

**Issues in Medication Management  
Relevant to Long-Term Care in Ontario:  
A Brief Review of the Literature**

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<b>Topic</b>	<b>Page</b>
<b>Executive Summary</b>	<b>2</b>
<b>Objectives and Methodologies</b>	<b>3</b>
<b>Introduction</b>	<b>5</b>
<b>Legislative/Regulatory Overview</b>	<b>9</b>
<b>Medication Errors</b>	<b>15</b>
<b>Systemic Interventions</b>	<b>16</b>
<b>Potential Technological Solutions</b>	<b>20</b>
<b>Examples of the Use of Two High-Alert Medications in Long Term Care:</b>	<b>22</b>
○ <b>Warfarin</b>	
○ <b>Insulin</b>	
<b>References</b>	<b>30</b>

## **Executive Summary**

This document was written as part of the Task Force on Medication Management in Long-Term Care, in response to recommendations made by the Auditor General to the Ministry of Health and Long-Term Care. The current state of the medication use system in the long term care setting is reviewed along with a description of the legislative/regulatory infrastructure that exists to support the system. A lack of consistency with the definition of medication error and when they occur within the medication use system is identified. Both systemic changes such as the culture of the home and available technological interventions to help improve the overall resident safety within the homes are reviewed. Excerpts from ISMP Canada reports on two high-risk medications, warfarin and insulin, are provided to describe the deficiencies and potential interventions specific to these two medications, in the long term care setting.

## **Objectives**

This paper endeavors to identify the current medication use practices in the long term care setting and its shortcomings as it relates to patient or resident safety. The direction of this paper is taken from the Auditor General's Report that outlined areas for improvement in the sector.

The objectives of this research are as follows:

1. To understand the current scene (standing orders, informed consent, definition etc.) of medication management in long term care homes;
2. To understand the legislative infrastructure and recognize the shortcomings of medication error reporting in the current state;
3. To identify potential system and technological interventions to reduce the rate of medication errors in long term care homes.

## **Methodologies**

The following methodologies were employed to gather relevant information on each topic:

### ***Legislation***

Enabling legislation and regulations were identified through the use of the MOHLTC Manual for long-term care homes. Relevant provisions were then cited utilizing the Canadian Legal Information Institute's website (<http://www.canlii.org>).

### ***Definitions***

The Google search engine was used to identify definitions of medication error using the keywords: DEFINITION, MEDICATION, ERROR, and their associated derivatives. The results were subsequently limited to either definitions that were national in scope for countries outside of Canada. Any available definitions within Canada were included in the results.

### ***Medication Error Prevention and Management***

MEDLINE was searched using the following search terms, limited literature from the past 10 years.

- Long Term Care
- Nursing Homes
- Medication
- Medication Systems

- Medication Errors (limit to “adverse drug reactions” and “prevention and control”)
- Best Practice
- Pharmaceutical Preparations
- Medical Directives
- Standing Orders
- Technology
- High-Risk Medications

The Medline search engine was used to obtain articles on the use of information technology for medication management in the long-term care setting through the use of the following keywords used as both MESH headings and as text contained within abstracts: MEDICATION ERROR, LONG-TERM CARE. This provided the maximum number of citations as both utilization of these terms in the thematic sense and as simple text occurring within abstracts was achieved. These results were then limited to articles focusing on the use of technology in addressing medication errors.

In addition, a Google search using the keywords: MEDICATION, TECHNOLOGY, and LONG-TERM CARE, was conducted to locate webpages concerning this topic. These results were then filtered to exclude commercial webpages, such that information provided by long-term care associations and/or government institutions was retained.

1. A similar Medline methodology to that utilized for objective number three was employed using the keywords INFORMED CONSENT and LONG-TERM CARE.
2. A similar Medline methodology to that utilized for objective number three was employed using the keywords STANDING ORDERS and LONG-TERM CARE.

## 1. Introduction

Ten years ago, 12% of Canadians were 65 years of age or older. By the year 2035, that proportion is expected to reach almost one-quarter of the population. (CIHI pg 16)<sup>1</sup> Long term care homes in Ontario care for approximately 75,000 residents, most of who are over the age of 65. These homes generally provide services (including care) and accommodation to individuals around the clock.<sup>2</sup>

Residents of long-term care homes are primarily comprised of the most fragile of the older patient group. As a result of their comorbid medical conditions and multiple medications, it is this patient population that is at most risk for medication-related problems, including medication errors and related adverse drug reactions. Research has shown that over half the cases of preventable medication errors result in an adverse drug reaction. In the late 1990's, the estimated cost of hospitalization due to adverse drug events was \$2013 US, although other estimates peg the cost to be higher<sup>3</sup>.

Medication errors are reported to affect over 1.5 million Canadians per year. The Canadian Institute for Health Information (CIHI) reports that one in ten patients receive the wrong medication, or the wrong dose while in hospital<sup>4</sup>. Unfortunately, it is estimated that only about 5% to 10% of medication errors that result in harm are actually reported<sup>5</sup>.

## 2. The Current Medication Use System

The medication use system in long term care (LTC) is not unlike those found in the community or acute care settings, although there are some differences in how the processes are played out (e.g., dispensing also includes delivery to the home). Table 1 outlines and describes the steps involved in medication management from the perspective of a LTC facility. Medication errors can occur throughout the medication management process and are a function of the

**Table 1 - Processes in Medication Management in LTC<sup>6</sup>**

Process	Description / Notes
Prescribing	Encompasses a treatment decision and ordering of an appropriate drug dose and strength of tablet for a resident.
Transcribing	Usually refers to the process where the prescription is transferred to a medication administration record in a hospital or LTC setting.
Dispensing	Occurs when the correct medication strength and amount to be given as per the physician's prescription is confirmed and medication provided. Depending on the setting, this may be done by pharmacy technicians independently, under the supervision of pharmacists, or by pharmacists independently. The process of

	delivering the medications to the facility from the pharmacy is included in this step.
Administering	Occurs when a caregiver gives the patient their prescribed dose of medication or the act of giving oneself medication. In the LTC setting, the nurse provides the appropriate dose of prescribed medication to the resident.
Monitoring	Review of the prescribed dose, administered dose, laboratory results and patient physical findings to ensure that the appropriate dose of medication is being prescribed and/or taken. Future dosage changes are made based on patient response as well as pertinent laboratory values.
Educating	The transfer of knowledge related to medications to empower the patient/caregiver, resulting in a higher degree of involvement in the patient's care and better informed decisions.

The characteristics of LTC residents make them particularly susceptible to changes in their medication regimen, whether they are intentional or not. Harm can occur with the initiation of a new drug, after dosage changes, with drug substitutions or after inadvertent discontinuation. At the time of hospital admission and upon return to the LTC home, dose changes and discontinuation often occur. In a study of 87 residents in LTC homes, Boockvar et al demonstrated that 86% of transfers from the home to the hospital result in the alteration of at least one medication. Sixty-five percent of the changes were discontinuations, with dose changes and substitutions rounding off the remainder. Going back to the home, 64% of transfers had at least changes in one medication, with 57% being discontinuations and 21% dose changes. Interestingly, 21% of changes at readmission to the home were reversions of medications and/or doses back to the resident's baseline before hospital admission. Boockvar et al noted that adverse drug reactions occurred 20% of the time when medications were changed and most occurred after returning to the nursing home. However, the authors noted that in their study, they were not able to ascertain whether the changes that occurred were intentional or accidental and that only adverse events that occurred upon admission (and not in emergency) were evaluated<sup>7</sup>.

The overall safety of a LTC home's medication use system is the central concern of this paper. Homes have an opportunity to evaluate their medication use system from a safety perspective using ISMP's Medication Safety Self Assessment (MSSA) for Long Term Care tool. The process highlights areas (key elements or contributing factors) in which homes fare well as well as opportunities for improvement within the system. Each key element may be further broken down into core characteristics that make up each element. Identified areas of vulnerabilities help the home target

specific processes to improve the overall safety of their medication use system. Table 2 highlights the key elements that are evaluated as part of the MSSA process<sup>8</sup>.

**Table 2 - Key Elements within the MSSA for LTC<sup>8</sup>**

Key Element	Core Characteristics
I Resident Information	#1 – Essential resident information is obtained, readily available in useful form, and considered when prescribing, dispensing and administering medications.
II Drug Information	#2 – Essential drug information is readily available in useful form and considered when ordering, dispensing and administering medications.
	#3 – Where applicable, a drug formulary system is followed (e.g., provincial, national or payee) to limit the choice to essential drugs, minimize the number of drugs with which practitioners must be familiar, and provide adequate time for designing safe processes for the use of new drugs added to the formulary.
III Communication of Drug Orders and Other Drug Information.	#4 – Methods of communicating drug orders and other drug information are standardized and automated to minimize the risk for error.
IV Drug Labelling, Packaging, and Nomenclature	#5 – Strategies are undertaken to minimize the possibility of errors with drug products that have similar or confusing manufacturer labeling/packaging and/or drug names that look and sound alike.
	#6 – Clear and readable labels that identify drugs clearly are on all drug containers, and drugs remain labelled up to the point of actual drug administration.
V Drug Standardization, Storage, and Distribution	#7 – IV solutions, drug concentrations, doses and administration times are standardized wherever possible.
	#8 – Drugs are delivered to care units in a safe and secure manner and available for administration within a time frame that meets essential resident needs.
	#9 – Medications stocked in the Home/facility are limited and securely stored.
	#10 – Hazardous chemicals are safely sequestered from residents and not accessible in drug preparation areas.
VI Medication Delivery Device Acquisition, Use and Monitoring	#11 – The potential for human error is mitigated through careful procurement, maintenance, use, and standardization of medication delivery devices.

VII Environmental Factors	#12 - Medications are prescribed, transcribed, prepared, dispensed and administered in a physical environment that offers adequate space and lighting and allows practitioners to remain focused on medication use without distractions.
	#13 – The complement of qualified, well-rested practitioners matches the clinical workload without compromising resident safety.
VIII Staff Competence and Education	#14 – Practitioners receive sufficient orientation to medication use and undergo baseline and annual competence evaluation of knowledge and skills related to safe medication practices.
	#15 – Practitioners involved in medication use are provided with ongoing education about medication error prevention and the safe use of drugs that have the greatest potential to cause harm if misused.
IX Resident Education	#16 – Residents or their substitute decision makers are included as active partners in care through education about the medications and ways to avert errors.
X Quality Processes and Risk Management	#17 – A non-punitive, system-based approach to error reduction is in place and supported by the Home’s administration team.
	#18 – Practitioners are stimulated to detect and report errors, and multidisciplinary teams regularly analyze errors that have occurred within the Home and in other Homes or healthcare facilities for the purpose of redesigning systems to best support safe practitioner performance.
	#19 – Simple redundancies that support a system of independent double checks or an automated verification process are used for vulnerable parts of the medication system to detect and correct serious errors before they reach residents.
	#20 – Proven infection control practices are followed when storing, preparing and administering medications.

The aggregate scores from 33 Ontario homes in the 2007-2008 fiscal year indicated that the areas identified as opportunities for improvement within Ontario homes were<sup>9</sup>:

1. Quality Processes and Risk Management - indicating a culture and system within the home that does not support error detection, reporting and analyses.
2. Resident Information - indicating significant lapses in resident information sharing, especially around the time of transfer.



3. Drug Information – indicating the accessibility to reliable drug information during the medication use process.
4. Communication of Drug Orders and Other drug Information – indicating poor standardization of processes to communicate drug orders

### **3. Legislative/Regulatory Overview**

This section will describe the overall regulatory as well as Ministry requirements of LTC homes related to medication safety in the Home. The standards related to pharmacists and pharmacies servicing LTC homes are also briefly described.

#### **3.1. Legislative Infrastructure**

In Ontario, long term care homes are categorized in one of the following categories<sup>2</sup>:

- For profit nursing homes
- Not-for-profit nursing homes
- Charitable homes
- Municipal homes

Three regulations constitute a requirement for long-term care homes to provide medication error reporting to the Ministry: the Nursing Homes Act; the Homes for the Aged and Rest Homes Act; and the Charitable Institutions Act<sup>10-12</sup>. The enabling statutes for these regulations are replaced by the *Long-Term Care Homes Act 2007*; however its associated regulations have not been fully developed. Hence during this transition period the previous regulations cited below are still in force. It is reasonable to assume that similar regulations will be created in conjunction with the new Act.

Each of the regulations (in their own specific way) state the following that “an injury in respect of which a person is taken to a hospital” or “a death resulting from an accident or an undetermined cause” needs to result in a prompt report to the Director regarding the incident<sup>10-12</sup>.

It follows then, that a report then would be expected of any medication error resulting in the resident being transferred to a hospital for appropriate care or death. The MOHLTC Long-Term Care Homes Program Manual specifically states that a medication error resulting in an adverse reaction causing hospitalization is required to be reported to the Ministry within ten business days<sup>13</sup>.

### 3.2. Pharmacy Services to Long Term Care Homes

The Auditor General's report found significant differences in the levels of service provided by contracted pharmacies to the audited Homes<sup>2</sup>. Table 3 outlines the Ontario College of Pharmacists (OCP) standards for pharmacists providing services to LTC facilities.

**Table 3 – OCP Standard 1 for Pharmacists Providing Service to LTC Homes<sup>14</sup>**

<b>Standard 1 – Clinical Services</b>	
1.1	The pharmacist communicates using effective and appropriate skills / tools to the relevant long-term care facility staff member (s), resident and/or agent of the resident.
1.2	The pharmacist utilizes various documentation tools as evidence of such communication.
1.3	The pharmacist participates in clinical activities relevant to the provision of drug therapy for the purpose of optimizing patient care. Activities may include but are not limited to, a comprehensive medication review and drug utilization reviews.
1.4	The pharmacist participates in educating members of the interdisciplinary team, residents and/or agents on drug therapy or medication use.
1.5	Continuous Quality Management
1.5.1	The pharmacist promotes safe medication practice and participates in the development, implementation and evaluation of these practices.
1.5.2	The pharmacist participates in the review of medication related incidents* and provides recommendations to prevent recurrence.

According to OCP, the purpose of the Standards for Pharmacists Providing Services to Licensed Long Term Care Facilities (Standards for LTC) is to identify the level of pharmacy services required to ensure the safe and effective use of medications that will improve the quality of life of the long-term care resident. The Standards for LTC represent those pharmacy functions that are the responsibility of the pharmacist providing the service. The Standards for LTC do not stand alone but focus on a special area of care. These standards are utilized in conjunction with the Standards of Practice, the Standards of Practice for Pharmacy Managers, the Code of Ethics and the Ontario College of Pharmacists (OCP) Documentation Guidelines. The pharmacist works in conjunction with the resident and/or resident's agent and the interdisciplinary care team to determine residents' needs, and what care should be provided by the pharmacist to meet these needs through the responsible provision of drug therapy. The pharmacist acts as a resident advocate for the pharmaceutical aspects of resident care<sup>14</sup>.

These standards of practice, do not however, address the shortcomings noted in the Auditor General's report. It states that in the contract with the pharmacy, each long term care facility should "specify the type and frequency of procedures the pharmacy is to perform, as well as reporting methods to be used, with respect to assessing the home's compliance with medication-related policies"<sup>2</sup>. In order to address this, the LTC Home contract with pharmacies should have expectations of the different services provided as well as the level of service.

### **3.3. Informed consent**

The Ministry of Health and Long Term Care describes Long Term Care residents' rights to be treated respectfully and compassionately<sup>15</sup>. One of these rights is the right to be informed of one's medical condition and treatment<sup>15</sup>. Being informed of one's treatment allows the resident, family member or substitute decision maker to make informed choices. Patients who are more knowledgeable about and intimately involved with the medications they are taking act as a last barrier to medication errors and related adverse drug reactions<sup>16</sup>. However, residents of long term care homes are often not in the position to be actively involved in their medication regimens due to cognitive or other health problems. In these instances, family members or other advocates take on this role. But in the absence of these individuals in these cases, this layer of protection is eliminated. When a new medication is initiated, consent needs to be obtained from the resident or a substitute decision maker. The Auditor General's report indicated that this does not always occur or is not documented appropriately, indicating most likely a lack of education about the medication as well as the basic knowledge that the resident is taking the drug.

The resident also has the right to refuse treatment if he/she so wishes. In certain situations, such as emergencies, informed consent does not need to be obtained. The Auditor General's Report identified difficulties in obtaining informed consent from residents or surrogate decision-makers for administration of medication to residents in long-term care homes. These difficulties were of a practical nature, including problems in contacting the surrogate by telephone in a timely manner.

Unfortunately, the literature does not speak significantly to this issue per se, as the majority of the medical/legal literature addresses issues related to capacity for decision-making on behalf of long-term care residents and the appropriateness of surrogate decision-making. However,

Butterworth suggests an approach to “ongoing consent” that may be particularly useful for addressing issues in timely context of surrogate decision-makers<sup>17</sup>.

Butterworth emphasizes the importance of developing a care plan with residents of long-term care homes that explores the different kinds of care that a resident wishes to receive<sup>17</sup>. This process of categorization could equally be employed in obtaining advance consent from surrogate decision-makers to avoid the kind of problems identified by the Auditor General.

Whether well-articulated care plans are generally developed by long-term care homes in Ontario that would alleviate the concerns of the Auditor General is unknown to this author. However it would seem that if this is not the case, perhaps the informed consent process utilizing a substitute decision-maker should contemplate a more categorical approach. Hopefully this could be employed to address concerns regarding the use of common medications, and in the interests of addressing the use of medication with a greater potential for harm perhaps the possibility of advanced/contingent consent could be explored.

#### **3.4. Standing Orders in Long-Term Care**

Standing orders for medications are often authorized by the prescribing physician upon admission into a Home. These orders generally include drugs such as acetaminophen (for pain) or dimenhydrinate (for nausea). Medications on the standing order list can be administered, if in the opinion of the nurse, the resident requires treatment. The physician has the option to remove items from the standing order (i.e., for allergies)<sup>2</sup>.

The concern brought up by the Auditor General is that Ministry requirements regarding standing orders in long term care homes lack standards (i.e., length of time that the standing order can be carried out before contacting the physician)<sup>2</sup>. This leaves the details of what is incorporated into policy up to the individual Home.

The issue of standing orders in long term care has not been addressed by the literature outside the context of vaccinations for influenza in the event of an outbreak. Accordingly, regarding the Auditor General's concern that a standing order might be inappropriately implemented by a nursing staff member, it is not possible from the perspective of the literature to gain insight into how this problem can potentially be addressed.

### 3.5. Definition of Medication Error

The Institute of Medicine, in its 2006 report Preventing Medication Errors suggests that medication errors are likely underreported<sup>6</sup>. One of the contributing factors to this is the lack of consistency in the definition of a medication error. A brief review of the definition of medication errors from select organizations that impact medication reporting systems is presented below:

#### **MOHLTC Compliance Review Monitoring Tool**

The monitoring tool for review of resident care and services highlights medication errors in one section. The tool doesn't directly define a medication error, but defines "a risk or negative outcome" as "any errors in the administration of medications requiring medical intervention, and/or a pattern of errors"<sup>18</sup>.

#### **National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP (US))**

The Council defines a "medication error" to be "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. Such events may be related to professional practice, health care products, procedures, and systems, including prescribing; order communication; product labeling, packaging, and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use"<sup>19</sup>.

#### **Institute for Safe Medication Practices (ISMP (Canada & US))**

The above NCCMERP definition is used by ISMP<sup>20</sup> but has not been specifically tailored for use in the Long-Term Care (LTC) setting.

#### **College of Nurses of Ontario (CNO)**

"Medication errors are defined as preventable events associated with the prescribing, transcribing, dispensing and/or administering and distribution of medication(s). Medication errors can be further classified into errors of commission (e.g., giving the wrong medication) and errors of omission (e.g., not administering an ordered medication), which can result in<sup>21</sup>.

- an adverse drug event resulting in harm or injury;
- a "near miss" where an error does not reach the client, but had it, client harm could have resulted (e.g., a wrong dose is prescribed, but is intercepted before administration); or
- a client's near or actual death."

### **National Association of Pharmacy Regulatory Authorities (NAPRA)**

NAPRA distinguishes between medication discrepancies and medication errors. Medication discrepancies are identified as “potential errors, which do not reach the patient”. Medication errors are situations “in which the patient actually receives the erroneous prescription”<sup>22</sup>.

### **Ontario College of Pharmacists (OCP)**

Similar to NAPRA, OCP also distinguishes between events that do and do not reach the patients. They define a medication discrepancy as an event which does not involve the actual administration of a drug to a patient, but where an error in the medication process has been detected and corrected before reaching the patient. On the other hand, medication error (may also be referred to as a medication incident) is an event, which involves the actual prescribing, dispensing, delivery or administration of a drug or the omission of a prescribed drug to a patient<sup>23</sup>.

Other organizations such as the Alberta College of Pharmacists define medication error to include both drug discrepancies and drug incidents (event reached the patient)<sup>24</sup>.

As can be seen through the different definitions, there is a lack of standard terminology, which creates confusion among the front-line workers. This lack of standardization is a contributing factor in the low rate of medication incident reporting.

#### 4. Medication Errors

Each medication use system stage is susceptible to errors. Prescribing errors are usually more difficult to detect as prescribing errors as orders are not generally questioned, unless there is a blatant error (e.g., ordering a drug dosage that cannot be administered given the available dosage forms). These types of errors encompass errors in medication use, drug selection, dosage, frequency, route, or duration.

Transcribing errors can easily occur if there is ambiguity in the prescription or the handwriting is difficult to read, in addition to the actual errors in transcribing the order.

Dispensing usually occurs in the pharmacy contracted to the long term care home. Some pharmacies deal strictly with long term care homes and their physical set up is different from community pharmacies that handle homes as part of the overall community clientele. Errors can occur during the entering of orders into the pharmacy's computer system, the selection of the drug from the shelf, the determination of how many units to dispense or the labeling of the blister pack or vial.

Once the medication is delivered to the long term care home, the resident's medications are stored and retrieved when it is time for administration of the drug. Selection of an incorrect drug or dosage, administration via a different route, administration at an incorrect time, administration to the wrong patient or omission of an order altogether are some of the errors that can occur during the administration process.

Monitoring of drug effects is the responsibility of all health care professionals who care for the patient, especially the nurses, doctors and pharmacists. Missed orders for appropriate laboratory (e.g., international normalized ratio for patients on warfarin to measure the drug's effects) or culture and sensitivity follow-up, omissions for physical symptom monitoring or errors in ascertaining the patient situation (e.g., missed doses not accounted for, resulting in a dosage increase because of a lack of effect) are all examples of breakdowns in the monitoring process.

Gurwitz et al in a large study of adverse drug reactions in the LTC setting, determined that more than 50% of events that occur can be prevented. Monitoring errors contributed to 70% of these events<sup>25</sup>.

An US-based consensus group of geriatric specialists (physicians, pharmacists and advanced practitioners) developed a consensus list of signals to detect potential adverse drug reactions in the LTC setting. The authors quote an ADR incidence rate of 1.19 to 7.26 incidents per 100 resident-months<sup>26</sup>.

The investigators attempted to develop a consensus list of laboratory, pharmacy and Minimum Data Set (MDS) signals that would be detectable using a computer-based program. A total of 40 signals achieved consensus. There were 15 combination laboratory-medication signals, 12 medication concentration signals, 10 antidote signals, and three Resident Assessment Protocol (RAP) signals<sup>26</sup>.

The six signals that achieved the greatest consensus were<sup>26</sup>:

1. Hypoglycemia in an individual on a drug that can cause/worsen hypoglycemia
2. Supratherapeutic INR in an individual taking warfarin
3. Naloxone given to an individual taking an opioid
4. Phytonadione (vitamin K) given to an individual taking warfarin
5. Dextrose 50%, glucagons or liquid glucose given to an individual taking a drug that can cause/worsen hypoglycemia
6. Falls RAP is triggered in an individual taking a drug that can cause/worsen falls

This consensus can be helpful also in homes without the technology infrastructure (i.e., computerized medication system). Use of a paper-based trigger tool has been successfully used<sup>26</sup>.

To make any effective change it is important to identify and understand the underlying reason or root cause of the error. To determine the root cause, an analytical tool called the Root Cause Analysis (RCA) Framework can be used to perform a system-based evaluation of incidents. The Framework will help identify the root causes as well as any contributing factors that resulted in the event. RCA determines what exactly happened, why it occurred and what steps can be taken to reduce the future incidence of the error<sup>27</sup>.

## **5. Systemic Interventions**

### **5.1. Long Term Care Home Culture**

The MSSA for LTC aggregate results indicated that one of the top opportunities for improvement in Ontario LTC homes is bringing safety to the forefront in the home's culture.

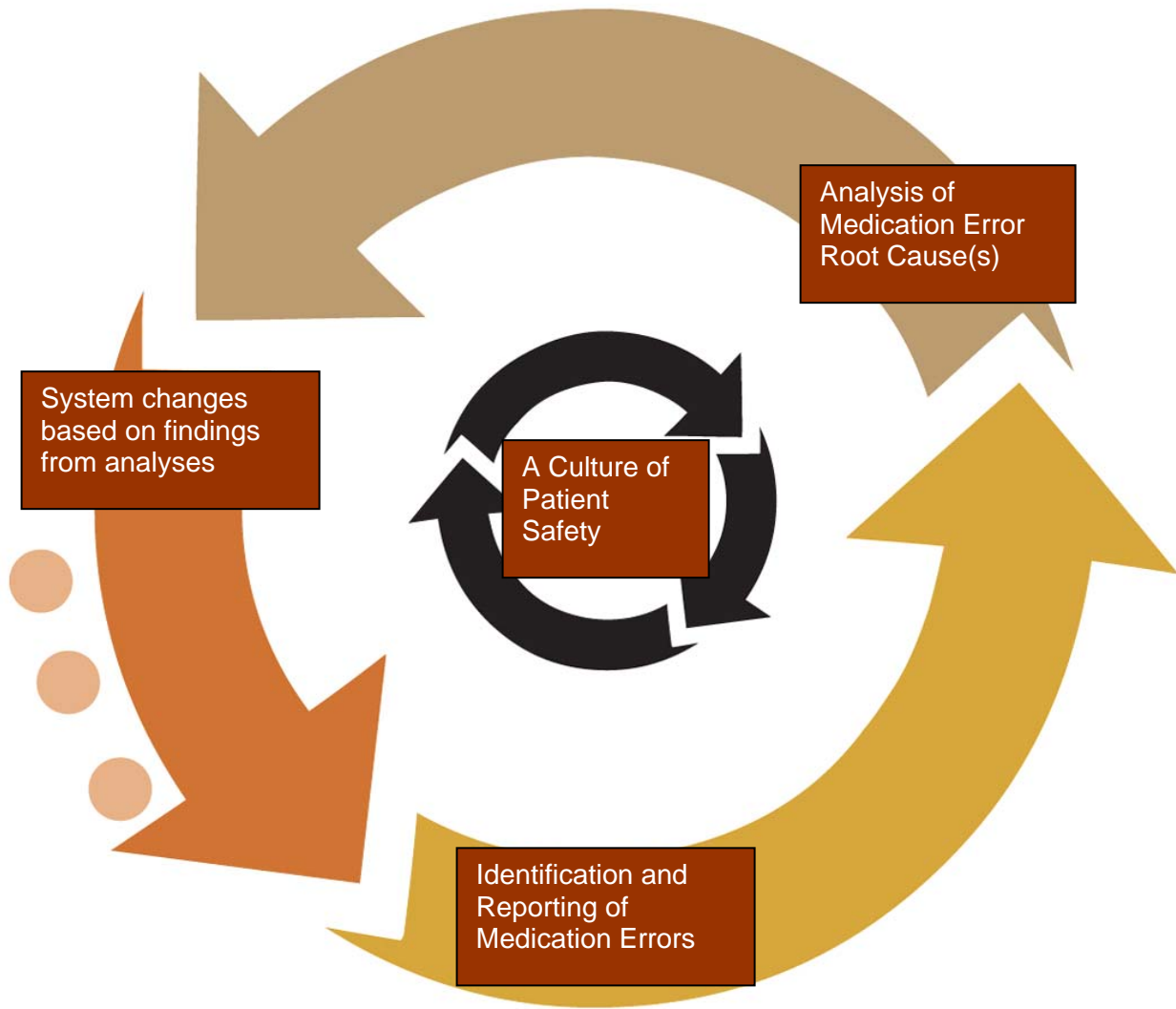
Homes that harbour a culture of blame in which individuals involved in an event are penalized or punished, are much less likely to have front-line staff come forward in reporting medication errors. These facilities put the blame for the incident directly on the individual, instead of looking for ways to improve the home's infrastructure and processes and uncover, understand



and fix the reasons behind the error. The lack of a culture where patient safety is forefront, is one of the continuing systemic barriers to creating an environment where staff are comfortable reporting medication errors<sup>28</sup>.

Individuals that make up the front-line staff are human and do make mistakes. What needs to happen is the creation of a system with which they work to minimize that risk. When the front-line staffs are comfortable in reporting incidents, only then will a continuous feedback cycle as described in Figure 1 be created.

**Figure 1 - Steps to a Culture of Patient Safety**



In the long term care setting, creating a culture of safety starts with addressing issues related to communication, teamwork and leadership. This will help build capacity within the organization to address and improve systemic problems. Only when this capacity within the system is created, can the ability to focus on system safety be carried out<sup>28</sup>.

Organizational trust has been cited as a critical element in fostering a culture of safety within the home. In order to have organizational trust, good relationships, the sharing of decision making and open, accurate and timely communication all need to be in place<sup>28</sup>.

The involvement of front-line staff in the decision making process is important. Front-line staffs are the ones who see the pitfalls of the current system on a day –to-day basis. Engagement of staff in decisions that affect them will help them and their colleagues embrace changes that are forthcoming.

## 5.2. Overall Barriers to Medication Error Reporting

Handler et al describes the top three modifiable barriers that if eliminated, could improve the culture and system of medication error reporting in long term care homes (Table 4). The first barrier is the lack of a good and readily available reporting system that staffs can use<sup>29</sup>. Each home should have a reporting system that is not only easy to access, but also intuitive to use. Even better would be a province-wide reporting program with standardized taxonomy to capture the data in a manner conducive to analysis.

The second is the knowledge gap that staff have on how to report a medication error<sup>29</sup>. Development of a provincially standard education program on the ins and outs of medication error reporting would enhance the uptake of educating LTC staff by homes. This education program should be implemented during staff orientation with periodic reinforcement of the concepts throughout the year. The development of such an education program goes hand in hand with a provincially data capture system.

The last modifiable barrier is the lack of feedback provided to both the facility and the original staff reporter of the error. When the reporter receives a description of actions taken in response to the report, it only further reinforces the importance of error reporting and encourages them to spread the message to colleagues. A lack of feedback diminishes the impact of efforts put forth by staff<sup>29</sup>. One quality measure of a home’s Quality Improvement Program could be a provincially established benchmark on the feedback provided to the reporter.

**Table 4 – Potential Solutions to Medication Error Reporting<sup>29</sup>**

Fixes to Address Barriers to Medication Error Reporting
1. Have a readily available and user-friendly medication incident reporting system
2. Educate staff on the identification and reporting of errors
3. Provide timely feedback (including actions taken) to the facility and original reporter

Interestingly, these barriers differ from a study undertaken in the acute care setting where the

most important barriers include the inability to report anonymously, a lack of understanding about the usefulness of reporting and the belief that situations that do not result in patient harm do not need to be reported<sup>29</sup>.

## **6. Potential Systemic Technological Solutions**

Available technology can be solutions for creating a safer medication use system. These options include use of a computerized medication administration record (cMAR), bar coding, automated dispensing machines (ADM), computerized physician order entry (CPOE), and clinical decision support software (CDS). However, it is important to note that technological solutions can also create new types of error that can impact patient safety. Implementing technology also requires an understanding of how individuals actually use it. Poorly designed solutions and interruption of workflow often cause the users to create workarounds to bypass the technology. This can result in worsening the original problem for which the technology was implemented<sup>30</sup>. For example, to bypass the safety blocks when ordering high doses, workarounds using several orders to obtain the full dose have been used, rather than speaking to either the pharmacist or physician<sup>31</sup>.

### **6.1. Computerized Physician Order Entry System and/or Clinical Decision Support Software**

Baycrest Centre for Geriatric Care, an academic teaching facility that houses a chronic care hospital, long term care facility and residential units, was one of the first long term care homes to implement CPOE. They undertook this project with the goal to improve prescribing practices that would eventually lead to better patient safety. Baycrest's residents had many factors that put them at risk for medication errors. These included overall medication use (average >6 concurrent medications), multiple chronic conditions, high use of higher-risk medications (e.g., anticoagulants, diuretics, psychoactive drugs)<sup>32</sup>.

The system Baycrest implemented included clinical decision support (CDS) software that provided additional tools to help clinicians properly order, monitor and manage the resident's drug therapy. The implementation team felt the need for an adjunct CDS to help guide the user and provide critical feedback. An example of a tool was the reminder to order INR tests on a resident who was ordered warfarin. The team included all specialties potentially impacted by the new technology so a complete user perspective could be obtained<sup>32</sup>.

As previously mentioned, technology can result in different types of errors. For example, as evidenced in the acute care setting, the interfaces could allow the prescriber to select the

wrong patient or incorrect drug order. Or pharmacy inventory displays in the system can be confused with recommended medication doses.

The use of too many low risk alerts can also reduce the effectiveness of the system by reducing the impact of the alert (even high level alerts) on the user<sup>32</sup>.

## **6.2. Bar Code Systems for Medication Management in Long-Term Care**

Although different methods of medication management have emerged for potential use in the long-term care sector, the use of barcode systems has received the most treatment in the literature and has been adapted by numerous long-term care providers. With this adaptation, some amount of experience has been obtained regarding both its effectiveness in reducing medication error and also in identifying its limitations.

Bar Code Medication Administration (BCMA) technology employs the use of bar code scanning of medication and patient identification over time, helping to ensure that a given patient is matched correctly with their medication order. This can be augmented or complemented through the use of automated dispensing carts or cabinets to reduce error in drug product selection. If the “5 Rights of Medication Administration” (Right Patient, Drug, Dose, Route, Time) are not met, a warning will appear to alert to the nurse of an error<sup>33</sup>. Although BCMA has been shown to reduce medication errors at the point of administration in a number of acute care settings, its ability to perform comparably in long-term care settings has not been addressed substantially in the literature.

The attached summaries and review articles suggest that BCMA can be effective in reducing error in the long-term care setting. However, some emerging evidence suggests that nurses may develop workaround strategies when using the technology that while improving its utilization may simultaneously introduce an alternative route for medication error. This evidence also suggests that BCMA solutions for the long-term care setting will likely require customization to address nuances in the delivery of long-term care and minimize or eliminate the need for workaround strategies<sup>34</sup>.

### 6.3. Other Technological Interventions

Technological interventions on a smaller scale can be helpful for individual residents without cognitive difficulties, although they do not necessarily target more generalized issues with the medication use system. A few of these options include:<sup>35</sup>

- Multi-Alarm Pill Boxes that store medication and provide reminders to take medication at specific times
- Personal Automatic Medication Dispensers, which can be programmed and locked. They dispense one dose at predetermined times and are usually equipped with various alerts to remind the resident of medication administration times.

### 6.4. General Considerations

When making a decision about the types of technological interventions to be undertaken, the following parameters should be taken into consideration:<sup>36</sup>

- The functional status of residents – products such as a personal automated medication dispensers/monitor will not be useful in a Home whose residents are largely dependant on the staff and family. However, targeting interventions to support the staff will be of more use.
- The environment – homes with highly mobile residents may require different strategies such as mobile automated dispensing carts.
- The amount and type of training provided to staff and/or residents
- The interfacing capabilities with the existing system in-house (if maintained)

## 7. Examples of High-Alert Medication Use in the LTC Setting

### Warfarin Anticoagulation<sup>37</sup>

Warfarin is an anticoagulant generally used for stroke prophylaxis in patients with atrial fibrillation or treatment or prevention of recurrent venous thromboembolism. Warfarin is part of the anticoagulant medication class of medications (that include unfractionated heparin and low molecular weight heparins) included in ISMP's List of High-Alert medications.

<http://www.ismp.org/Tools/highalertmedications.pdf> The United States Joint Commission has also highlighted anticoagulants as a 2009 National Patient Safety Goal to reduce harm associated with anticoagulants. Specific for the long term care setting, the Joint Commission has several defined elements for performance in the long term care setting, which includes implementation of an anticoagulation program, use of protocols for the initiation and maintenance of therapy and education

of the resident and/or caregivers. The following is an excerpt from a 2008 ISMP Canada environmental scan and discussion from practitioner interviews.

Warfarin interferes with the vitamin K-dependent clotting cascade that is necessary to maintain a proper hematological balance in the body. When this balance is off, there are two inherent risks – the risk of thromboembolic events (usually deep vein thrombosis (DVT) or pulmonary embolism (PE)) and the risk of hemorrhage. For patients on warfarin, the first scenario is often due to low levels of warfarin, and the second, perpetuated by excessive drug. In order to ensure patients use the right dose of warfarin to prevent thrombosis or bleeding, blood is drawn regularly to test the INR. The INR is used to ascertain the level of coagulation achieved. The INR target for most patients is 2.0 to 3.0, although the target zone is shifted slightly for particular conditions.

The following provides a glimpse into the processes and pitfalls with warfarin use in LTC.

The process by which a resident’s anticoagulation is managed is far from ideal. Table 5 outlines the steps involved in warfarin management. These medication use processes are generally similar for other medications found in long term care.

Table 5: Processes in Warfarin Management

Process	Description / Notes
Prescribing	Encompasses a treatment decision and ordering of an appropriate drug (warfarin), dose and strength of tablet.
Transcribing	Usually refers to the process where the prescription is transferred to a medication administration record in a hospital or LTC setting. Transcribing can occur in the community pharmacy where the pharmacist or technician transfers the paper prescription to the pharmacy’s computer system prior to dispensing.
Dispensing	Occurs when the correct warfarin strength and amount to be given as per the physician’s prescription is confirmed and medication provided. Depending on the setting, this may be done by pharmacy technicians independently, under the supervision of pharmacists, or by pharmacists independently. Patient education is usually provided by the pharmacist with the dispensing of an initial prescription in the community pharmacy.
Administering	Occurs when a caregiver gives the patient their prescribed dose of warfarin or the act of giving oneself warfarin. In the LTC setting, the nurse provides the appropriate dose of prescribed warfarin to the resident.

Monitoring	Review of the prescribed dose, administered dose and laboratory results to ensure that the appropriate dose of warfarin is being prescribed and/or taken. Future dosage changes are made in response to the International Normalized Ratio (INR) results to maintain the INR within the desired therapeutic range.
Educating	The transfer of knowledge related to warfarin to empower the patient/caregiver, resulting in a higher degree of involvement in the patient's care and better informed decisions.

The Canadian Stroke Network and the Institute for Clinical Evaluative Sciences has recently shown the continued underutilization of warfarin for stroke prevention in high stroke risk patients with atrial fibrillation. The vast majority of these patients were over 65 years old. Only 40% of patients were receiving appropriate preventative warfarin therapy. This example of a shortcoming in the prescribing process where the decision has been made to not prescribe the resident warfarin is a result of the general fear of bleeding and its ramifications in this population, despite the good evidence for use.

Resident monitoring, one of the basic processes in warfarin management, is also a challenging hurdle in this setting. In LTC homes, the laboratory work is generally outsourced. This essential process to optimal warfarin management requires a lab technician to come into the home to draw the necessary bloodwork. Then a process, not unlike in community, occurs in which the home waits for the results to be communicated from the lab and then acts upon the result, if necessary.

A 12-month retrospective chart review completed in five Ontario LTC homes sought to determine the percentage of time residents were in the therapeutic INR range, the incidence and prevalence of co-prescribing of warfarin-interacting drugs and the impact of using interacting drugs on the time in the therapeutic range. Nine percent of the LTC residents in these homes were prescribed warfarin, primarily for atrial fibrillation and deep vein thrombosis. These patients spent 54.1% of the time in therapeutic range (INR 2.0-3.0), while being subtherapeutic 34.7% and supratherapeutic 11.2% of the time. Residents received a laboratory measurement of the INR approximately every nine days. Given the frequency of the INR tests, the in-range time should have been much better.

Of all the residents on warfarin therapy, 79% have been prescribed at least one interacting drug. Anticoagulated residents spent 53.0% vs.58.2% of their time in therapeutic range compared to residents who were not prescribed an interacting drug. In 82% cases, the INR of these residents were checked within a week, which is more favourable than the data from a separate study which found that elderly community-based patients had their INRs checked 77% of the time within 14 days after being prescribed an interacting antibiotic treatment.



In a 12-month cohort study of LTC residents of 25 nursing homes, Gurwitz et al evaluated the safety of warfarin use in this patient population. Similar to the previous study by Verhovsek et al, the majority of patients were prescribed warfarin for atrial fibrillation, followed by DVT/PE, and stroke prophylaxis in the absence of atrial fibrillation. In the 490 residents who received warfarin, there were 720 warfarin-related adverse events, of which 29% were considered to be preventable (attributed to an error in prescribing, dispensing, administering or monitoring). Overall, 87% of the adverse warfarin-related events were considered to be minor in nature, with 11% classified as serious and 2% life-threatening or fatal.

There were 253 potential warfarin-related events in which the INR was  $\geq 4.5$  but did not result in injury. Of the total preventable errors (both actual and potential), the prescribing and monitoring processes of managing warfarin therapy accounted for most of them, with 70% and 92% of errors occurring at these stages (not all errors occur at stages that are mutually exclusive), respectively.

Serious, life-threatening, or fatal adverse warfarin-related adverse events occurred at a rate of 2.5 per 100 resident-months on warfarin. More importantly, the life-threatening or fatal incidents were preventable at a rate of 1.4 per 100 resident-months.

The Canadian Medication Incident Reporting and Prevention System (CMIRPS) houses 43 incidents related to warfarin in the long term care and nursing home setting. Of these, two cases resulted in harm. More than half the incidents were dose omissions, with incorrect dose administered and incorrect administration time rounding off the top three error types.

The CMIRPS data does not correlate with the conclusions found in Gurwitz's study. This is not unexpected as prescribing and monitoring errors are unlikely to be captured and submitted as incidents. This factor holds true in all practice settings.

Despite the fact that LTC residents face fewer management challenges, such as compliance issues, a more standardized diet and consistent activity level than the elderly in the community, there still exists many outstanding issues related to appropriate prescribing and adequate monitoring for LTC residents.

The above data and discussion further demonstrates the need for better education of practitioners to ensure all elderly patients who would benefit from warfarin get the opportunity to do so and be managed appropriately so that their risk of both hemorrhage and thrombosis is minimized.

## Predominant Issues and Potential Solutions for Warfarin Use

Interviews with anticoagulation professionals both in the family health team and ambulatory clinics indicate several reasons for suboptimal warfarin management. These reasons, although not identified in the long term care setting, are underlying causes for the current state of warfarin management. Two of the causes and their potential interventions would appear to be applicable to the LTC environment and are outlined in Table 6.

**Table 6 – Potential Interventions to Address Top Three Reasons for Suboptimal Warfarin Use**

Reason	Potential Interventions
Lack of physician knowledge about warfarin and its proper management	<ul style="list-style-type: none"> <li>• Integrate an anticoagulant management service (AMS) that could be shared among several LTC facilities.</li> <li>• Ensure that all AMS professional staff (e.g., pharmacist) are certified to provide anticoagulation management to patients</li> <li>• Assess and accredit organizations providing anticoagulation management programs</li> </ul>
Communication issues between all parties involved in the management of patients, including the patient themselves	<p><b>General:</b></p> <ul style="list-style-type: none"> <li>• Increase funding for number of AMS to be located throughout each LHINs (long-term intervention)</li> <li>• Reassess the legislation that prevents certified pharmacists or nurses from performing the necessary functions to manage their patient effectively (long-term intervention)</li> <li>• Review reimbursement models for pharmacists or nurses who manage AMS (long-term)</li> </ul> <p><u>Laboratory Communication:</u></p> <ul style="list-style-type: none"> <li>• Make POC devices and strips more accessible through funding, especially in LTC homes</li> </ul>

## Insulin Use <sup>38</sup>

Like warfarin and the anticoagulant class of medications, insulin is also considered a High-Alert medication by ISMP because errors in dosing and administration can result in severe patient adverse effects. A U.S. study revealed that in diabetic patients who died within forty-eight hours of a medical error, 1/3 of the medical errors involved insulin administration. The following is taken from an ISMP Canada environmental scan and practitioner interviews on the safety issues of insulin use in the acute care and long term care settings.

## **Insulin Usage**

A similar environmental scan and interviews with practitioners was written in 2008 to review the safety of insulin use in LTC and acute care facilities. The following is an excerpt from the report to highlight the safety issues with this high-alert medication used to treat diabetes, a disease affecting 1.8 million Canadians.

Insulin is considered one of the top five “high alert” medications by ISMP-Canada because errors in dosing and administration can result in severe patient adverse effects. A U.S. study revealed that in diabetic patients who died within forty-eight hours of a medical error, 1/3 of the medical errors involved insulin administration.

In LTC and Complex Continuing Care (CCC) facilities, the majority of insulin is administered by nursing staff. In some homes, the option to self-administer is available to residents with both cognitive abilities and manual dexterity. However, there lacks consistency with the documentation of such occurrences, making it difficult for caregivers to monitor and make changes to insulin doses based on effect.

Another LTC-specific issue was with the timing of administration of the shorter acting insulin analogues as the Ministry has guidelines that prevent administration of insulin in the dining room, so timing the insulin pre-meals is hard because you cannot anticipate if the resident will eat their meal; this might result in hypoglycemic episodes for patients.

### ***Monitoring Requirements for Insulin***

For most institutions, the monitoring requirements were associated with the available pre-printed orders as well as specified in the nursing manual on care of the hospitalized diabetic patient (with blood glucose measurements taken before all meals and at bedtime). In the long-term care setting, diabetics automatically have blood glucose measurements taken four times daily for 72 hours after admission, then it is re-assessed. In one LTC consulting practice, all diabetic patients have fasting BS done and then all other monitoring is done on order of the physician. There does not appear to be a standard or consensus, especially within LTC facilities on how often monitoring was required.

### **Predominant Issues and Potential Solutions for Insulin Use**

As identified in the insulin environmental scan and practitioner interviews, Table 7 highlights the main issues and potential solutions to the shortcomings in insulin management use in long term care. Although these issues may not have been identified in the LTC (rather the acute care) setting, the problem is similar and potential solutions applicable to LTC.

**Table 7 – Insulin Issues and Potential Solutions**

<b>Medication Use Process</b>	<b>Issue</b>	<b>Potential Solution(s)</b>
Prescribing	Transfer of patients between LTC and acute care facilities and continuation of therapy	Medication reconciliation initiatives
	Prescribing errors with the L-insulins (Lantus vs. lente vs. lispro)	Conduct proactive in-services/ ongoing education for all health professional staff
	Sound-alike/look-alike names	Standardization of insulin orders (including use of Trade names, nomograms, standard infusion concentrations, writing of sliding scales, protocols for hypoglycemia/hyperglycemia).  Technology solutions (e.g., computerized physician order entry, preprinted orders, bar coding for patient and drug identification)
	Use of abbreviations (U for units)	
Transcribing	Use of abbreviations (U for units)	Standardization of insulin orders (as noted above)
	Selection errors (including the L-insulins)	Conduct proactive in-services/ ongoing education for all health professional staff
Dispensing	Selection errors (including the L-insulins)	Conduct proactive in-services/ ongoing education for all health professional staff
	Preparation	
Administering	Selection errors (including the L-insulins)	Pharmacy labeling improvements (e.g., increased font size)  Process for double checks of insulin dose and type
	Inappropriate dosing (wrong insulin, wrong time, incorrect concentration for IV use, wrong person)	Conduct proactive in-services/ ongoing education for all health professional staff

Monitoring	Insufficient monitoring	Use of an insulin specialist to coordinate care
Educating	Clinical knowledge deficit in healthcare professionals  Lack of patient knowledge – administration errors	Conduct proactive in-services/ ongoing education for all health professional staff  Education for patients who self administer insulin

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