TITLE PAGE

Title: Older patients' engagement in hospital medication safety behaviours

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ABSTRACT

• Background: Increasing age is associated with more medication errors in hospitalised patients. Patient engagement is a strategy to reduce medication harm.

• Aims: To measure older patients' preferences for and reported medication safety behaviours, identify the relationship between preferred and reported medication safety behaviours and identify whether perceptions of medication safety behaviours differ between groups of young-old, middle-old and old-old patients (65-74 years, 75-84 years, and ≥85 years).

• Methods: A survey, which included the Inpatient Medication Safety Involvement Scale (IMSIS) was administered to 200 older patients from medical settings, at one hospital. Data were analysed using descriptive statistics, Spearman's rho and the Kruskal-Wallis Test.

• Results: Patients reported a desire to ask questions (59.5% n=119) and check with healthcare professionals if they perceived that a medication was wrong (86.5% n=173) or forgotten (87.0% n=174). Patients did not have particular preferences, which differed from their experiences in terms of viewing the medication administration chart and self-administering medications. Preferred and reported behaviours correlated positively (r= 0.46-0.58, n=200, $p \leq 0.001$). Young-old patients preferred notifying healthcare professionals of perceived medication errors more than middle-old and old-old patients ($p =< 0.05$).

• Conclusions: Older patients may prefer verbal medication safety behaviours like asking questions and notifying healthcare professionals of medication errors, over viewing medication charts and self-administering medications. The young-old group wanted to identify perceived medication errors more than other age groups. Older

patients are willing to engage in medication safety behaviours, and healthcare professionals and organisations need to embrace this engagement in an effort to reduce medication harm.

Keywords: inpatients; medication systems, hospital; medication safety; patient participation; patient preference.

INTRODUCTION

Increasing age is a major predictor of medication errors amongst older hospitalised people [1]. In a retrospective review of over 10,000 older patients' hospital charts, 81% of hospitalisations had one medication error and 19% had two or more errors. The most frequent medication errors, including administration, transcribing, dispensing, prescribing and process errors, were omission of medication (48.8%) or wrong dose (16.3%) [2]. In all, 96% of these medication errors were deemed preventable [2]. Polypharmacy and multi-morbidity is common for older adults, putting them at high risk for medication error [3]. The World Health Organization issued a worldwide call for action to healthcare professionals and patients, to reduce preventable medication harm by 50% by 2022 [4]. In Australia, medication safety was recently declared the 10th National Health Priority Area by the government. However, ensuring medication safety, described as freedom from preventable harm from medication use [5], is a growing challenge, especially for older hospitalised patients, who often have chronic co-morbidities and require prescription of several medications [6].

Internationally, patient engagement in care is advocated as a strategy to reduce medication harm [7]. Patient engagement has been defined as patients having "…the desire and capability to actively choose to participate in care in a way uniquely appropriate to the individual in cooperation with a healthcare provider or institution for the purposes of maximising outcomes or experiences of care"(p33) [8]. Patient engagement is an umbrella term for other terms used synonymously, like involvement and participation [8]. The term patient engagement is currently the most popular used term, when compared to the other terms used synonymously [9]. Moshin-Shaikh et al. [10] developed the Inpatient Medication Safety Involvement Scale (IMSIS) to measure patients' in-hospital "medication safety behaviours" which they defined as patients viewing inpatient medication records, prompting staff to avoid perceived dose omissions or errors, voicing queries to healthcare professionals, and self-administering medications under supervision. Patients typically enact these behaviours during routine hospital activities like medication administration, bedside handover, medication counselling, medication reconciliation, and ward rounds [6, 11].

However, evidence on older patients' preferences for and engagement in hospital medication safety behaviours is mixed. In a UK study of 100 hospitalised patients aged 18 years and older, younger patients (≤ 65 years) had significantly higher scores than older patients (≥ 65 years) for overall desired and reported medication safety behaviours. On the other hand, observational research shows older hospitalised patients share and seek medication-related information and voice medication-related problems [11]. Overall, it is unclear what role that older patients want in hospital medication safety behaviours. If known, appropriate strategies can be devised to promote this group's engagement at their desired level, to reap medication safety benefits.

Aims

The objectives were to:

- Describe older patients' preferences for and reported medication safety behaviours in hospital;
- Identify the relationship between older patients' preferred and reported medication safety behaviours in hospital; and
- Compare whether perceptions of medication safety behaviours differ between age groups of older patients.

METHODS

Study design

A cross-sectional survey design was used. Ethics approval for this study was obtained from the Human Research Ethics Committee at Gold Coast Hospital and Health Service, Griffith University, and Deakin University.

Setting

This study took place in six wards in an Australian metropolitan tertiary hospital. The wards were respiratory medicine, specialised medicine, cardiology medicine, vascular medicine and surgery, neurology medicine and rehabilitation. The wards were purposefully chosen as they regularly admitted patients aged ≥ 65 years, with chronic medical conditions. Electronic prescribing and electronic medication

administration records were implemented three months prior to data collection. The medication administration record was not tethered to a patient portal.

Participants

A consecutive sample of 200 patients aged ≥ 65 years were recruited to this study. The sample size was chosen pragmatically, to capture a range of older ages and ensure a low margin of error and confidence in the results obtained during planned analysis. Inclusion criteria were patients: 1) with ≥ 1 chronic illnesses; 2) with ≥ 6 medications prescribed per day that they or their family managed at home; and 3) whose estimated date of discharge was ≤ 3 days from the time of recruitment. Exclusion criteria were patients who were: 1) physiologically unstable; 2) mentally not capable of participation; and 3) unable to communicate in English. Participants were recruited by Research Assistants. Research Assistants were experienced healthcare professionals capable of determining exclusion criteria, but they also sought input from healthcare professionals on the wards if required.

Data collection

Research Assistants approached potential participants on Monday-Friday, explained the study and obtained written consent. Participants were surveyed while hospitalised. The Research Assistants offered participants the opportunity to complete a paper-based survey independently or with assistance. All survey responses were entered into REDCap database [12] by Research Assistants. Participant characteristics were abstracted from their medical record by Research Assistants, including their age, sex, reason for admission and chronic conditions. Additionally, ‘discharge medication records’ produced by pharmacists were inspected, and discharge medications data were extracted.

The Research Assistants received face-to-face training, and an implementation manual with standard study procedures to follow. A key focus of training was unbiased ways of delivering surveys.

The Inpatient Medication Safety Involvement Scale

The IMSIS is a survey that measures patients’ preferences for and reported medication safety behaviours while hospitalised [10]. The scale has eight questions,

of which three items relating to participants' preferences are matched with three items relating to participants' reported medication safety behaviours. There are two additional items on participants' preferences for medication safety behaviours that do not have matched reported behaviour items. For example, the reported behaviour item: "I have looked at my medication administration record (drug chart) while in hospital" matches the preference item "I would like to look at my medication administration record (drug chart) while in hospital". Likert scale response options included: strongly disagree=1, disagree=2, uncertain=3, agree=4, strongly agree=5. It has been assessed for internal reliability in 100 British inpatients aged 18 years and older, with demonstrated reliability with a Cronbach's Alpha >0.7 [10].

Data analysis

Data were exported from REDCap [12] into IBM SPSS statistics version 26 [13]. There were no missing data for the IMSIS survey. Descriptive statistics were used to summarise the participant characteristics, and responses to the IMSIS, including frequency and percentage and medians and interquartile ranges (IQR). Spearman's rho was used to test the relationship between the three reported behaviour items and the three matching preference items. A small correlation ranged from 0.10-0.29, a medium correlation was from 0.30-0.49 and a large correlation was 0.50-1.0 [14], which was used in data interpretation.The Kruskal-Wallis Test was used to test the difference between the three age groups and IMSIS responses. Participant age was recoded into three groups: young-old (65-74 years) middle-old (75-84 years) and old-old (≥85 years). Older people comprise a heterogeneous group, and these groupings account for the physiological, disability, morbidity and mortality differences between groups [15]. Dunn's test for pairwise comparisons was applied, to identify which age groups differed significantly. For all tests, the level of significance was set at $p < 0.05$.

RESULTS

In total, 266 eligible patients were invited to participate from July 2019-March 2020, of whom 200 completed the survey.

[Figure 1 here]

Participants' median age was 74 years (IQR=10). Most patients were men admitted with cardiovascular/vascular or respiratory medical conditions and discharged on 12 medications on average (Table 1).

Table 1. Participant characteristics

Characteristics	**Total Sample n = 200**	**Young-old (65-74 years) n = 101**	**Middle-old (75-84 years) n = 78**	**Old-old (≥85 years) n = 21**
	Frequency (%)	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**
Male	121 (60.5)	63 (62.4)	46 (59.0)	12 (57.1)
Reason for admission:				
• Medical	175 (87.5)	93 (92.1)	67 (85.9)	15 (71.4)
• Surgical	25 (12.5)	8 (7.9)	11 (14.1)	6 (28.6)
Reason for medical admission:				
• Vascular/ cardiovascular	69 (39.4)	36 (38.7)	26 (38.8)	7 (46.7)
• Respiratory	59 (33.7)	33 (35.5)	22 (32.8)	4 (26.7)
• Neurologic	24 (13.7)	11 (11.8)	11 (16.4)	2 (13.3)
• Metabolic	8 (4.6)	6 (6.5)	2 (3.0)	0 (0.0)
Other	15 (8.6)	7 (7.5)	6 (9.0)	2 (13.3)
Reason for surgical admission:				
Vascular/cardiovascular	25 (100.0)	8 (100.0)	11 (100.0)	6 (100.0)
	Median (IQR)	**Median (IQR)**	**Median (IQR)**	**Median (IQR)**

Total co-morbidities	4 (2.0, 5.0)	4 (2.0, 5.0)	4 (2.0, 6.0)	3 (1.0, 5.0)
Discharge medications[a]				
• Total discharge medications prescribed	12 (19.0, 16.0)	12 (9.0, 17.0)	12 (9.0, 16.0)	11 (7.5, 14.0)
• Unchanged medications of total discharge medications	8 (5.0, 12.0)	7 (4.0, 13.0)	8 (5.0, 11.0)	8 (3.5, 10.0)
• New medications of total discharge medications	2 (1.0, 4.0)	2 (1.0, 4.3)	2 (1.0, 4.5)	3 (1.0, 4.5)
• Changed medications of total discharg	0 (0.0, 1.0)	0 (0.0, 1.0)	0 (0.0, 1.0)	0 (0.0, 0.5)

e medications				
• Ceased medications of total discharge medications	0 (0.0, 1.0)	0 (0.0, 1.0)	0 (0.0, 1.0)	0 (0.0, 1.0)

[a]n=32 missing data for discharge medications. Patients discharged after hours, patients who self-discharged, patients who died prior to discharge, or patients who were not seen by pharmacist due to organisational pressures did not have a "discharge medication record" produced by a pharmacist.

Participants' responses to the IMSIS scale are reported in Table 2. In our study, Cronbach's Alpha was <0.7, thus items were not summed as suggested by the authors who developed the scale [10]. Participants wanted to ask questions and check medications that they perceived were forgotten or incorrect with a health care professional. Similarly, patients reported asking questions about medications while in hospital. Patients did not want to look at their medication chart or administer their own medications while hospitalised. Likewise, 90-91.5% of patients reported not undertaking these medication safety behaviours.

Table 2. Patient preferences for and reported medication safety behaviours

Item		**Total Sample n = 200 Frequency (%)**	**Young-old (65-74 years) n = 101 Frequency (%)**	**Middle-old (75-84 years) n = 78 Frequency (%)**	**Old-old (≥85 years) n = 21 Frequency (%)**
Preferences					
I would like to look at my medication	Disagree	149 (74.5)	71 (70.3)	59 (75.6)	19 (90.5)
	Uncertain	7 (3.5)	4 (4.0)	2 (2.6)	1 (4.8)

administration record (drug chart) while in hospital	Agree	44 (22.0)	26 (25.7)	17 (21.8)	1 (4.8)
I would like to ask questions about my medicines while in hospital	Disagree	78 (39.0)	37 (36.6)	31 (39.7)	13 (61.9)
	Uncertain	3 (1.5)	1 (1.0)	2 (2.6)	0 (0.0)
	Agree	119 (59.5)	63 (62.4)	45 (57.7)	8 (38.1)
I would check with a healthcare professional if I thought one or more of my medicines may have been forgotten	Disagree	13 (6.5)	5 (5.0)	6 (7.7)	2 (9.5)
	Uncertain	13 (6.5)	5 (5.0)	6 (7.7)	2 (9.5)
	Agree	174 (87.0)	91 (90.0)	66 (84.6)	17 (81.0)
I would check with a healthcare professional if I thought I might be being given the wrong medicine	Disagree	11 (5.5)	3 (3.0)	7 (9.0)	1 (4.8)
	Uncertain	16 (8.0)	5 (5.0)	9 (11.5)	2 (9.5)
	Agree	173 (86.5)	93 (92.0)	62 (79.5)	18 (85.7)
I would like to keep and administer my own medicines while in hospital	Disagree	154 (77.0)	75 (74.3)	60 (76.9)	19 (90.5)
	Uncertain	8 (4.0)	4 (4.0)	4 (5.1)	0 (0.0)
	Agree	38 (19.0)	22 (21.8)	14 (18.0)	2 (9.5)
Reported behaviors					
I have looked at my medication administration record (drug chart) while in hospital	Disagree	183 (91.5)	91 (90.1)	71 (91.0)	21 (100.0)
	Uncertain	2 (1.0)	1 (1.0)	1 (1.3)	0 (0.0)
	Agree	15 (7.5)	9 (8.9)	6 (7.7)	0 (0.0)
I have asked questions about my medicines while in hospital	Disagree	75 (37.5)	37 (36.6)	27 (34.6)	11 (52.4)
	Uncertain	2 (1.0)	1 (1.0)	1 (1.3)	0 (0.0)
	Agree	123 (61.5)	63 (62.4)	50 (64.1)	10 (47.6)
I have kept and administered my medicines while in hospital	Disagree	180 (90.0)	89 (88.1)	72 (92.3)	19 (90.5)
	Uncertain	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	Agree	20 (10.0)	12 (11.9)	6 (7.7)	2 (9.5)

There was a medium-large positive correlation between all preferences and reported behaviours (Table 3).

Table 3. The relationship between patient preferences for and reported medication safety behaviours

Medication safety behaviours	**Spearman's rho**		
	Correlation coefficient	95% confidence intervals	Significance level
Look at my medication administration record (drug chart) while in hospital	0.46	0.30, 0.60	≤0.001
Ask questions about my medications while in hospital	0.58	0.44, 0.70	≤0.001
Keep and administer my own medications while in hospital	0.52	0.40, 0.67	≤0.001

Table 4 compares the age groups on IMSIS responses. There were no significant differences between groups on all but one item: **"**I would check with a healthcare professional if I thought I might be being given the wrong medicine". For this item, the pairwise post-hoc Dunn test was significant for young-old versus middle-old group (p = 0.03) and young-old versus old-old group (p = 0.04). The pairwise comparison between middle-old and old-old group was not significant.

Table 4. Patient preferences for and reported medication safety behaviours by age group

	Young-old (65-74 years), n=101 *Median (IQR)*	**Middle-old (75-84 years), n=78** *Median (IQR)*	**Old-old (≥85 years), n=21** *Median (IQR)*	**P value**
Preferences				
I would like to look at my medication administration record (drug chart) while in hospital	2 (1, 4)	2 (1, 2)	2 (2, 2)	0.94
I would like to ask questions about my medicines while in hospital	4 (2, 5)	4 (2, 5)	2 (2, 4)	0.12
I would check with a healthcare professional if I thought one or more of my medicines may have been forgotten	4 (4, 5)	4 (4, 5)	4 (4, 4)	0.06
I would check with a healthcare	4 (4, 5)	4 (4, 5)	4 (4, 4)	0.03

professional if I thought I might be being given the wrong medicine				
I would like to keep and administer my own medicines while in hospital	2 (1, 3)	2 (1, 2)	2 (2, 2)	0.91
Behaviours				
I have looked at my medication administration record (drug chart) while in hospital	2 (1, 2)	2 (1, 2)	2 (1, 2)	0.90
I have asked questions about my medicines while in hospital	4 (2, 5)	4 (2, 5)	2 (2, 4)	0.17
I have kept and administered my medicines while in hospital	2 (1, 2)	2 (1, 2)	2 (1, 2)	0.46

DISCUSSION

In this study of 200 older patients, we measured their preferences for and reported medication safety behaviours in hospital. This study showed older patients would like to undertake verbal medication safety behaviours in hospital. Older patients preferred asking questions and checking with healthcare professionals if there was a medication that was perceived to be wrong or forgotten. Conversely, more physical medication safety behaviours were not preferred or reported. Older patients did not want to administer their own medications in hospital and did not report this behaviour. We found positive correlations between preferences and perceived behaviours, suggesting that older patients believed that they enacted their desired behaviours. When comparing age groups, young-old patients preferred notifying healthcare professionals of perceived medication errors more than middle-old and old-old patients.

We found that patients' preferences and reported behaviours were dependent on the type of medication safety behaviour. Consistent with previous research, patients were willing to ask questions, which may be because patients with both low and high literacy feel comfortable undertaking this behaviour [16]. Researchers have demonstrated that although older patients express confidence in asking questions [17], they report not speaking-up unless healthcare professionals create opportunities and invitations for participation [18]. Given patients in our study reported asking questions about their medications, it is possible that healthcare professionals at our site encouraged older patients to ask questions.

Patients in our study reported not self-administering medications in hospital and did not want to perform this behaviour. Reasons why patients in our study reported not self-administering medications may be because it represents a shift from normal practice; other researchers have observed patients only self-administering inhalers in hospital [19]. Previous research showing that patients perceive that self-administering medications would cause power struggles with nurses and that patients would be defying hospital policy [20]. In contrast to our findings, researchers have interviewed patients and healthcare professionals, showing that they view self-administration as beneficial for patients because it allows patients to practice self-management, maintain routines, and maintain autonomy and independence [21]. These differences may be explained by the fact that Vanwesemael et al.'s [21] research was conducted in Belgium, where the law supports patients to self-administer medications in hospital. If we want to increase patients' willingness to more actively manage medications in hospital, interventions are required to implement self-administration practices in hospital, and patient and organisational barriers will need to be addressed. For instance, patient competence needs to be taken into account; the SAM tool is one of the most comprehensive measures available to assess patients' ability to self-administer medications [22]. Additionally, hospitals need legal contexts that support self-administration practices with defined roles for patients and healthcare professionals, medication administration software that supports these practices and medication storage options that are accessible for patients [19, 21].

In our study, patients reported that they did not look at their medication administration records. This is similar to previous research that involved 247 observations; four (2%) had evidence of patients viewing their paper/electronic medication administration record, while interviews revealed that no patients or carers had viewed the electronic medication administration record [19]. It is possible that patients in our study found electronic medication administration records difficult to view, given previous research shows that healthcare professionals did not share medication administration records with patients because they believed patients cannot have unsupervised access [19]. When electronic medical records are held by healthcare professionals, consideration needs to be given to patient and healthcare

professional seating and physical positions in order to facilitate both parties to view information [23].

Conversely, when patient portals are implemented that are tethered to the EMR, patients can view and manage their medication administration records [24]. Digital health solutions like patient portals are becoming increasingly visible to patients in hospital [25]. However, some hospitals are still yet to adopt patient portals, which could be attributed to the challenges in designing and implementing them, including appropriate data governance, interoperability between systems and patient and healthcare worker willingness [26]. Researchers have demonstrated that patients who can access medication administration records through patient portals have high rates of use (51-83%) [27, 28], and patients have reported subsequently communicating with pharmacists about the accuracy of the record [27, 28], and sharing medication preferences during ward rounds [23]. However there are barriers; people aged 65 years and older are significantly less likely to use patient portals than those aged younger than 65 years [29], with adopters tending to be the young-old group or younger [23]. Despite this older patients are open to the idea of using patient portals, and are satisfied when they use them [29, 30]. However they need support; having a healthcare professional or family member assist in using the patient portal is a facilitator to older peoples' use and adoption of patient portals [30]. Thus, it would be interesting to see patient responses to the IMSIS survey in a context that has patient portals implemented.

We found that preferences and behaviours showed a positive correlation in this study, which differed to previous research using the IMSIS [10]. Mohsin-Shaikh et al. [10] found that adult patients wanted significantly more participation in medication safety behaviours than what they experienced. A key difference between studies was that Mohsin-Shaikh et al.'s [10] included adult participants of all ages (18 years and older), whereas we only included patients ≥65 years. These differences in results may reflect our focus on older patients; researchers suggest that as patients grow older, they have more time to focus on healthcare, and are diagnosed with more chronic conditions, thus, they take more responsibility for their healthcare [31]. Therefore, participants in our study may have ensured they enacted their desired behaviours.

In our study, the young-old were more comfortable to speak-up to ensure their own medication safety. Researchers have shown that young-old adults had better emotional health, cognitive functioning, and health promotion behaviours than the middle-old and old-old adults, which may explain their confidence in these behaviours [32]. Interestingly, in our study the young-old, middle-old and old-old largely had similar total co-morbidities and discharge medications, suggesting these may not be factors that influence their ability to speak-up. Identifying errors in healthcare professionals' practice can be viewed as confrontational by patients [33]. Previous research suggests patients 80 years and older undertake a subtle approach to involvement [34], by engaging with healthcare professionals in a non-disruptive and cooperative manner [34], which may explain the differences we found across age groups.

Patient engagement interventions on admission may be required to encourage the middle-old and old-old group to speak-up about medication errors. Interventions could comprise audio-visual or written materials that emphasize the acceptance of and value for patients engaging in medication-safety behaviours in hospital [35]. However, older patients also desire healthcare professionals' verbal support for their involvement in care, thus staff training may also be required [36, 37]. These interventions need to encourage a value-based approach to healthcare, whereby patients are invited to share their goals and preferences about the medications prescribed and administered [38]. Importantly, older patients are a unique group with many factors that influence their engagement in care such as hearing loss, cognitive impairment, multiple co-morbidities, non-English speaking backgrounds and reliance on family to manage medications [37]. Thus, when promoting older patients' engagement in medication safety behaviours, and care more broadly, an individualized approach is necessary.

Given older people may be reluctant to enact some medication safety behaviours, regular and multidisciplinary communication with patients may be a way to promote patient engagement, and in turn safer care. For example, 'huddles', which are brief stand-up meetings involving multi-disciplinary healthcare professionals at the patient's bedside, are an embedded practice that can be used to encourage regular patient participation [39]. Further, families often manage older patients' medications, thus case conferences at the bedside could increase both patient and family

engagement [40]. However, holding these routine conversations at the patient bedside does not automatically result in patient engagement, healthcare professionals need to actively promote patient participation in these conversations [41]. Additionally, having the patient engage within a multi-disciplinary team is beneficial. For instance, geriatric co-management, an approach where the geriatrician and the patient's treating team share responsibility and decision-making for the patient, and multi-disciplinary meetings about medication reconciliation can reduce patient length of stay, patient complications and medication risks for older patients [42, 43].

Our study contains strengths and limitations. First, the scale was not shown to be internally consistent, which may be because the scale was developed with a younger cohort and items may be less suitable for older patients. Second, the mode of survey administration (Research Assistant administered or self-administered) differed based on participant preference. To avoid social desirability and interviewer bias, Research Assistants underwent training in unbiased survey administration techniques [44]. Third, the old-old group had more cardiovascular surgical patients, which may hinder the generalizability of the findings in this age group. Finally, the findings are restricted to one sample, at one public, teaching, metropolitan hospital, and may not be generalizable to other settings.

CONCLUSIONS

In our sample, older patients were agents for enhancing medication safety through verbal behaviours like asking questions and notifying healthcare professionals of perceived medication errors. Although the study was confined to older patients, the young-old embraced identifying wrong medications more than any other age group. To improve medication safety, researchers should explore ways to promote patient engagement in self-administering medications and checking medication charts, as it seems unlikely that older patients will undertake these behaviours without encouragement. Promoting these behaviours is complex; implementation strategies will need to be targeted at the patient, to ensure they are competent and supported to engage in care. Further, there needs to be organisational support to implement these new practices, and staff willingness to support patients who choose this option. Importantly, the patient's preference must always be assessed, and if they desire no

role in self-administering medication or checking medication charts this must be discussed [45]. In conclusion, it appears older patients are willing to engage in medication safety; a situation healthcare professionals and organisations will need to accept and embrace.

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Fig.1 Recruitment flowchart