ADEs causing ED visits were unintentional overdoses and the medications most commonly implicated were warfarin (33.3%), insulins (13.9%), oral antiplatelet agents (13.3%), and oral hypoglycemic agents (10.7%).[1] A limitation of this work is that many ADEs are unrecognized.[5] Anticoagulant and diabetes ADEs have laboratory levels (INR, glucose respectively) that result during the ED visit. ADEs that cannot be identified using drug or laboratory levels - such as the drug classes we identified - could be implicated, but underrecognized.

Our finding that antibiotics were often omitted suggests that medication taken for a short period of time may be forgotten. This is problematic as antibiotics have potentially fatal interactions with many medications. For instance, there is an increased risk of bleeding when warfarin is combined with ciprofloxacin, macrolides, or trimethoprim-sulfamethoxazole – antibiotics commonly prescribed for urinary tract infections, pneumonia, and skin infections. Additionally, cardiac glycosides such as digoxin were often omitted. Digoxin has a narrow therapeutic index and can lead to fatal arrythmias, particularly in patients with congestive heart failure and renal failure. Early identification of digoxin toxicity can prompt the use of its antidote, digoxin immune Fab. However, if patients fail to report this medication physicians may miss cases of digoxin toxicity.

What can ED prescribers do when faced with this data that inaccurate medication recall is common? First, prescribers should be aware that prescribing new medication in the ED introduces risk. A study by Hastings et al found that among 942 seniors discharged from the ED, 44.6% were prescribed a new medication at discharge; 31.8% were discharged on suboptimal pharmacotherapy.[9] Risk can be reduced by avoiding prescriptions for sedative antihistamines, muscle relaxants, and benzodiazepines, which are rarely appropriate in this population.[3]

Second, prescribers should encourage patients to carry up-to-date medication lists, use caregivers for help, and reconcile medications at each visit. Some EHRs provide up-to-date pharmacy-dispensing records, which could reduce barriers to reconciliation and copy/paste errors by medical staff entering medications de novo.

Third, ED embedded pharmacists could improve medication list accuracy. Up to 27% of hospital prescribing errors can be attributed to medication histories being incomplete on admission.[10] Comprehensive medication histories take 9–30 minutes and require several steps including interview, inspection of medication, and contact with pharmacies or physician offices. Although these histories outperform physician-acquired histories and should be performed in patients with polypharmacy, pharmacy trained staff are necessary to make this feasible in EDs.

Limitations include that this is a secondary analysis and the primary aim of the study was to evaluate opioid misuse, therefore more attention may have been paid to opioid medication rather than other medications. Pharmacy-dispensing records reflect medications that were filled and not medication that were taken by patients. Some patients may use multiple pharmacies and may have failed to report this to the research staff, which could have made the pharmacy-dispensing record less accurate. Unmeasured factors, such as poor health literacy or insufficient explanation of medications by prescribers, could also contribute to recall errors. Our mainly White, highly educated cohort may not reflect the OA ED population as a whole.

In conclusion, only one in five OAs reported all of their medications accurately in the ED when compared to pharmacy-dispensing records. Antibiotics, urologicals, respiratory and cardiac medication were commonly omitted by patients. Solutions include encouraging patients to use multiple sources (e.g. lists, caregivers) during reconciliation, ED embedded pharmacists, and linkage between pharmacy records and EHRs.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Financial Support

This publication was made possible by the Emergency Medicine Foundation (PI: Beaudoin), Society of Academic Emergency Medicine (SAEM Institutional Research Training Grant; PI: Merchant). This work was also supported by the National Institute on Aging (R03AG056349; K76AG059983), and the Brown Physicians, Inc. Academic Assessment Research Award (PI: Goldberg).

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Table 1.

Multinomial logistic model (ORs with 95% CI) of factors associated with medication reporting (reference is complete concordance between participant or EHR list and pharmacy report)

	Participant versus pharmacy medications				EHR versus pharmacy medications			
	Additional	**Omitted**	**Additional & Omitted**	**p-value**	**Additional**	**Omitted**	**Additional & Omitted**	**p-value**
Age	1 (1, 1.1)	1 (0.9, 1.1)	1 (1, 1.1)	0.98	1 (1, 1)	1 (0.9, 1)	1 (1, 1.1)	0.31
Education								
Less than high school graduate	Reference	Reference	Reference	0.25	Reference	Reference	Reference	0.37
High school graduate/GED	1.6 (0.5, 5.7)	0.8 (0.1, 4.2)	0.9 (0.2, 3.9)		0.9 (0.2, 3.5)	0.4 (0.1, 1.7)	1.0 (0.2, 5.1)	
Some college	0.8 (0.2, 3.2)	0.1 (0.01, 1.2)	0.3 (0.1, 1.5)		0.5 (0.1, 2.4)	0.5 (0.1, 2.4)	1.3 (0.2, 7.1)	
College graduate or more	3.1 (0.7, 14.1)	1.6 (0.2, 11)	0.5 (0.1, 3.9)		1.2 (0.3, 5.4)	0.6 (0.1, 3.3)	0.3 (0.03, 2.6)	
Male	1.3 (0.5, 3.5)	1.8 (0.5, 6.9)	1.8 (0.5, 6.1)	0.76	1.5 (0.5, 4.0)	1.9 (0.6, 6.3)	3.9 (1.1, 13.6)	0.19
Race/Ethnicity				0.18				0.04
Hispanic	0.4 (0.04, 4.1)	1.3 (0.1, 25.1)	4.9 (0.5, 46.4)		0.1 (0.01, 1.3)	0.1 (0.006, 1.6)	0.5 (0.05, 5.4)	
Non-Hispanic and white	1.1 (0.3, 3.7)	1.5 (0.2, 10.4)	0.7 (0.1, 3.8)		0.7 (0.2, 2.7)	0.6 (0.1, 2.9)	0.1 (0.03, 0.8)	
Non-Hispanic and non-white	Reference	Reference	Reference		Reference	Reference	Reference	
Source for medications					[redacted]			
Memory	Reference	Reference	Reference	0.01				
List	0.6 (0.1, 2.6)	0.3 (0.03, 2.3)	0.1 (0.02, 1)					
Multiple sources	1.1 (0.4, 3.3)	0.1 (0.01, 0.7)	0.1 (0.03, 0.6)					
Self-reported health status	0.9 (0.6, 1.5)	1.1 (0.5, 2.4)	1 (0.5, 1.9)	0.96	1.1 (0.6, 1.8)	1.1 (0.6, 2.0)	1.1 (0.6, 2.2)	0.99
Total number of medications	1.7 (1.3, 2.2)	1.9 (1.3, 2.6)	3 (2.1, 4.2)	<0.0001	1.7 (1.3, 2.3)	1.7 (1.3, 2.4)	2.8 (2.0, 3.9)	<0.0001

Footnote: We defined an “omitted” medication as a medication that was pharmacy-dispensed but was not reported by the patient and or in the EHR list. We defined “additional” medication as medication reported by the patient or EHR, but not pharmacy dispensed. Thus, it was also possible for the same participant to have both “omitted” and “additional” medications.