A novel program of self-administration of medications within an acute inpatient rehabilitation unit

Kwok Kah Meng, Wee Tze Chao and Tay San San

Abstract
Introduction: Self-administration of medications (SAM) is a critical component of independent living in the face of chronic illnesses. The current local practice, where nurses manage all aspects of inpatient medication administration, has significant limitations in promoting this important activity post-discharge. Inpatient SAM is considered novel in Singapore. In this paper, we aim to describe the process of establishing a SAM program in a local rehabilitation inpatient ward.

Materials and methods: In 2016, a multidisciplinary workgroup was formed in a local general hospital to develop a SAM protocol to empower participants to better self-manage their medications post-discharge through a series of graduated assessments and targeted education. The program started as a pilot in April 2017, and was eventually expanded to all rehabilitation wards within the hospital. Medication errors and near-misses were tracked, and surveys targeting participating patients and staff were given at the end of each encounter.

Results: As of 31 December 2019, 160 patients were enrolled into the SAM program. Of these, 75, 63 and 22 patients were in SAM 1, SAM 2 and SAM 3 (tiers representing differing independence levels), respectively, at discharge. There were no medication errors. One near-miss was reported. The program was well-received by both patients and staff.

Conclusions: We present a novel and viable protocol for the inpatient selection and assessment of patients, with the aim of supporting safe SAM post-discharge through educational empowerment and early identification of barriers with interventions.

Keywords
Self-administration, medications, novel, inpatient, rehabilitation

Introduction
Self-administration of medications (SAM) has been defined by the Royal Pharmaceutical Society as a “transfer of responsibility which should be dependent on a patient’s ability to manage the tasks involved, as well as their consent to do so”.

Although the concept of SAM has been around for more than 60 years and is often encouraged in many hospitals worldwide, inpatient SAM is considered novel in Singapore.

Medications are routinely administered by nurses, with patients adopting a passive role in the process. Changes to medication regimen are often made when patients are hospitalised, and these patients are only counselled prior to discharge. The inpatient stay represents a golden opportunity for assessing and educating patients on their ability to self-manage medications after discharge. This is especially relevant in an inpatient rehabilitation ward where the turnover of patients is generally slower compared to an acute medical ward, and where the mindset of the patients should be tuned towards active recuperation rather than passive rest. We feel that developing a SAM protocol and incorporating it within the holistic care model will further enhance the rehabilitation program that patients undergo.

SAM promotes self-management of chronic diseases. Self-management is a crucial element of illness recovery and health maintenance and is defined “as the day-to-day management of chronic conditions by individuals over the course of an illness”.

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self-management as one of four goals in a strategic framework for improving the health status of persons with multiple chronic conditions. A systematic review of the effectiveness of SAM in the hospital setting by Richardson et al. concluded that SAM schemes increased patients' knowledge, and had a variable impact on improving patients' compliance and reducing medication errors.

In this paper, we aim to describe the process of establishing a SAM program in a local inpatient rehabilitation ward. We will present the outcomes of the program in terms of rates of medication errors, along with a staff and patient satisfaction survey.

**Methods**

**Design and setting**

In 2016, a multidisciplinary workgroup was formed in a large regional general hospital with an onsite inpatient rehabilitation unit. The workgroup comprised rehabilitation physicians, nurses, pharmacists, risk management, nursing and medical informatics professionals, to develop a SAM protocol within the inpatient rehabilitation wards. Our objectives were to empower participants to better self-manage their medications post-discharge through a series of graduated assessments and targeted education.

A detailed flowchart of the actual process was created. The workgroup scrutinised and discussed each step of the process to identify potential risks. The team then assessed each identified risk and rated its potential impact, likelihood and existing control effectiveness, then classified them to be either adequately controlled, potentially under-controlled or under-controlled. The team then came up with additional controls and mitigation measures to bring down the risk level. The workflow, with its accompanying risk levels and mitigation plans, was presented to senior medical management for their input and approval (see Figure 1 for final version of workflow).

**Pilot phase**

The program was approved in April 2017 as a pilot project targeting the recruitment of at least 25 patients over six months in one rehabilitation ward. During this period, the team limited the numbers of participants based on nursing staff ratio (not more than two patients per cubicle of 10 patients) in order to avoid a sudden increase in the nurses' workload. All medication errors (defined as errors in dispensing or administration of a drug by patient, nursing or pharmacy staff, irrespective of whether such errors lead to any adverse consequences) and near-misses (defined as patients requiring nurses' intervention(s) to prevent medication error(s)) that resulted from this program were actively tracked. We recruited 39 patients over this period, with no medication errors or near-misses. Feedback was given by senior management that one of the promotion criteria (being able to state the indication of each medication) from SAM 1 to SAM 2 was too strict and may not reflect what was happening in the community, in which patients who do not know the indications of some of their medications could still adequately comply with...
self-medication – hence, modification was made to the promotion criteria to only require patients to state the indications of “as-per-required” (PRN) medications rather than all medications.

**Implementation**

The pilot phase confirmed the viability and the robust safeguards built into the program and SAM was expanded to all rehabilitation wards. Further refinements were made along the way by the team based on feedback (Figure 1).

Presently, patients are screened by the nursing and medical teams regularly on their suitability for participation in the SAM program (Table 1). Of note, the Functional Independence Measure is a score that measures disability and is done for all patients within three days of admission to our rehabilitation ward. Within this score, there are five cognitive domains, which are assessed by the ward occupational therapist, and these include memory, comprehension, expression, social interaction and problem-solving. A score of at least 5 in these domains suggests that the patient is at least at the “supervision” level.

The nurse will introduce the SAM program to suitable patients. The doctor will obtain written informed consent from patients who agreed to participate. The pharmacist will counsel patients and provide individualised instructions on their current medications. The nurse will then put up a SAM tag at the bedside for easy identification of patients. Medications in their original packaging (as per what patients receive on discharge) will then be placed into the patient’s locked cabinet by the nurse.

The nurse will then perform an initial assessment, using the key assessment criteria (KAC) (Table 2), to document the baseline ability of the patient in self-managing his/her medications.

| Task to be assessed                                                                 | Able to perform independently | Able to perform with prompting | Unable to perform |
|-----------------------------------------------------------------------------------|-------------------------------|-------------------------------|------------------|
| 1. Identifies each medication by packaging or name/colour/shape                   |                               |                               |                  |
| 2. State number of pills or amount of syrup to be consumed each time              |                               |                               |                  |
| 3. State schedule of medication                                                    |                               |                               |                  |
| 4. State indication of “PRN” medication                                            |                               |                               |                  |
| 5. Able to open container/packaging, etc.                                         |                               |                               |                  |
| 6. Able to manage special instructions such as use of thickeners, pill breaking, etc. |                               |                               |                  |
| 7. Understand consequence of not taking each medication                           |                               |                               |                  |
| 8. State side effects of each medication                                           |                               |                               |                  |

**Promotion criteria**

Proceed from SAM 1 to SAM 2 if the patient is “able to perform independently” tasks 1 to 4 for ALL medications assessed.

Proceed from SAM 2 to SAM 3 if the patient is “able to perform independently” tasks 1 to 6 for ALL medications assessed.

PRN: as per required; SAM: self-administration of medications.

*Note: Item 7 and Item 8 are not required for progression across SAM levels; however, the repeated assessments of these two items across time can potentially reflect the improvement in patients’ knowledge of their medications.*
medications, with the preparation (i.e. selecting the correct medication from the entire pack in the cupboard, opening the medication packaging and preparing the appropriate doses of the medication) done by both the nurse and patient, and the patient will take the medications under direct supervision by the nurse.

After at least 24 hours, the nurse and pharmacist reassess the patient using the same KAC, and if the patient meets the promotion criteria (Table 2), he/she will be promoted to SAM 2. If not, the patient will remain in SAM 1 and the nurse will inform the doctor in charge who will then liaise with the rehabilitation team on further possible interventions within the next 72 hours (e.g. re-education with repeat assessment or some forms of targeted rehabilitative or compensatory strategies where appropriate).

At SAM 2, the patient is expected to initiate the serving of medications by informing the nurse that medications are due. Once prompted, the nurse will open patient’s locked cabinet and allow the patient to prepare the medications independently, after which the patient will take the medication under direct supervision by the nurse. To avoid medication errors, nurses will intervene if patient fails to prompt within one hour of the medication due time.

After at least 24 hours, the nurse and pharmacist reassess the patient using the same KAC and if the patient meets the promotion criteria (Table 2), he/she will be promoted to SAM 3. If not, the patient will remain in SAM 2 and the nurse will inform the medical team, who will then decide collectively on further possible interventions based on the latest assessment results within the next 72 hours.

At SAM 3, patients will initiate (via prompting nurse), prepare and take their medications without direct supervision. Nurses will return to patient’s bedside within one hour of medication due time, and count the remaining medications individually to ensure that the correct type and dose had been taken.

The patient will then be reassessed every 72 hours till discharge. All near-misses and medication errors are tracked. SAM will cease if the patient deteriorates or gets transferred out. This workflow is summarised in Figure 1.

We conducted a patient and staff satisfaction survey after the SAM program was implemented. A patient satisfaction survey form was handed to all patients who had participated in the program. The nurse in charge of the patient would complete the staff satisfaction survey upon the latter’s discharge. The surveys were conducted anonymously. The patient and staff satisfaction survey (Figures 2 and 3, respectively) contained eight Likert-type questions, with five responses that were ranked in order of strength (1 representing strongly disagree to 5 representing strongly agree).

Approval (for waiver) from the Institutional Review Board was obtained. All data were entered into a Microsoft Excel database (version 14.0). Ordinal data were presented in percentages and bar charts (Figures 2 and 3).

Results

As of 31 December 2019, 177 patients were screened, of which 160 patients were enrolled into the SAM program until their discharge. Of the enrolled patients, 75, 63 and 22 patients were in SAM 1, SAM 2 and SAM 3, respectively, at discharge. For the remaining 17 patients, 12 dropped out of the program (one required transfer-out for urgent colonoscopy, one required ongoing medication titration, 10...
patients were not able to complete the key tasks for progression due to limited cognition despite repeated education and visual reminders) and five patients declined participation (three patients were not comfortable with the “additional work” required on their part, and the remaining two patients felt that they could safely self-administer medications post-discharge without going through the program).

There were no adverse events or medication errors reported. One near-miss event was reported, in which the patient, in his first day of SAM 2, self-dispensed omeprazole twice. Upon root cause analysis, it was found that the omeprazole was packed in two separate packets (by the covering pharmacist as the designated pharmacist was on leave), and that the patient simply dispensed the medications in each packet without referring to the written instructions provided. No medications error resulted as the nurse (who was directly supervising as per protocol) corrected the patient before administration of these medications. Reinforcements were thus made to the patient to routinely refer to the written instructions prior to medications dispensing, and to the pharmacy team to pack identical medications in the same packet.

Patient survey results

A total of 103 (response rate of 63.2%) patient responses were recorded: 92.2% of patients felt that the intent of the program was clearly explained to them and 83.5% felt that the program increased their overall understanding of the medications including their side effects (85.5%); 84.5% felt that the program allowed them to be more proactive in caring for their health, 86.4% felt it was a safe program and 86.5% will recommend this program to other suitable patients. There was a mixed response to whether this program will improve their subsequent compliance to medications post-discharge.

Staff survey results

A total of 97 responses were recorded from participating nurses: 97.9% of nurses felt that participating in the program improved their understanding of the medications that they commonly serve, as well as their side effects (96.9%); 91.7% of participating staff felt that the program will enable patients to be more independent in self-medicating post-discharge, and 78.2% felt it will improve their compliance; 92.8% felt that it was a safe program, and 95.7% will recommend the program to suitable patients. Two thirds felt that the program increased their workload and stress.

Discussion

Our results suggest that our SAM program can be potentially administered as standard practice in a rehabilitation ward setting, given our good patient safety outcomes (in terms of medication errors and near-misses) and good acceptance from both patients and staff, albeit at an initial cost of increase in workload and stress to the nursing staff, the latter of which can potentially be mitigated with a graduated scaling of the program. The benefits of the program included increasing knowledge of both nursing staff and patients, as well as promoting patients’ proactivity in managing their own health, as
reflected by the significant majority of survey responses from both patients and staff, and could also possibly improve patients' compliance to medications. These are similar to the findings in the literature review of inpatient SAM programs in 2006 by Wright et al.10

More significantly, beyond the primary aim of empowering patients, the SAM program had also enabled us to identify the “hidden threat”: a significant number of patients who have entered our program could not progress to independent SAM (i.e. SAM 3) during our inpatient assessments, even though they are expected to be responsible for self-administration post-discharge. Many of these patients would not have been picked up, had they not entered into our program and attempted self-administration, thus significantly predisposing them to the risk of medication errors post-discharge, with its myriad of potentially serious sequelae. This is consistent with the conclusion in the study by Tran et al.11 that “an inpatient SAM program effectively detected barriers to medication adherence that otherwise may not have been detected and addressed prior to discharge”.

Most importantly, the identification of these patients allows us to apply targeted interventions to mitigate the difficulties and support their ability for safe medication administration post-discharge. A noteworthy example would be a stroke patient who had initial difficulty in breaking open her medication sachets due to post-stroke impairment in the use of her hands. By participation in our program, this barrier was identified and the managing team collaborated with the occupational therapist in focusing part of her usual therapy on improving her ability to break open the sachets, and she was eventually able to do so. Other examples of interventions would be the use of pillboxes or pre-packing of medications for patients who frequently forgot their medications during the assessments within the program.

It took more than a year from the idea being conceived to engage various stakeholders and obtain approval to pilot the program. There were concerns regarding the adequacy of safeguards built into the program to mitigate risks, which required multiple meetings to address safety concerns and fine-tune the workflow.

There was no precedence of such program locally that we are aware of. Internationally, we note the SelfMED procedure published in 2018 by Vanwesemael et al., which detailed their development of an evidence-based procedure for self-management of medication in Hospital.12 In the paper, Vanwesemael noted three critical aspects of such a program: firstly, the need for a multidisciplinary approach; secondly, the consideration of the current legal framework on self-management within the hospital itself; and, thirdly, the provision of an instrument for monitoring self-management within the context of the program.

Our journey began earlier in 2016, and we note striking similarities amongst our considerations: firstly, the ongoing multidisciplinary involvement from the birth of our program throughout its implementation; secondly, the involvement of the hospital’s medicolegal team in vetting the Patient’s Information Sheet cum Consent Form (the written medium we have developed to communicate the details of the program to the patients to get their consent); and, thirdly, the repeated joint assessments by the nurses and pharmacists (in-built into the workflow) to continuously monitor SAM.

However, there also exist some important differences in our approaches: we note that a significant portion of elderly patients in our community with mild cognitive difficulties may already have been independently and safely doing self-administration without fully understanding the individual indications of all their medications. As such, we have adapted our progression criteria to mirror what is practical in our community – for example, patients are not required to know the indications and side effects of every medication in order to progress to independent self-administration (SAM 3). They are, however, required to know the indications of their PRN medications as, otherwise, they will not be administering these medications correctly. We feel that this adapted criteria is important to allow patients with mild cognitive difficulties (“borderline cases”) to still participate and engage in self-administration.

In that light, we have also given the managing teams the options to exclude medications that still require frequent titration (such as warfarin) from SAM, in order to still engage the patient in self-administration of the remaining medications. In these cases, the excluded medications were wholly administered by the nurses as per usual practice.

**Limitations**

Our study was limited by the relatively small numbers of participants, which is attributable to two main reasons: firstly, a strict selection criteria; and, secondly, being rehabilitation wards with a sizeable number of patients with strokes and traumatic brain injuries, a significant proportion have cognitive or physical impairments limiting their ability to participate. Other contributing reasons could be related to inertia among suitable patients to participate, probably, in part, due to prevalent local culture that administration of inpatient medications are primarily the “responsibility of nurses”.

Our protocol was carried out in the inpatient rehab setting, of which patients typically stayed for a minimum of 1–2 weeks and had multiple chronic medications. This protocol may not be directly feasible for “acute” patients with much shorter lengths of stay and, also, may not significantly value-add to patients with minimal chronic medications. One of the inclusion criteria we used was the cognitive Functional Independence Measure score, which is not widely done in non-rehab wards. Nonetheless, we suggest that for patients who meet the rest of the inclusion/exclusion criteria (including being responsible for self-medication after discharge), initial opinions from the medical or nursing team on the patients’ cognitive capabilities for medication administration can still be used as a rough surrogate for inclusion, upon which the specific assessment framework within our program can then be further applied.

It had been, and may still be, challenging to get buy-in from staff (increased workload and stress) and patients (local cultural expectations) as local SAM programs are still considered novel, but if more hospitals adopt and develop similar programs, this paradigm shift may be promulgated in the longer-term.
Implications for future studies

Further studies can expand on our protocols to further individualise the processes suited for different patient subgroups (which can be stratified according to key diagnoses or expected length of stay). More data can be collected to assess the baseline characteristics of patients (total number of medications, survey to assess prior knowledge of own medications), quantify the average duration of each tier (i.e. SAM 1, 2 and 3) in these subgroups and the specific interventions delivered, to allow for potential comparisons across different planes, such as among different patient subgroups and the effectiveness of different interventions. Future studies can also examine issues related to medication compliance post-discharge and readmission rates related to medication errors post-discharge, with a view to accessing the cost-effectiveness of a SAM program.13

Conclusion

SAM is increasingly critical among our aging population with a rising epidemic of chronic diseases and their accompanying chronic medications. The current local practice, where nurses manage all aspects of inpatient medication administration, has significant limitations in promoting this important “activity of daily living” post-discharge. We adopted a novel and viable protocol for the selection and assessment of patients in this realm, with the ultimate aim of supporting safe SAM post-discharge through educational empowerment and early identification of barriers with interventions, and achieved both good patient safety outcomes and favourable acceptance from both patients and involved staff.

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Authors’ contributions

KKM and WTC were involved in the conception and design of the program. KKM was involved in data acquisition, analysis and interpretation. KKM drafted the manuscript. WTC and TSS were involved in revising the manuscript critically for important intellectual content. The manuscript has been read and approved by all authors.

Availability of data and materials

The datasets generated and/or analysed during the current study are available from the information collected by the respective ward nurses who are involved in the SAM program.

Declaration of conflicting interests

The authors have no conflicts of interest to declare.

Ethical approval

Ethical approval for this study was waived by the SingHealth Institutional Review Board because the study is a clinical audit (CIRB ref: 2020/2064). This study was completed in accordance with the Helsinki Declaration.

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