THE NATIONAL MEDICATION RECONCILIATION GUIDELINES

2018

ACKNOWLEDGEMENTS

The *National Medication Reconciliation Guidelines 2018* has been reviewed by the Medication Reconciliation Implementation Workgroup (see Table 1 for composition) under the National Medication Safety Committee (NMSC) 2017-2020 term (see Table 2 for composition). Credits of developing the *National Medication Reconciliation Guidelines* also goes to the National Medication Reconciliation Workgroup (see Table 3 for composition) under NMSC 2014-2017 term (see Table 4 for composition).

Table 1. Composition of Medication Reconciliation Implementation Workgroup, July 2017 – June 2020

Name	Institution	Designation
A/Prof Ng Heng Joo (Lead)	SGH	Senior Consultant, Department of Haematology; Director of Patient Safety
Asst. Prof Yeo Wee Tiong (Co-Lead)	NUHCS	Consultant, Department of Cardiology
Dr Steven Chong Shih Tsze	NUP	Head, Clementi Polyclinic; Chair, Medication Management and Utilisation Committee, NUP
Ms Quek Hui Chen	JCH	Head of Pharmacy

Table 2. Composition of the National Medication Safety Committee, July 2017 – June 2020

Name	Institution	Designation
Members		
Adj Assoc Prof Augustine Tee (Chairperson)	CGH	Chief, Medicine, Chief & Senior Consultant, Department of Respiratory & Critical Care Medicine
Mr Wu Tuck Seng (Immediate Past Chairperson)	NUH	Deputy Director, Pharmacy Department
Dr Chua Mei Chien	KKH	Head and Senior Consultant, Department of Neonatology
Dr Loh Seow Siang	KTPH	Senior Consultant, Department of Acute and Emergency Medicine / Patient Safety Officer

Name	Institution	Designation
Dr Kurumbian Chandran	NTFGH	Director of Endocrinology; Co-chair of the Medication safety committee
A/Prof Ng Heng Joo	SGH	Senior Consultant, Department of Haematology; Director of Patient Safety
Ms Angelina Tan Hui Min	SKGH	Head, Pharmacy
Dr Tan Sze-Chin	TTSH	Consultant, Department of Rheumatology, Allergy and Immunology; Chair of the Medication Safety Team
Ms Soh Lay Beng	IMH	Head, Pharmacy Department
Dr Ang Mei Kim	NCC	Senior Consultant, Division of Medical Oncology
Prof Ding Zee Pin/	NHC	Senior Consultant, Department of Cardiology; Chairperson, Pharmacy & Therapeutics Committee
Mr Li Kaihui Benny	NSC	Manager (Pharmacy Quality & Safety)
Dr Marcus Ang	SNEC	Consultant, Corneal and External Eye Disease Department
Ms Chua Hui Min	NCIS	Senior Clinical Pharmacist
Asst. Prof Yeo Wee Tiong	NUHCS	Consultant, Department of Cardiology
Dr Peter Moey	SHP	Director, SingHealth Polyclinics-Pasir Ris; Chair Pharmaceutical & Therapeutics Committee, SHP
Dr Valerie Teo	NHGP	Associate Consultant Family Physician; Deputy Head, Ang Mo Kio Polyclinic; Chairperson, Medication Management and Usage Committee, NHGP
Dr Steven Chong Shih Tsze	NUP	Head, Clementi Polyclinic; Chair, Medication Management and Utilisation Committee, NUP
Ms Quek Hui Chen	JCH	Head of Pharmacy
Dr Colin Ngeow	YCH	Consultant, Medical Services
Dr Lou Huei-Xin	IHiS	Director, Clinical Safety, Governance and Measurements, Information System Division
A/Prof Lita Chew	MOH	Chief Pharmacist
Secretariat		
Patient Safety & Quality Improvement Branch, Clinical Quality, Performance & Technology Division, Ministry of Health		

Table 3. Composition of Medication Reconciliation Workgroup, August 2014 — March 2017

Name	Institutions	Designation
Members		
Ms Chan Soo Chung (Chairperson)	NHG Pharmacy	Executive Director, NHG Pharmacy
Dr Roland Boey (Co-chairperson)	TTSH	Senior Consultant, Department of General Medicine, Chairman of Medication Safety
Dr Christopher Lien	CGH	Senior Consultant, Geriatric Medicine, Head of Community Geriatrics
Ms Low Suat Fern	KTPH	Principal Pharmacist, Pharmacy
Ms Ng Ying Ru	NHG Pharmacy	Senior Pharmacist, NHG Pharmacy
Dr Aisha Lateef	NUH	Consultant, Division of Rheumatology and General Medicine, Clinical Services Director, University Medicine Cluster
Mr Tan Chwee Huat	NUH	Principal Pharmacist, Pharmacy
Ms Yee Mei Ling	SGH	Senior Principal Clinical Pharmacist, Pharmacy
Dr Wong Song Ung	Singhealth Polyclinics	Family Physician, Head, Medical Informatics
Ms Jasmine Kang	TTSH	Advanced Practice Nurse (Geriatrics), Nursing Service
Dr Tan Tze Lee	The Edinburgh Clinic	Family Physician
Dr Theresa Yap	Yang & Yap Clinic & Surgery	Family Physician
Ms Reshma Lhode	Guardian Health and Beauty	Clinical Pharmacist
Ms Lee Siew Ann	MOHH	Manager, Medications Management Capabilities, Information Systems Division
Dr Lou Huei-Xin	MOHH	Director, Medications Management Capabilities, Information Systems Division

Table 4. Composition of the National Medication Safety Committee, March 2014 - February 2017

Name	Institution	Designation/
Members		
Mr Wu Tuck Seng (Chairperson)	NUH	Deputy Director, Pharmacy,
Dr Joseph Manuel Gomez (Co-Chair)	KKH	Head & Senior Consultant, Neonatal Intensive Care Unit

Dr Augustine Tee	CGH	Chief & Senior Consultant, Respiratory and Critical Care Medicine
Ms Pang Nguk Lan	KKH	Director, Quality, Safety and Risk Management, Medical Administration
Dr Tai Hwei Yee	NHG/ SHINe	Deputy Chief Quality Officer, NHG Co-chairperson of SHINe
Ms Chan Soo Chung	NHG Pharmacy	Executive Director, NHG Pharmacy
Mr Hing Wee Chuan	NUH	Principal Pharmacist, Pharmacy
Dr Ng Heng Joo	SGH	Senior Consultant, Haematology, Head of Medication Safety Committee
Dr Bernard Thong	TTSH	Head &Senior Consultant, Rheumatology, Allergy and Immunology
Dr Roland Boey	TTSH	Senior Consultant, Department of General Medicine, Chairman of Medication Safety
Ms Lee Soo Boon	SGH	Assistant Director, Department of Pharmacy
Ms Alison Sim	SACH	Director of Nursing
Mdm Low Mui Lang	Peacehaven Nursing Home	Executive Director
Asst Prof Lita Chew	MOH/ NCC	Chief Pharmacist, MOH, Head Oncology Pharmacy, NCC
Dr Lou Huei-Xin	MOHH	Director, Clinical Safety, Governance and Measurements, Information Systems Division
Secretariat		
Patient Safety Quality Improvement Branch, Clinical Quality, Performance & Technology Division, Ministry of Health		

INTRODUCTION

Medication reconciliation is an established process within the medication management pathway to reduce preventable adverse drug events (ADEs) and to optimise medication therapy for better patient outcomes[1,2,3,4,5]. Studies have shown that medication reconciliation is an effective means to reduce medication errors by 70 to 80%[6,7,8,9,10]. Patient's Medication List (PML), one of the outputs of medication reconciliation, serves as an important communication tool between healthcare professionals (HCPs) and patients and/or caregivers regarding patients' medications.

A consultancy study[11,12,13] was conducted to review the medication management landscape in Singapore. Findings from the study suggested that the understanding and the level of adoption of medication reconciliation differed among HCPs. Hence, there is a need to establish a guideline for HCPs to understand and perform medication reconciliation and to create PML at appropriate points of the care continuum. Standardization of clinical processes, in this case, medication reconciliation will help to ensure patient safety throughout the care continuum and to support patient care integration. This will also facilitate sharing of information after medication reconciliation is carried out.

The National Medication Reconciliation Guidelines was first drafted by the National Medication Reconciliation Workgroup under the National Medication Safety Committee in 2015. To ensure operational feasibility, the Guidelines underwent a 1-year "in-use" consultation whereby public healthcare institutions were asked to use the Guidelines to guide medication reconciliation processes in their respective institutions. Institutions were also requested to provide feedback to further refine the Guidelines.

Following which, the Medication Reconciliation Implementation Workgroup under the National Medication Safety Committee that was reconvened in July 2017 reviewed the Guidelines and revised the Guidelines with the aim of ensuring operational feasibility and to provide clarification on several of the feedback obtained (see **Appendix I** for the list of clarifications and updates added since the initial draft).

CONTENT

1. WHAT IS MEDICATION RECONCILIATION?

Medication reconciliation is a structured and explicit process of creating the most accurate list possible of all medications a patient is taking, with the goal to ensure accurate and complete medication information transfer during transitions of care[14].

The medication reconciliation process usually precedes the medication review process.

Medication review may be defined as a systematic, critical evaluation of a patient's medications with the objective of reaching an agreement with the patient about treatment, optimising the impact of medications, minimising the number of medication-related problems and reducing waste[15].

Medication reconciliation and medication review are two distinct processes, which may be performed concurrently or consecutively, by the same or different individuals. Both processes are components of medication management that will facilitate patients having the best outcome.

2. WHY IS MEDICATION RECONCILIATION IMPORTANT?

Medication reconciliation aims to:

a) Reduce medication errors and preventable adverse drug events (ADEs) at transitions of care; and
b) Promote patient health and safety through the use of the Patient's Medication List (PML) as a tool to increase patient awareness of and adherence to their medications.

The PML created as part of the medication reconciliation process will serve to:

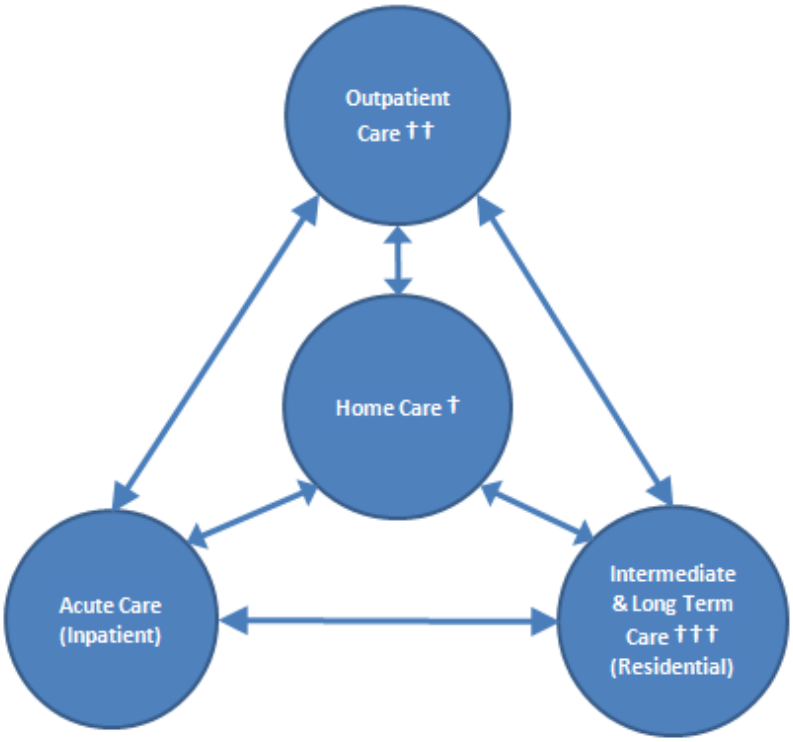
a) Inform the next healthcare professional (HCP) of the patient's current medication;
b) Facilitate the process of medication review;
c) Inform and educate patients and/or caregivers about their medications; and
d) Enable patients and/or caregivers to discuss their medication history with doctors and other HCPs.

3. WHEN IS MEDICATION RECONCILIATION CARRIED OUT?

Medication reconciliation should occur at interfaces of care (admission and discharge), and at transitions between facilities such as acute care, intermediate and long term care (ILTC), and outpatient care where there is high risk for medication discrepancies[16].

Depending on the patient's medical condition, the patient may visit or transit between different healthcare settings. **Figure 1** represents the appropriate occasions for performing medication reconciliation.

Figure 1: Transitions of care where medication reconciliation should be performed



† Includes home medical care and palliative home care

†† Includes visit to family physician, general practitioner, polyclinic, specialist outpatient clinic, community pharmacy

††† Includes community hospital, nursing home and inpatient hospice care

Hence, examples of when medication reconciliation should be performed include:

a) Within 48 hours of admission to acute care hospitals;
b) Before discharge from acute care hospitals;
c) Transfer to or from ILTC;

d) At reasonable intervals for each patient stayed in Nursing Homes;
e) Visit to outpatient care (e.g. family physician, general practitioner, polyclinic, specialist outpatient clinic, community pharmacy); and
f) Visit at patient's home.

Greater priority may be given to patients with risk factors for ADEs[17,18,19] when performing medication reconciliation. Risk factors predisposing patients to adverse drug events can be found in **Appendix II**.

4. HOW IS MEDICATION RECONCILIATION CARRIED OUT?

The medication reconciliation process involves Collection, Checking and Communication[20, 21](i.e. 3Cs):

a) Collection

   Collection/ Gathering of the medication history from a variety of sources (a minimum of two sources, if available). Institutions are highly encouraged to interview patients or caregivers on the current medications that patients are taking, where possible.

b) Checking

   Checking that medications prescribed (including doses) at that point in time (e.g. upon admission, upon discharge or during a clinic visit) for the patient are correct. Discrepancies may be identified at this stage and these may be intentional or unintentional. Discrepancies may include omissions, commissions, duplications and differences in dosage form, dose, route or frequency.

c) Communication

   Communicating any changes in medications so that they are readily available to the next healthcare provider caring for the patient. Communication should include reasons for the change(s) and any follow-up requirements. A written record should be made available on the patient's medical record.

There should be a systematic process for creating a medication list. Whenever possible, medication information should be obtained from more than one source[22], such as:

a) Patient and/or caregiver interview as this is the most valuable source of information to confirm the actual medications taken by the patient at the point in time;
b) Patient's clinical records e.g. electronic medical records, case notes, PML, National Electronic Health Records (NEHR);
c) Inspection of patient's physical medications; and
d) Contacting doctors, pharmacists, nurses and/or other healthcare professionals.

Some tips for interviewing patients and/ caregivers about patients' medications[23] can be found in **Appendix III**.

5. WHAT IS A PATIENT'S MEDICATION LIST?

A PML is the most accurate list possible of prescribed and non-prescribed medications that a patient is taking at a particular point in time. It should include medications that are taken regularly, on an 'as needed' basis, or temporarily withheld[24]. Medications should also include vitamins, supplements, alternative medications (including herbal and traditional medications), recreational medications (including substances of abuse) and investigational therapeutic products[24].

The PML document serves as an important tool to communicate to the next HCP, and patients and/or caregivers, of patients' medications during transitions of care. Hence, it is important that HCPs create a PML for their patients, and update the PML if there are changes.

5.1 Contents of PML

The PML should comprise the following[24]:

a) Patient demographics;
b) Medication details;
c) Creation details; and

d) General notes.

Patient demographics should comprise the following:

a) Name;
b) Identification number;
c) Date of birth;
d) Gender;
e) Allergies;
f) Glucose-6-phosphate dehydrogenase (G6PD) Deficiency status; and
g) Any other significant information (e.g. clinically significant adverse drug reactions)

Medication details should comprise the following:

a) Description of the medications should include generic name, strength and dosage form specified according to the Singapore Drug Dictionary (SDD) where possible. If a patient needs a specific brand of medication, the specific trade name should be specified. For combination medication, the name and strength of individual ingredients should be specified;
b) Prescribed instructions (dose, route of administration, frequency) should be included. Special instructions and cautionary instructions may be included. In the event that patient is not taking the medications as prescribed, the non-adherence should be documented;
c) Dosing duration of medications where appropriate (e.g. antibiotics). Start and stop date should be documented;
d) Indication is mandatory for medications taken 'as needed'. Stating the indications for long-term medications is encouraged;
e) Medications which are temporarily withheld should be included and highlighted. The reason for withholding, follow-up action and re-start date should be included;
f) Reasons for change in medications or prescribed instructions should be documented in the PML for the patients and/or caregivers and other HCPs where possible;

g) Details of variable dosage regimens should be included (e.g. oral corticosteroids, warfarin). For dose titration, the start and stop date should be documented for each dose; and
h) Medications for which only partial information is available should also be included (e.g. only the name of the drug is known).

Creation details should comprise the following:

a) Date and time the PML was completed;
b) Details of HCP who completed the PML (name and institution);
c) Date that PML was printed (for electronic PML only);
d) Occasion when the PML was completed (e.g. Admission, Discharge, Transfer, Outpatient Pre-consultation, Outpatient, Home Visit); and
e) The source(s) of information used to complete or update the PML (e.g. patients and/or caregivers interview, patient's clinical records, checking of physical medications and contacting other HCPs).

General notes may comprise the following:

a) Notes for the patient may be included in the PML if PML is intended to be given to the patients and/or caregivers. Changes in medication, dose, dose strength, frequency should be highlighted to patients and/or caregivers.
b) In the event that the PML is used for communication with another HCP, specific notes for other HCPs may be included in the PML. Medication management issues (e.g. adherence issues, difficulty in managing medications, medications requiring therapeutic monitoring), interventions, assessment of medication knowledge, monitoring plan may be included in this section. For patient taking investigational therapeutic product, the contact detail of the principal investigator may be included.

The sample PML for patient and HCP can be found in **Appendix IV** and **Appendix V** respectively. Depending on the PML content, the same copy may be used for both the patient and HCP. However, for the patient copy, instruction details should be indicated appropriately, and abbreviations (e.g. TDS, s/c, TCU) should not be used.

5.2. Creation and use of PML

The PML may be presented in handwritten, printed or take an electronic form and is considered as a component of the patient's clinical records. As part of the clinical record, the PML should be handled in the same manner as required under the Personal Data Protection Act 2012 and other relevant legislation. The HCP creating or updating the PML should attempt to provide the information to the best of his or her ability[25]. Language used in PML intended for the patient or caregiver should be in layman terms with minimal medical jargon.

Each healthcare institution should have a process for creating, storing, retrieving and sharing the PMLs. Within each healthcare institution, the PML should be stored in a designated place in the patient's clinical records, where it is easily accessible by other HCPs involved in the care of the patient[24] especially when medication is being prescribed. A copy of the PML should also be provided to the patient and/or caregiver for their reference and to be presented at the next healthcare encounter. To facilitate the transfer of updated PML information, all healthcare institutions using systems with electronic interface to the NEHR should contribute the updated PML information to the NEHR, or other future national medical record sharing system.

When making use of PMLs, it is important to verify the information against the latest sources and/or with the patient or caregiver, as there may be changes since the PML was last created. If changes are discovered, the PML should be updated.

6. ROLES AND RESPONSIBILITIES OF STAKEHOLDERS IN MEDICATION RECONCILIATION

Medication reconciliation is a shared responsibility of all stakeholders including healthcare institutions, healthcare professionals, patients and caregivers (where appropriate)[21,23,28]. It is important that all stakeholders are aware of their roles and responsibilities in the process.

6.1 Healthcare institutions

Each healthcare institution should formulate a policy on medication reconciliation, which should include:

a) assigning roles and responsibilities of healthcare professionals based on internal processes and available resources;
b) ensuring staff are aware of their roles and responsibilities in medication reconciliation;
c) providing training to ensure staff are competent;
d) integrating medication reconciliation process into current workflow;
e) determining the timeframe in which medication reconciliation should be completed at relevant care transitions;
f) engaging patients and/or caregivers in medication reconciliation process;
g) monitoring and tracking measures of medication reconciliation process; and
h) conducting regular audit and establishing a continuous improvement program.

6.2 Healthcare professionals

Recommended HCPs involved in medication reconciliation include doctors, pharmacists and advanced practice nurses (APN). Doctors and pharmacists by virtue of their training should provide guidance and oversight over medication reconciliation. With supervision and oversight from doctors and pharmacists, pharmacy technicians, nurses and other assigned personnel may perform medication reconciliation in accordance with applicable regulations.

HCPs involved in medication reconciliation should receive appropriate training to achieve the skills listed in **Appendix VI**[26,27,28]. HCPs should attend regular, continuing education to be kept updated about medication reconciliation issues.

HCPs should exercise due diligence when performing medication reconciliation. This includes:

a) using best available resources at the point in time;
b) bringing up identified discrepancies with the prescriber(s) involved in the care of the patient and documenting them as appropriate; and
c) informing the patient or caregiver of the changes where applicable.

HCPs should engage patients and/or caregivers in the process of medication reconciliation. Patients and/or caregivers are often in the best position to provide up to date information about the medications they are taking and how they take them. They can assist by providing the physical medications, medication lists and other relevant information[14]. Whenever possible, educate them about the medication and side-effect(s) to look out for, as well as encourage them to report any concerns regarding the medication. It is important that HCPs create or update the PML for their patients and/or caregivers to ensure that they have accurate and complete information. HCPs should emphasize to patients and/or caregivers the importance of sharing the information by presenting the PML at every healthcare encounter.

Strategies to solicit patients and caregivers' involvement in medication reconciliation[32] can be found in **Appendix VII**.

6.3 Patients and caregivers

Patients and/or caregivers should be encouraged to actively participate in the medication reconciliation process by keeping an up-to-date PML. They should present the PML at every healthcare encounter. Whenever possible, they should be encouraged to bring along the physical medications. They should also be encouraged to take responsibility to monitor and report any unexpected changes in patient condition after any medication alterations[29], and ask their HCPs if they are unsure about their medication or think a mistake has occurred.

7. EVALUATION

Standardisation of the medication reconciliation process across healthcare institutions will achieve the best overall results for medication safety. The impact will need to be evaluated based on a set of common measures.

Measuring for improvement in the medication reconciliation process starts with collecting baseline data to compare and track adoption rates and quality of the process over time.

The following indicators help to evaluate the process and impact of implementing the medication reconciliation process[28,30]:

7.1 Process measures

To determine the degree to which medication reconciliation is adopted and whether the system is performing as planned, the percentage of patients with medication reconciliation performed should be monitored.

The percentage of patients with medication reconciliation performed in all patients eligible for medication reconciliation

$$= \frac{\text{No. of patients with medication reconciliation performed} \times 100\ \%}{\text{No. of patients eligible for medication reconciliation}}$$

For acute care hospitals, sample data collection form and indicator details can be found in **Appendix VIII**.

7.2 Outcome measures

Outcome measures are essential for monitoring the effectiveness of medication reconciliation in healthcare institutions. If there is an increasing trend in the number of errors, near misses or detected discrepancies, the medication reconciliation workflow

should be reviewed to identify gaps and corresponding improvement measures. The following outcome measures are recommended:

7.2.1. Medication errors or near misses related to the lack of or inadequate medication reconciliation

Medication errors or near-misses from lack of or inadequate medication reconciliation in hospital admission or across transitions of care could be captured from existing channels such as incident reporting system or pharmacist intervention recording system within the institution. The number of medication errors or near-misses related to the lack of or inadequate medication reconciliation performed on admission could be tracked and monitored. As these incidents are self-reported and highly dependent on the institutional culture of incident reporting, the intent of this measure is not meant for benchmarking across institutions, but rather, to highlight learning opportunities to internally review and improve the quality of medicine reconciliations performed.

7.2.2. Discrepancy in mediation reconciliation

To monitor the thoroughness of the medication reconciliation process, the percentage of patients with outstanding discrepancy in medication reconciliation (i.e. incomplete medication reconciliation) could be determined through auditing of a random sample. Prospective audit (i.e. doing the audit at the time the patient is admitted) is recommended[21] for real time detection of errors. Audit should preferably be conducted by another personnel with experience in performing medication reconciliation. If possible, the audit should be conducted at least every quarter on a random sample of at least 30 patients for whom medication reconciliation has been performed.

The percentage of patients with incomplete medication reconciliation detected by the audit team in a random sample of patients with medication reconciliation performed, as measured by:

Numerator: No. of patients with incomplete medication reconciliation detected
Denominator: No. of patients in the random sample audit of medication reconciliation

Examples of discrepancies [33,29,35] (i.e. incomplete medication reconciliation) are as follows:

- Omission: Patient reports taking a medication before visit to healthcare professionals e.g. hospitalisation. It was not ordered on admission or it was not listed on the patient's discharge instructions. No clinical explanation supports the omission.
- Commission: A medication that the patient did not take before hospitalisation is ordered at admission and no clinical explanation supports the commission. A medication is listed on the patient's discharge instructions, but it was not ordered during the hospital stay and the patient did not take before hospitalisation with no clinical explanation supports the commission.
- Duplication: More than one entry of the same medication order on patient's discharge instructions or prescription. No clinical explanation supports the duplication.
- Different dosage form, dose, route, or frequency: The dosage form, dose, route, or frequency of medication listed on the patient's discharge instructions are different from what was ordered during the hospital stay or that the patient reports taking before hospitalisation. No clinical explanation supports the difference.

GLOSSARY

Term	Description
Adverse Drug Event	An adverse drug event is defined as any untoward medical occurrence that may present during treatment with a drug but which does not necessarily have a causal relationship with this treatment.
As needed	This term may be used interchangeably with ‘as required’, ‘prn’, ‘when necessary’.
Commission	Commission is an unintentional discrepancy when a medication that the patient did not take before hospitalisation is ordered at admission, or when a medication is listed on the patient’s discharge instructions, but it was not ordered during the hospital stay and the patient did not take before hospitalisation. No clinical explanation supports the discrepancy.
Healthcare Institutions	Healthcare institutions include providers such as hospitals, medical centres, community health centres , nursing homes, clinics and community pharmacy.
High Alert Medications	Medications which bear a heightened risk of causing significant patient harm when used inappropriately.
Investigational Therapeutic Product	An investigational therapeutic product is (a) a therapeutic product; or (b) a placebo, that is to be tested or used as a reference in a clinical trial.
Medication Error	A medication error is any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer.

Term	Description
Medication Reconciliation	Medication reconciliation is a structured and explicit process of creating the most accurate list possible of all medications a patient is taking, with the goal to ensure accurate and complete medication information transfer during transitions of care.
Omission	Omission is an unintentional discrepancy when medication was not ordered on admission or when medication was not listed on the patient's discharge instructions. No clinical explanation supports the discrepancy.
Patient's Medication List	A Patient's Medication List (PML) is the most accurate list possible of prescribed and non-prescribed medications that a patient is taking at the point of creation of the list. It should include medications that are taken regularly, on an 'as needed' basis or temporarily withheld. Medications will also include vitamins, supplements, alternative medications (including herbal and traditional medications) recreational medications (including substances of abuse) and investigational therapeutic product.
Singapore Drug Dictionary	The Singapore Drug Dictionary (SDD) is a collection of concepts, relationships and descriptions, which together describe the medicinal products available in Singapore, at a variety of levels of detail (or 'abstraction').
Undocumented intentional discrepancy	A discrepancy in which the prescriber has intentionally added, changed or discontinued a medication but this decision is not clearly documented. This failure to document may lead to confusion, extra work and potential medication errors.
Unintentional discrepancy	A discrepancy in which the prescriber unintentionally changed, added or omitted a medication the patient was

Term	Description
	taking prior to this visit. Unintentional discrepancies are potential medication errors that can lead to adverse drug events.
Withheld	This term may be used interchangeably with ‘hold’, ‘held off’, ‘suspend’ or ‘pause’.

Abbreviations	Full Term
ADE	Adverse Drug Event
EMR	Electronic Medical Records
G6PD	Glucose-6-phosphate dehydrogenase
HCP	Healthcare Professional
ILTC	Intermediate and Long Term Care
NEHR	National Electronic Health Records
PIL	Patient Information Leaflet
PML	Patient’s Medication List
SDD	Singapore Drug Dictionary

APPENDIX I: REVIEW OF THE NATIONAL MEDICATION RECONCILIATION GUIDELINES

The National Medication Reconciliation Guidelines was first drafted by the National Medication Reconciliation Workgroup under the National Medication Safety Committee (NMSC) in 2015. To ensure operational feasibility, the Guidelines underwent a one-year “in-use” consultation whereby public healthcare institutions were asked to use the guidelines to guide medication reconciliation processes in their respective institutions. Institutions were also requested to provide feedback to further refine the guidelines.

Following which, the Medication Reconciliation Implementation Workgroup under the NMSC that was reconvened in July 2017 reviewed the guidelines and made revisions to the guidelines with the aim of ensuring operational feasibility and providing clarification on several of the feedback obtained

The following were the clarifications made:

a) The processes involved for the medication reconciliation are further refined to comprise of 3 key steps i.e. Collection, Checking and Communication (3Cs) (refer to Section 4);
b) Process and outcome measures were updated following consultation with institutions and NMSC.
c) The recommended PML was updated (refer to Appendix IV and V).

APPENDIX II: RISK FACTORS PREDISPOSING PATIENTS TO ADVERSE DRUG EVENTS

Institutions with different healthcare settings may give different priority to patients with risk factors for adverse drug events (ADEs)[23,24,27] when performing medication reconciliation. Some of the risk factors pre-disposing patients to ADEs (but not limited to) are listed below:

Patient-related factors

a) Age > 65 years old
b) Has medication management issues or need of assistance with taking medications
c) Suspected or reported non-adherence
d) Following up with three or more doctors for multiple co-morbidities

Disease / health status related factors

a) Patient has cognitive impairment
b) Patient has multiple co-morbidities
c) Patient has renal or hepatic impairment or transplant
d) Patient has had multiple hospital admissions
e) Patient has been recently discharged from hospital

Medication-related factors

a) Patient is on five or more chronic medications
b) Patient is taking 12 or more doses per day
c) Patient is on high alert medications or drugs with narrow therapeutic index
d) Patient is on medications requiring therapeutic drug monitoring
e) Patient has a history of significant changes to medication regimen in the last 30 days
f) Patient has a history of medication-related problem or adverse drug event
g) Patient on medication with complex dosing regimen

APPENDIX III: TIPS FOR INTERVIEWING PATIENTS AND CAREGIVERS ABOUT THEIR MEDICATIONS

Medications at Transitions and Clinical Handoffs (MATCH) Toolkit for Medication Reconciliation [28]

1. Introduce yourself to the patient and/or caregiver, and explain the purpose of the visit/consultation.
2. Use both open-ended questions (e.g. “What do you take for your high cholesterol?”) and closed-ended questions (e.g. “Do you take medication for your high cholesterol?”) during the interview.
3. Ask patients and/or caregivers about routes of administration other than oral medication (e.g. “Do you put any medications on your skin?”). Patients often forget to mention creams, ointments, lotions, patches, eye drops, ear drops, nebulisers, and inhalers.
4. Ask patients and/or caregivers about what medications they take for their medical conditions (e.g. “What do you take for your diabetes?”).
5. Ask patients and/or caregivers about the types of doctors that prescribe medications for them (e.g. “Does your ‘arthritis doctor’ prescribe any medications for you?”).
6. Ask patients and/or caregivers about when they take their medications (e.g. time of day, week, month, as needed, etc.). Patients often forget to mention infrequent dosing regimens, such as medication taken once a month.
7. Ask patients and/or caregivers if their doctor recently started them on any new medication, stopped medications they were taking, or made any changes to their medications.
8. Asking patients and/or caregivers to describe their medication by color, size, shape, etc., may help to determine the dosage strength and formulation. Calling patients’ pharmacists or prescribers may be helpful to determine the exact medication, dosage strength, and/or directions for use.
9. For inquiring about non-prescription drugs, prompts may be helpful such as:
    a) What do you take when you get a headache?
    b) What do you take for allergies?
    c) Do you take anything to help you fall asleep?

d) What do you take when you get a cold?
e) Do you take anything for heartburn?

10. On rare occasions whereby it may not be possible to get a full history from an unwell or uncooperative patient who may still require a prescription to be written, every effort should be made to ensure such a prescription is safe and appropriate to the needs of the patient and that a full history is obtained at the earliest opportunity. Details of the exceptional circumstances and subsequent decision to treat must be recorded in the patient's clinical records.

APPENDIX IV: SAMPLE PML TEMPLATE (PATIENT COPY)

Patient's Medication List

Reviewed By: HCP name (Healthcare Institution)
Date: 18 Aug 2018 19:09

Name: XXX (S1234567A)

DOB/Age: Gender/Race:

Drug Allergy: G6PD Deficiency:

Patient's Medication List

This is not a prescription and should not be used for buying medications.
This is a list of your medication(s). Please provide this list to your healthcare professional at your next visit.

Reviewed upon: Admission/ Discharge/ Transfer/ Outpatient (Pre-consultation)/ Outpatient / Home Visit
Source of Medication List: Patient and/or caregiver Interview/ Clinical Records/ Physical Medications/ Other HCPs

	Route	Medication Name	Instructions	Used For*	Other Instructions
1.	Take by mouth	Candesartan 8mg tablet	1 tablet every morning	High blood pressure	
2.	Take by mouth	Prednisolone 5mg tablet	3 tablets every morning	Inflammation	Take for 1 week from 18 Aug 2018 to 24 Aug 2018.
3.	Take by mouth	Prednisolone 5mg tablet	2 tablets every morning	Inflammation	THEN Take for 1 week from 25 Aug 2018 to 31 Aug 2018.
4.	Take by mouth	Paracetamol 500mg tablet	2 tablets four times daily when required.	Fever	Take when required for fever.
5.	*Take by mouth*	*Metformin Hydrochloride 500mg tablet*	*1 tablet 3 times daily*	*Diabetes*	***Status: Pause*** *Stop medication for 48 hours after CT scan. Restart on 20 Aug 2018.*

Notes to Patient (optional): Take note of the change in dose for candesartan (Reduced from 16mg to 8mg, 1 tablet every morning).

The information here is accurate as of the date of creation and is meant to serve as a guide. Update your PML whenever there are changes to your medications. Please consult the relevant healthcare professional if any clarification is required.

*currently mandatory for medications taken ‘as needed’

APPENDIX V: SAMPLE PML TEMPLATE (HEALTHCARE PROFESSIONAL COPY)

Patient's Medication List
(Healthcare Professional Copy)

Reviewed By: HCP name (Healthcare Institution)
Date: 18 Aug 2018 19:09

Name: XXX (S1234567A)

DOB/Age: Gender/Race:

Drug Allergy: G6PD Deficiency:

Patient's Medication List (Healthcare Professional Copy)

Reviewed upon: Admission/ Discharge/ Transfer/ Outpatient (Pre-consultation)/ Outpatient / Home Visit
Source of Medication List: Patient and/or caregiver Interview/ Clinical Records/ Physical Medications/ Other HCPs

	Route	Medication Name	Instructions	Indication*	Other Instructions	Reasons for change/ Remarks
1.	Oral	Candesartan 8mg tablet	8mg OM	High blood pressure		Reduced from 16mg to 8mg, as patient was unable to tolerate 16mg dose. Monitor patient's BP during next visit.
2.	Oral	Prednisolone 5mg tablet	15mg OM	Inflammation	Take for 1 week from 18 Aug 2018 to 24 Aug 2018.	
3.	Oral	Prednisolone 5mg tablet	10mg OM	Inflammation	THEN Take for 1 week from 25 Aug 2018 to 31 Aug 2018.	
4.	Oral	Paracetamol 500mg tablet	500mg QDS PRN	Fever		
5.	*Oral*	*Metformin Hydrochloride 500mg tablet*	*500mg TDS*	*Diabetes*	***Status: Pause*** *Stop medication for 48 hours after CT scan. Restart on 20 Aug 2018.*	

Notes to Patient (optional): Take note of the change in dose for candesartan (Reduced from 16mg to 8mg, 1 tablet every morning).

Notes for HCP: NA

*currently mandatory for medications taken ‘as needed’

Notes to HCP (optional): _____

Medication Management Issues: Difficulty in managing medications/Adherence issues/Medications requiring therapeutic monitoring/ Others (optional):

_____

Interventions (optional): _____

Assessment of medication knowledge (optional):

_____

Monitoring plan (optional):

_____

APPENDIX VI: KEY SKILLS REQUIRED FOR MEDICATION RECONCILIATION

The following are key skills required for medication reconciliation[31,32,33]:

a) Effective communication skills

This skill is important for HCPs involved in medication reconciliation which relies on the accurate transfer of information about a patient's medication.

b) Technical knowledge of relevant medication management processes

This may include local medication documentation policies (e.g. discharge prescriptions, case note entries, allergy status recording etc); the local procedures for patients bringing their own medication into hospital with them; how repeat prescriptions work; monitored dosage systems; and other forms of documenting medication use.

c) Therapeutic knowledge

Some steps in the medication reconciliation process might require detailed therapeutic and clinical knowledge. This may include:

i. An up-to-date knowledge of brand and generic names of commonly used medication; the form in which they are available
ii. Their indications and common dosing instructions
iii. An ability to correctly interpret a prescription, including dosage
iv. A basic understanding of what the medication is intended to do and how it works

d) Skill to interview patients and/or caregivers about their medications

Patient and/or caregiver interview is the most valuable source of information to confirm the actual medications taken by the patient at the point in time. As such, HCPs should master the skill to interview patients and/or caregivers. Tips for interviewing patients and/or caregivers about their medications outlined in Appendix IV: Suggested tips for interviewing patients and caregivers about their medications[28].

e) Critical thinking process to identify and clarify discrepancies

In the course of performing medication reconciliation, HCPs may encounter discrepancies when comparing medication lists. The HCPs should apply critical thinking process to determine whether clarification with prescribing doctor is required. Examples of critical thinking can be found in Table 1:

Table 1: Critical Thinking Process to Identify and Clarify Discrepancies during medication reconciliation (adapted from Medications at Transitions and Clinical Handoffs (MATCH) Toolkit for Medication Reconciliation)

Category	Description	Example	Action Required? (Yes/No)
No discrepancy	Medications ordered for the patient during the episode of care or upon discharge match what the patient was taking prior to admission.	• Patient takes frusemide 40 mg by mouth twice daily at home, which is ordered upon admission. • Patient's pre-admission dose of simvastatin by mouth every evening is continued during the hospital stay and at discharge.	No
Undocumented Intentional Discrepancy (i.e., purposeful)	Discrepancies exist but are appropriate based on the patient's plan of care (e.g. based on information gathered on rounds, based on a review of the medication history and physical and progress notes, based on communication/ handoffs in preparation for discharge).	• Antibiotics started for infection. • "As needed" medications ordered for pain/fever. • Pre-admission doses of patient's blood pressure medications were changed due to hypotensive episodes. • Warfarin and aspirin withheld for a procedure.	No clarification with prescriber needed. Document information supporting the intentional discrepancy.
Unintentional Discrepancy	Discrepancies exist and require clarification of intent because there is no supporting documentation of explanation based on the patient's current clinical condition or care plan.	• Patient takes her blood pressure medication twice daily at home but ordered only once daily in the hospital. No indication for frequency change and patient's current blood pressure slightly elevated. • Patient's simvastatin was omitted from their discharge instructions without any clear indication for why.	Yes— discrepancy should be highlighted to prescriber for resolution and documentation.

APPENDIX VII: STRATEGIES TO SOLICIT PATIENTS AND CAREGIVERS INVOLVEMENT IN MEDICATION RECONCILIATION

To solicit patients and caregivers' involvement in medication reconciliation, HCPs should[32]:

a) Educate patients and/or caregivers on the importance of medication reconciliation and the use of PML to achieve medication safety;
b) Provide patients and/or caregivers with verbal and written information on the medications to be taken and discontinued, any new medications which have been started and any changes in dosages of the current medications. HCPs should take time to address any potential confusion associated with changes in medications that occurred during an episode of care e.g. change of brand name;
c) Provide patients and/or caregivers with updated PML, Patient Information Leaflet (PIL) on the new medication;
d) Provide patients and/or caregivers with information on the medications in the PML, and training on self-administration of new medications (e.g. inhalers, insulin); and
e) Evaluate or assess patients' and/or caregivers' level of understanding of the medications using the "teach-back" method. Patients' and/or caregivers understanding is confirmed when they can restate in their own words the information learnt from the HCP.

APPENDIX VIII: DATA COLLECTION FORMS AND INDICATOR DETAILS FOR ACUTE CARE HOSPITALS

For acute care hospitals, sample data collection form for the percentage of patients with medication reconciliation performed are provided in Table 1a-b, definition and details of the indicators are provided in Table 2.

Table 1a: Data on medication reconciliation performed upon admission

Data item	**Admission Period**		
	Month/Year	**Month/Year**	**Month/Year**
Denominator: Number of inpatient admissions			
Numerator: Number of patients with medication reconciliation performed within 48 hours of admission			

Table 1b: Data on medication reconciliation performed upon discharged

Data item	**Admission Period**		
	Month/Year	**Month/Year**	**Month/Year**
Denominator: Number of inpatient discharges			
Numerator: Number of patients with medication reconciliation performed upon discharge			

Table 2. Definition and details of the indicator

Definitions:
Percentage of Medication Reconciliation Performed (based on 3 key processes i.e. collection, checking and communication) (i) Within 48 hours upon admission; and (ii) Upon discharge. '48 hours' is counted from: Start time: Time the patient was admitted for that episode End time: Time medication reconciliation was performed 'Upon discharge' is counted within 48 hours before patient is discharged.

Denominator 1a	
Definition:	Number of inpatient admissions
Inclusion:	Patients admitted as inpatient
Exclusion:	Cases with Length of Stay <24 hours Cases admitted and discharged directly from Short Stay Ward
Numerator 1a	
Definition	Number of patients with medication reconciliation performed based on the 3 key processes (3Cs) (i.e. collection, checking and communication) within 48 hours upon admission.
Denominator 1b	
Definition:	Number of inpatient discharges
Inclusion:	Patients admitted as inpatient
Exclusion:	Cases with Length of Stay <24 hours Cases admitted and discharged directly from Short Stay Ward Cases who pass away
Numerator 1b	
Definition:	Number of patients with medication reconciliation performed based on the 3 key processes (3Cs) (i.e. collection, checking and communication) upon discharge.
Further details	
Unit of measure:	%
Desired direction:	↑
Risk-adjustment:	No

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