



## **Report to Ontario Ministry of Health and Long- term Care**

### **Knowledge Translation of Insulin Use Interventions / Safeguards**

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*A Key Partner in the Canadian Medication Incident Reporting and Prevention System  
Un partenaire clé du Système canadien de déclaration et de prévention des incidents médicamenteux*

**The Institute for Safe Medication Practices Canada (ISMP Canada)** is an independent national not-for-profit agency committed to the advancement of medication safety in all health care settings. ISMP Canada works collaboratively with the health care community, regulatory agencies and policy makers, provincial, national, and international patient safety organizations, the pharmaceutical industry, and the public to promote safe medication practices.

ISMP Canada's mandate includes reviewing, and analyzing medication incident and near-miss reports, identifying contributing factors and causes, making recommendations for the prevention of harmful medication incidents, and facilitating quality improvement initiatives. One of ISMP Canada's core competencies is identifying root causes of medication incidents which leads to identification of system safeguards and solutions for prevention of (or mitigation of harm from) medication incidents. This work is done in collaboration with key stakeholders to maximize the dissemination and translation of knowledge into practice.

ISMP Canada also facilitates the implementation of medication reconciliation in acute care, long-term care, primary care and in the home care settings. ISMP Canada works with stakeholders across the continuum of care and also leads an international collaborative project in order to share learning at the global level.

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## Knowledge Translation of Insulin Use Interventions / Safeguards

### 1. Background and Understanding of Project

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Diabetes is a chronic illness with serious complications that affects people of all ages. In Canada there are over 3 million people living with diabetes and this number is growing due to the aging population and increasing rates of obesity and sedentary lifestyles.

Insulin effectively manages diabetes as it replaces or supplements a person's natural insulin that helps the body control the level of glucose in the blood. Insulin is the mainstay of therapy for those who live with type 1 diabetes and may be an eventual treatment for those who live with type 2 diabetes. However, insulin presents certain risks due to its narrow therapeutic index (see glossary). Administration of an excessive dose can rapidly lead to hypoglycaemia which may progress to seizure, coma and even death, while an under-dose can allow for worsening of hyperglycemia that may progress to ketoacidosis. The risk for medication errors with insulin is high because of its narrow therapeutic index and frequent use.

Insulin is considered one of the top five "high alert" medications by ISMP US. High-alert medications are medications that bear a heightened risk of causing significant patient harm when they are used in error. Insulin has been identified nationally and internationally as one of the most frequently repeated medication incident causing harm. Incidents causing harm occurs in the home setting by patients self-administering insulin and also occurs frequently by health professionals in institutional settings, such as in acute care and long term care settings, when ordered and administered by health professionals. The Ontario Medication Incident Database (2009-11) captured 55 insulin incidents that caused patient harm, while the Canadian Institute for Health Information (CIHI) NSIR database received 23 incidents with harmful consequences in Ontario during the same period.

In efforts to reduce the potential for harm, many national associations have published recommendations on best practices for improving the safety of insulin use in hospitals. The recommendations touch on all aspects of insulin use from prescribing and transcribing, dispensing and distribution to administration and monitoring. Although these interventions are recommendations and not requirements hospitals have implemented many of these interventions based on the specific needs of their organizations. Unfortunately in spite of this harmful insulin incidents continue to occur. As a means to further assist hospitals with implementing safe insulin practices and decreasing potential patient harm ISMP Canada proposed that hospitals in Ontario be provided with specific required interventions that have:

- 1) evidence to support them
- 2) high impact on safety

- 3) widespread applicability and
- 4) few barriers to implementation.

## **2. Purpose**

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- To complete a literature search on current practices of the safe use of insulin
- To gather information on insulin use interventions and safeguards already implemented by Ontario hospitals
- To identify interventions on the safe use of insulin for testing and evaluation in the acute care setting for potential province wide implementation (or province wide dissemination)

## **3. Methodology**

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ISMP Canada conducted a multi-phase process which included:

- Literature search on published recommended insulin use safeguards and interventions
- Development and dissemination of a survey to identify current safe use of insulin practices
- Review and prioritization of recommended safeguards and interventions
- Expert review and selection of interventions to be tested as best practices for safe use of insulin in acute care settings in Ontario

The first step of the environmental scan was to complete a literature search on safe use of insulin practices. The databases PubMed®, Medline®, Embase®, CINAHL® and Google® Scholar were searched using the search terms: insulin, hospital, medication errors, safe\*, medication errors prevention and control from 2008 to 2012. After reviewing the information collected the decision was made to primarily use the “Professional Practice Recommendations for Safe Use of Insulin in Hospitals” from the American Society of Health-System Pharmacists (ASHP). The ASHP recommendations were used as the framework for review and selection of evidence based recommendations on the safe use of insulin. This document mainly cited recommendations from national standard setting, patient safety, professional associations and advisory organizations. Some of the recommendations cited in the literature search noted to be relevant and not mentioned by these organizations were also included for review.

To capture practices in Ontario associated with safe use of insulin and any potential deficiencies in this area a survey was developed using the web based tool Survey Monkey® (refer to Appendix 3). The survey consisting of fifty two questions was sent to Ontario hospitals through the distribution lists of the Ontario

Hospital Association, the Ontario Branch of the Canadian Society of Hospital Pharmacists, the Association of Pharmacy Directors in Greater Toronto Area and the group of Northern Directors of Pharmacy.

An internal ISMP Canada team then compiled a list of all the interventions and safeguards on the safe use of insulin from the literature search and results from the survey. Each of these interventions was reviewed against the hierarchy of effectiveness or error prevention strategies (refer to Appendix 4). The interventions that fit most appropriately within the bottom 2 categories (education/information and rules and policies) within the hierarchy were discarded. Other interventions were also discarded based on the professional judgment of the reviewers if they felt they did not have a high impact on safety, impact was not easy to measure or if it was felt that most hospitals in Ontario would have already implemented that particular intervention or safeguard.

An invitation was sent out to experts in the field within Ontario to area to attend, either in person or by telephone, a half-day session with the goal to further review the interventions and safeguards and assist with the determination of interventions that could be tested as potential required interventions by the province of Ontario. Each member of the expert group was presented with a worksheet with the interventions selected by the ISMP Canada team categorized by medication process of prescribing/transcribing, pharmacy distribution and administration/monitoring (refer to Appendix 5). The experts were asked to assess each intervention on measurability, feasibility, level of evidence and against the hierarchy of effectiveness. This was followed by a facilitated discussion to rank the interventions for potential required implementation in Ontario hospitals. Following review and discussion of all the interventions presented the expert group determined that the interventions most appropriate for testing as potential required interventions were best grouped into three specific areas of safe insulin use. A consensus was reached as to which interventions were most appropriate for testing within each area.

## **4. Results**

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### **LITERATURE SEARCH:**

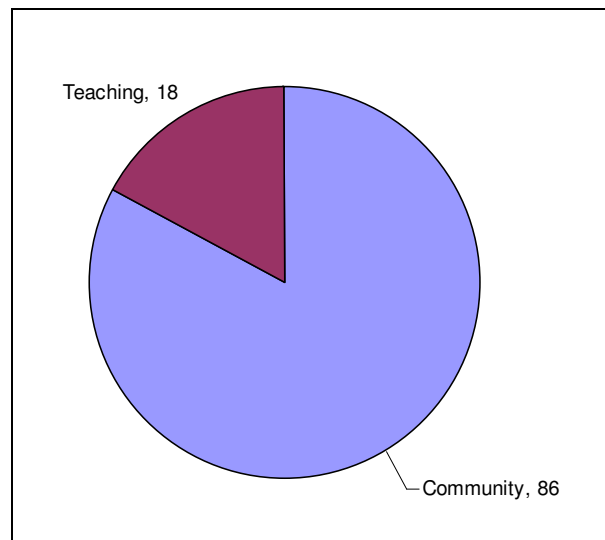
The literature search resulted in 41 articles yielding many potential safety interventions for insulin use in hospitals, (refer to appendix 2). The interventions encompassed many facets of health care system and medication use stages. The emphasis ranged from prescribing (e.g. electronic prescribing, no dangerous abbreviations), dispensing (e.g. clarification of ambiguous orders, safe insulin storage practices), to administration (e.g. appropriate measuring devices for insulin) and monitoring (regular testing of blood monitoring equipment). Some articles also focused on the importance of education for health care providers or caregiver, and of role of nurses (e.g. provide additional care and advice from diabetes specialist

nurse prescriber) and pharmacists (e.g. educate caregivers/health care professionals on insulin delivery devices).

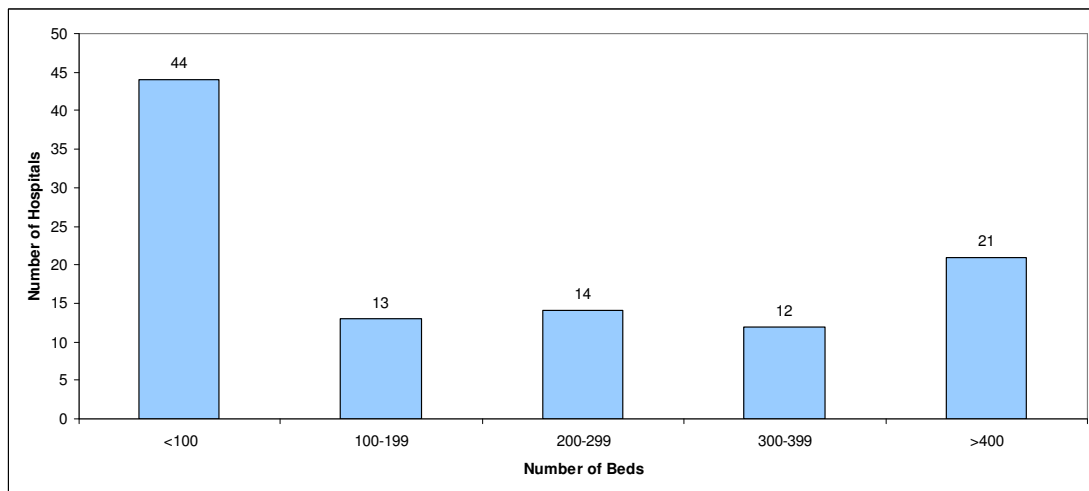
### **SURVEY RESULTS:**

There were 207 survey respondents, however only 132 respondents completed the entire survey and were considered in the results. One hundred and four facilities within Ontario participated in the survey with 19 facilities having more than one respondent. Fifteen of these had more than one site within their facility respond or more than one type of profession responding.

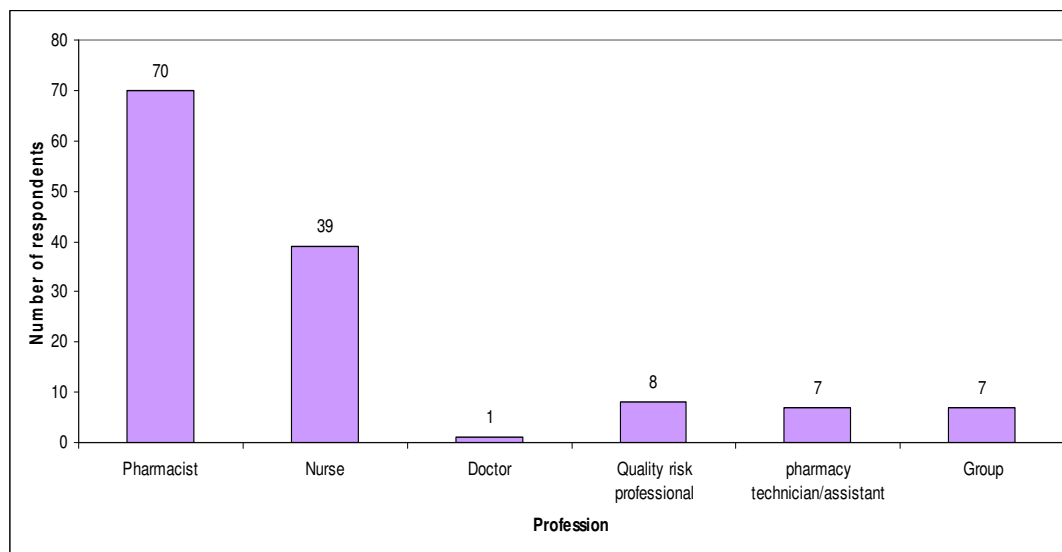
The main findings from the survey are summarized below.



**Figure 1: Respondents by facility type**



**Figure 2: Size of respondent hospitals**



**Figure 3: Breakdown by Respondent**



**Table 1: The ten most commonly implemented interventions by the respondents include:**

Intervention	% of respondents
All automated blood glucose monitoring equipment is subject to regular testing and calibration	95%
Documentation policy includes: trailing zeroes are never used following decimal points	94%
Insulin dosage included on the label are listed as “units” or “units = mL”, but not “mL” alone	93%
Documentation policy includes: leading zeroes are always used before all decimal points	93%
Hypoglycemia “rescue” agents (dextrose and glucagon) are readily accessible throughout the organization. A standard method for initial management is approved, established, communicated and readily available to caregivers	92%
The word “unit” is always spelled out completely; “u” or “U” are not allowed	91%
Any ambiguous insulin therapy orders are clarified in writing prior to administration	88%
Only SHORT or RAPID acting insulins are used for adjustment, supplemental, or correction doses	87%
The organization has an active ongoing process for detecting, reporting and assessing adverse patient events related to insulin use. The organization utilizes information obtained from incident reports involving insulin to improve processes	88%
Insulin (all forms) is designated as a “high-alert” medication in a hospital policy and procedure within the organization. The “high-alert” nature of insulin is communicated to staff because of the common and widespread use of insulin may result in safety new workarounds and complacency by staff. The policy specifies procedures which include, but not limited to, documentation of double checking processes.	84%

### **EXPERT GROUP DISCUSSION:**

The expert group selected three areas of insulin use that would benefit from required standardized insulin interventions:

- Diabetic specific medication administration records (MAR),
- Smart pumps with drug errors reduction systems (DERs) and
- Insulin therapy pre-printed order sets.

### **Diabetic Specific MARs**

The expert group proposed implementation of diabetic specific MARs as a potential solution to address issues with transcription and administration errors. The MARs would contain only orders specific to insulin and blood glucose monitoring parameters.

The expert panel proposed that this solution include the following interventions:

- 1) A defined organization-wide process for transcription of insulin therapy orders and blood glucose monitoring orders is delineated and implemented. The transcription process is standardized, allowing variance between patient care units only when necessary. Staff transcribing insulin orders and blood glucose monitoring orders are specifically trained and their competency assessed on a regular basis.
- 2) In order to reduce fragmentation of insulin orders, when handwritten MARs are used:
  - all insulin orders must be transcribed together, i.e., not separated by other non-insulin orders
  - insulins to be administered together in one syringe should be always transcribed together (e.g., mixing regular and NPH prior to administration)

In addition, it was recommended that the following be incorporated into the above interventions for testing:

- Reference to diabetic MAR should be included on “main” MAR
- Standardize terminology used when writing and transcribing insulin orders - to minimize confusion amongst all the brands of types of insulin use brand names instead of generics
- Transcription onto MAR should be only be completed by designated health professional – e.g., nursing

### **Smart Pumps with Drug Errors Reduction Systems (DERs)**

It was recommended that all insulin infusions be delivered using smart pumps with drug error reduction system technology.

The expert focus group further clarified the proposed solution include the following interventions:

- 1) Insulin infusions are administered using smart pump technology with DERs utilized that incorporate hard and soft limits, maximum and minimum infusion rates, alerts, and override criteria.
- 2) Organizational policies define protocols for use of standardized insulin infusion(s) and limit the use of insulin infusions and dilutions to predetermined standard concentrations and solutions. Insulin orders provide specific titration parameters or refer to an established standard process. Non specific orders such as “titrate insulin drip to target blood glucose” are not allowed.

### **Insulin Therapy Pre-printed Order Sets**

It was recommended that pre-printed order sets should be used when ordering insulin regimens. These should include specific guidelines for ordering insulin and orders for managing hypoglycemia.

The expert panel proposed that this solution include the following interventions:

- 1) If sliding scales are used for insulin therapy, the sliding-scale insulin is only ordered on a pre-printed order or computerized order set and provide specific titration parameters or refer to an established standard process (Non specific orders such as “titrate insulin drip to target blood glucose range” are not allowed); and sliding scale insulin orders only use SHORT- OR RAPID-ACTING insulin. Intermittent sliding scale insulin regimens are not used alone.
- 2) Standardized order sets/forms that list specific products and contain prompts to specify administration times in relation to meals are used.
- 3) Orders for perioperative administration of insulin therapy are established and written using a predetermined format or using established format, CPOE, or pre-printed order sets or protocols.
- 4) Standards for minimum frequency for monitoring of blood glucose are established by the organization.

It was recommended that the following be considered with the interventions above for testing:

- Clarify wording in pre-printed order sets to incorporate that sliding scales are for short term use only or during periods of uncertainty - reviewed in 24 hours and maximum usage is 48 hours.
- Organization wide standard times could be difficult depending on variability of when meals are served on each unit. Order should read 30 min before breakfast but not necessarily associated with a specific time. For CPOE systems must ensure that the time range associated with the order allows for variance in meal time
- Guidelines for monitoring should be specific to types of insulin regimens.
- Pre-printed order forms should include blood glucose monitoring prompts.

## **5. Next Steps**

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The interventions recommended for pilot testing will disseminated to additional experts in the field for further review and comment. Once consensus is reached the process of recruiting sites for pilot testing and evaluating the effectiveness of the interventions will begin. Data of pre- and post-testing will be collected and findings including outcome measures will be evaluated by ISMP Canada and the expert group.

## ***Appendix One: Glossary of Terms***

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**High-alert medications** - medications that bear a heightened risk of causing significant patient harm when they are used in error. Although mistakes may or may not be more common with these drugs, the consequences of an error are clearly more devastating to patients.

**Therapeutic Index** - the ratio of the median lethal dose to the median effective dose. It is used in assessing the safety of a drug.

## Appendix Two: References

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### Appendix Three: Safe Use of Insulin Practices in Ontario - Survey

**1. Please indicate the type of institution that you are from:**

☐ Community

☐ Teaching

☐ Long Term Care/Complex Continuing Care

☐ Other (please specify)

**2. Please indicate the number of beds in your institution:**

**3. Please indicate the number of sites with beds:**

**4. Health care professional completing survey:**

☐ Doctor

☐ Nurse

☐ Pharmacist

☐ Quality risk professional

☐ Other (please specify)

**5. Please complete the following in case we need to follow up with you:**

Hospital name

Address

Email/contact number

**6. Insulin (all forms) is designated as a "High Alert" medication in a hospital policy and procedure within the organization. The "High Alert" nature of insulin is communicated to staff because the common and widespread use of insulin may result in safety net workarounds and complacency by staff. The policy specifies procedures which may include, but are not limited to, documentation of double checking processes, etc.**

☐ Yes

☐ No

**7. The pharmacy routinely stocks only those insulin products approved by the P&T Committee or other responsible body. The organization uses a single "brand" source for each insulin type. Product safety is considered in the approval process.**

☐ Yes

☐ No

Opportunity to explain answer further:

**8. Insulins are purchased, obtained, and stored in the pharmacy in such a manner as to reduce the chance of wrong product selection:**

	Yes	No
Only regular insulin (Ipro and aspart if subcutaneous insulin pumps are also prepared) are stored in the parenteral products area.	<input type="radio"/>	<input type="radio"/>
Appropriate labels/signs and separation are used to differentiate insulin products and reduce risk of wrong product selection.	<input type="radio"/>	<input type="radio"/>

Opportunity to explain answer further:

**9. Insulin is only available and dispensed from pharmacy as an individual supply of insulin labelled with patient specific name, a second identifier and vial expiration time per institutional guidelines (except regular insulin, which may be available as an emergency stock item in patient care areas).**

☐ Yes

☐ No

Opportunity to explain answer further:

**10. Access to emergency stock of regular insulin is limited and controlled in patient care areas.**

☐ Yes  
☐ No

**11. Question 11 is only for hospitals with automated dispensing cabinets, otherwise go to question 12.**

**In hospitals with automated dispensing cabinets, insulin cannot be removed from unit-based medication dispensing cabinets without prior review of insulin orders by a pharmacist during pharmacy hours. For all doses removed after pharmacy hours, there is timely review of all orders and reconciliation of doses removed from the medication dispensing cabinets once pharmacy opens the next day.**

☐ Yes  
☐ No

Opportunity to explain answer further

**12. Insulin for subcutaneous injections is never borrowed from or shared with another patient.**

☐ Yes  
☐ No

**13. Insulin products are always maintained in a secure manner at all times, e.g. in locked cupboard/ med room/ medication cart. Insulin is never kept at the patient's bedside, unless a locked drawer is provided.**

☐ Yes  
☐ No

**14. The pharmacy routinely inspects patient care areas for unauthorized, unlabelled, and non-secure insulin products and actively removes any unauthorized insulin products from patient care units. This inspection for insulin products for removal may include but is not limited to patient specific insulin when the product has been discontinued or the patient has been transferred or discharged.**

☐ Yes  
☐ No

Opportunity to explain answer further

**15. Hypoglycemia "rescue" agents (50% dextrose and glucagon) are readily accessible throughout the organization. A standard method for initial management of hypoglycemia with directions to call the physician for further treatment is approved, established, communicated, and readily available to caregivers (e.g., protocol or algorithm).**

☐ Yes  
☐ No

Opportunity to explain answer further

**16. Organization monitors the use of 50% dextrose and glucagon as triggers for case review to determine if that use was associated with insulin therapy and/or oral hypoglycemic agents, e.g. glyburide.**

☐ Yes  
☐ No

Opportunity to explain answer further

## Double check systems

### 17. Are the following independent double check processes in place in your hospital?

	Yes	No
When insulin orders are manually transcribed, the organization has a process for an independent double check of transcribed insulin orders and Blood Glucose/Blood Sugar monitoring orders (include written, pre-printed and verbal) . The double check of the order transcription is documented. No insulin is administered until the double check has been completed and documented.	<input type="radio"/>	<input type="radio"/>
An independent double check (properly documented manually) and/or machine-readable verification is required whenever insulin products are dispensed from the pharmacy or placed into unit-based medication dispensing cabinets.	<input type="radio"/>	<input type="radio"/>
All measured insulin doses are confirmed by independent checks by two individuals before administration. The double check is documented.	<input type="radio"/>	<input type="radio"/>
An independent double check of the insulin infusion product and IV pump settings are completed each time a new insulin IV infusion bag is hung. The double check is completed and documented again, each time there is a new order, change in an order, change in rate, change in infusion bag and/or IV tubing, change in shift, transfer of care.	<input type="radio"/>	<input type="radio"/>
Barcode technology is used to minimize dispensing errors (automated double check).	<input type="radio"/>	<input type="radio"/>
Barcode technology is used	<input type="radio"/>	<input type="radio"/>

## Documentation/Labeling

**18. In all insulin related documentation (e.g. pre-printed/written insulin orders, order sets containing insulin, prescription labels, storage area labels, medication profiles, MARs, hospital computer systems including pharmacy, etc):**

	Yes	No
use both generic and brand names of the insulin.	<input type="radio"/>	<input type="radio"/>
use the complete name of the insulin product. (Prescribing incomplete product names may lead to the patient receiving the wrong insulin, such as Humulin R instead of Humulin N.)	<input type="radio"/>	<input type="radio"/>

**19. The following dangerous abbreviations are included in the hospital's approved DO NOT USE/dangerous abbreviation list:**

	Yes	No
the word "unit" is always spelled out completely; "u" or "U" are not allowed	<input type="radio"/>	<input type="radio"/>
insulin dosage included on the label are listed as "units" or "units = mL", but not "mL" alone.	<input type="radio"/>	<input type="radio"/>
For IV solutions, label should specify total dose/total mL, and units/mL.	<input type="radio"/>	<input type="radio"/>
leading zeroes are always used before all decimal points.	<input type="radio"/>	<input type="radio"/>
trailing zeroes are never used following decimal points.	<input type="radio"/>	<input type="radio"/>

Opportunity to explain answer further.

## Automation and Computerization

**20. The following safeguards are provided in the pharmacy computer system:**

	Yes	No
Pharmacy computer system includes appropriate alerts to reduce the risk of error in prescribing. Pharmacy computer system alerts pharmacists to unsafe orders, appropriateness of dose regimens, drug-dietary interventions (i.e. enteral feeds), prompt use of organization-specific protocols and orders for blood glucose/blood sugar monitoring.	<input type="radio"/>	<input type="radio"/>
The pharmacy computer alerts the pharmacist when orders for insulin fall outside pre-determined dose limits based on total amount of insulin or based on a unit-per-kilogram basis.	<input type="radio"/>	<input type="radio"/>
The pharmacy computer is directly linked to the laboratory computer, or the reviewing pharmacist should have real-time access to the laboratory computer.	<input type="radio"/>	<input type="radio"/>

Opportunity to explain answer further

**21. The following questions only apply to hospitals in which pharmacy generates the MARs, otherwise go to question 22**

	Yes	No
Pharmacy-generated MARs include specific administration times or time prior to meals for all scheduled insulin doses.	<input type="radio"/>	<input type="radio"/>
Pharmacy-generated MARs clearly discriminate between insulin types when a patient is prescribed more than one type of insulin.	<input type="radio"/>	<input type="radio"/>

Opportunity to explain answer further

## Policy and procedures

Ordering/prescribing

**24. For organizations treating pediatric patients, otherwise go to question 25**

**Organizational policy requires that all insulin orders in pediatric patients be ordered in the format of “units per kilogram” with the final calculated insulin dose specified in the order by the prescriber. All weight-based dose calculations are independently re-calculated by either the pharmacist or nurse.**

- ☐ Yes  
☐ No

**25. Protocols for standardized insulin infusion(s) are in place and are used.**

- ☐ Yes  
☐ No

**26. Organizational policies define and limit the use of insulin infusions and dilutions to predetermined standard concentrations and solutions.**

- ☐ Yes  
☐ No

**27. Whenever there is a change in insulin orders, the physician rewrites the complete orders in full.**

- ☐ Yes  
☐ No

**28. Standardized order sets/forms that list specific products and contain prompts to specify administration times in relation to meals are in place and are used.**

- ☐ Yes  
☐ No

**29. The following questions pertain to sliding scale insulin:**

**As use of sliding scale insulin has not been substantiated by clinical evidence, our hospital does not allow the use of sliding scale for insulin therapy.**

- ☐ Yes  
☐ No

**30. If sliding scales are used for insulin therapy,**

	Yes	No
the sliding-scale insulin is only ordered on a preprinted order or computerized order set created and approved by the organization.	<input type="radio"/>	<input type="radio"/>
sliding scale insulin orders only use SHORT- OR RAPID-ACTING insulin and not long acting insulin.	<input type="radio"/>	<input type="radio"/>

**31. Intermittent sliding scale insulin regimens are not used alone to manage hyperglycemia in diabetic patients. (Hyperglycemia commonly occurs when sliding scale insulin dosing is used without basal insulin therapy or continuation of oral hypoglycemics.)**

- ☐ Yes  
☐ No

**32. Insulin orders provide specific titration parameters or refer to an established standard process. Non specific orders such as “titrate insulin drip to target Blood Glucose/Blood sugar range” are not allowed.**

- ☐ Yes  
☐ No

**33. All insulin infusions (critically ill, non-critically ill, severe hyperglycemic, DKA patients) are only ordered using approved protocols, algorithms, or order sets.**

- ☐ Yes  
☐ No

**34. Orders for perioperative administration of insulin therapy are established and written using a predetermined or established format, preprinted order sets, protocols, or CPOE.**

- ☐ Yes  
☐ No

Opportunity to explain answer further.

**35. Only SHORT- OR RAPID-ACTING insulins are used for adjustment, supplemental, or correction doses, and not long acting insulins.**

☐ Yes  
☐ No

Opportunity to explain answer further.

**36. Any ambiguous insulin therapy orders are clarified in writing prior to administration.**

☐ Yes  
☐ No

Opportunity to explain answer further.

**37. Oral and telephone orders for insulin therapy are only used in emergency situations orders are transcribed and read back to confirm accuracy.**

☐ Yes  
☐ No

Opportunity to explain answer further.

**Transcribing**

**38. A defined organization-wide process for transcription of insulin therapy orders and Blood Glucose/Blood Sugar monitoring orders is delineated and implemented. The transcription process is standardized, allowing variance between patient care units only when necessary. Staff are specifically trained to transcribe insulin orders and Blood Glucose/Blood Sugar monitoring orders and their competency is assessed on a regular basis.**

☐ Yes  
☐ No

**39. When handwritten MARs are in place within the organization, minimize the number of pages used and “fragmentation” of insulin-related orders:**

	Yes	No
All insulin orders are transcribed sequentially, e.g. not separated by other non-insulin orders.	<input type="radio"/>	<input type="radio"/>
Insulins to be administered together in one syringe (e.g., mixing regular and NPH prior to administration) are always transcribed together.	<input type="radio"/>	<input type="radio"/>

**40. All insulins are measured using insulin syringes marked in “units”, i.e. not tuberculin syringes.**

☐ Yes  
☐ No

Opportunity to explain answer further.

**41. Rapid-acting insulins (and rapid-acting insulin mix products) are administered only when meals are being consumed or present on the unit available for the patient to start to consume within 15 minutes. This may be accomplished by implementing a policy and procedure that has been created and approved by the organization (i.e. MAR policy).**

☐ Yes  
☐ No

### Documentation

**42. All patients receiving insulin have clear documentation about what has or has not been given. Documentation of insulin administration occurs immediately following administration while at the bedside.**

- ☐ Yes  
☐ No

Opportunity to explain answer further.

### Compounding

**43. When pharmacy prepares/manufactures/compounds insulin products, a checklist and documentation log are employed to ensure proper verification by at least one pharmacist who is not involved in the actual admixture of both the volume and concentration of insulin added to the solution.**

- ☐ Yes  
☐ No

Opportunity to explain answer further.

### Monitoring

**44. Results of all Blood Glucose/Blood Sugar monitoring are clearly documented in the medical record and can be easily correlated with insulin doses, concurrent oral hypoglycemic(s) administration, and caloric/meal intake.**

- ☐ Yes  
☐ No

Opportunity to explain answer further.

**45. Standards for minimum frequency for monitoring of Blood Glucose/Blood Sugar is established by the organization.**

- ☐ Yes  
☐ No

Opportunity to explain answer further.

**46. Pharmacists, nurses and physicians are aware of diabetic patients with insulin order receiving enteral feeding or TPN. As part of order sets, practitioners are guided to call the physician to adjust or discontinue the insulin order accordingly whenever the enteral feeding or TPN is stopped or held for these diabetic patients,.**

- ☐ Yes  
☐ No

Opportunity to explain answer further.

### Caregiver competency

**47. The organization has a process for periodic competency assessment of caregivers involved in insulin therapy management, i.e. included in new staff orientation.**

- ☐ Yes  
☐ No

Opportunity to explain answer further.

### Quality assurance

**48. The organization has an active ongoing process for detecting, reporting, and assessing adverse patient events related to insulin use. The organization utilizes information obtained from incident reports involving insulin to improve processes.**

☐ Yes

☐ No

Opportunity to explain answer further.

**49. The learnings from incident reports, Root Cause Analysis (RCA) or Failure Mode and Effects Analysis (FMEA) are shared with staff broadly and externally.**

☐ Yes

☐ No

Opportunity to explain answer further.

**50. Please list any other insulin safety interventions in place at your organization.**

**51. Please list and explain any insulin safety interventions which you feel would be useful in your organization (may not be in place).**

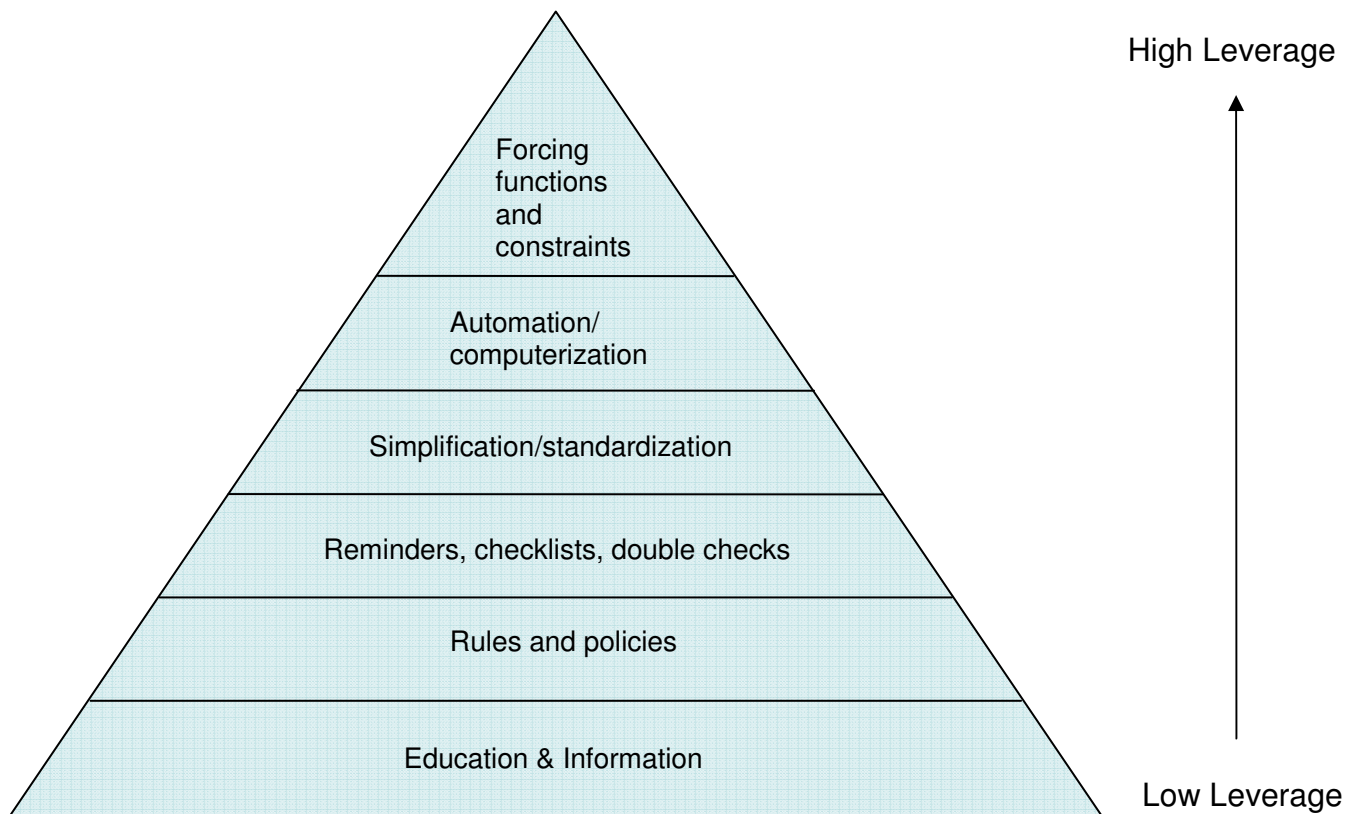
**52. This is an opportunity to provide any further comment/feedback related to this survey or any questions answered.**

**Thank you very much for your participation in this survey. ISMP Canada will provide a summary to all Ontario hospitals at the completion of this project.**



## Appendix Four: Hierarchy of Effectiveness

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Adapted from: Medication error prevention "toolbox". ISMP Med Saf Alert. 1999;5(11)

## Appendix Five: Prioritization of Insulin Interventions Worksheets

Prescribing/ Transcribing	H	F	M	Y/N Comments
P1.* hospital does not allow the use of sliding scale orders for insulin therapy.				
P2.* If sliding scales are used for insulin therapy, the sliding-scale insulin is only ordered on a preprinted order or computerized order set and provide specific titration parameters or refer to an established standard process (Non specific orders such as "titrate insulin drip to target Blood Glucose/Blood sugar range" are not allowed); and sliding scale insulin orders only use SHORT- OR RAPID-ACTING insulin. Intermittent sliding scale insulin regimens are not used alone.				
P3.** Organizational policy requires that insulin orders in pediatric patients be ordered in the format of "units per kilogram" with final calculated insulin dose specified in the order by the prescriber. All weight-based dose calculations are independently re-calculated by the pharmacist or nurse.				
P4.** A defined organization-wide process for transcription of insulin therapy orders and Blood Glucose/Blood Sugar monitoring orders is delineated and implemented. The transcription process is standardized, allowing variance between patient care units only when necessary. Staff are specifically trained to transcribe insulin orders and Blood Glucose/Blood Sugar monitoring orders and their competency is assessed on a regular basis.				
P5.** When handwritten MARs are in place, minimize the number of pages used and "fragmentation" of insulin-related orders: All insulin orders are transcribed sequentially, e.g. not separated by other non-insulin orders; and insulins to be administered together in one syringe are always transcribed together (e.g., mixing regular and NPH prior to administration).				
P6.* Standardized order sets/forms that list specific products and contain prompts to specify administration times in relation to meals are used.				
P7.* Organizational policies define protocols for use of standardized insulin infusion(s) and limit the use of insulin infusions and dilutions to predetermined standard concentrations and solutions. Insulin orders provide specific titration parameters or refer to an established standard process. Non specific orders such as "titrate insulin drip to target Blood Glucose/Blood sugar range" are not allowed.				
P8. Orders for perioperative administration of insulin therapy are established and written using a predetermined format or using established format, CPOE, or preprinted order sets or protocols.				
P9. Only SHORT- OR RAPID-ACTING insulins are used for adjustment, supplemental, or correction doses.				
P10. All insulin orders follow the hospital's approved DO NOT USE/dangerous abbreviation list, which include: a.** the word "unit" is always spelled out completely; "u" or "U" are not allowed b.* insulin dosage included on the label are listed as "units" or "units = mL", but not "mL" alone. c.* For IV solutions, label should specify total dose/total mL, and units/mL. d.** leading zeroes are always used before all decimal points. e.** trailing zeroes are never used following decimal points.				
P11.** Whenever there is a change in insulin orders, the physician rewrites the complete orders in full.				

Supported by \*1, \*\*2, \*\*\*3 of the major sources of references (ISMP, ASHP, JCAHO, AC)

H = Hierarchy of effectiveness, F = Feasibility, M = Measurability

Pharmacy / Distribution	H	F	M	Y/N comments
D1.*** The organization uses single "brand" source for each insulin type.				
D2.*** Insulin is only available and dispensed from pharmacy as an individual supply of insulin labelled with patient specific name, a second identifier and vial expiration time per institutional guidelines, except for regular insulin, which may be available as an emergency stock item in patient care areas with limited and controlled access.				
D3.** In hospitals with automated dispensing cabinets, insulin cannot be removed from unit-based medication dispensing cabinets without prior review of insulin orders by a pharmacist during pharmacy hours. For all doses removed after pharmacy hours, there is timely review of all orders and reconciliation of doses removed from the medication dispensing cabinets once pharmacy opens the next day.				
D4. *** Insulin products are always maintained in a secure manner at all times, e.g. in locked cupboard/ med room/ medication cart. Insulin is never kept at the patient's bedside. (unless a locked drawer is provided)				
D5. *** The pharmacy routinely inspects patient care areas for unauthorized, unlabeled, and non-secure insulin products and actively removes any unauthorized insulin products from patient care units. This inspection for insulin products for removal may include but is not limited to patient specific insulin when the product has been discontinued or the patient has been transferred or discharged.				
D6.** Only regular insulin (lispro and aspart if subcutaneous insulin pumps are also prepared) are stored in the parenteral products area and appropriate labels/signs and separation are used to differentiate insulin products and reduce risk of wrong product selection..				
D7.** Pharmacy computer system includes appropriate alerts to reduce the risk of error in prescribing. Pharmacy computer system alerts pharmacists to unsafe orders, appropriateness of dose regimens, drug-dietary interventions (i.e. enteral feeds) , prompt use of organization-specific protocols and orders for blood glucose/blood sugar monitoring.				
D8.** The pharmacy computer is directly linked to the laboratory computer, or the reviewing pharmacist should have real-time access to the laboratory computer.				
D9.* The pharmacy computer alerts the pharmacist when orders for insulin fall outside pre-determined dose limits based on total amount of insulin or based on a unit-per-kilogram basis.				
D10. When pharmacy prepares/manufactures/compounds insulin products, a checklist and documentation log are employed to ensure proper verification by at least one pharmacist who is not involved in the actual admixture of both the volume and concentration of insulin added to the solution.				
<p>supported by *1, **2, ***3 of the major sources of references (ISMP, ASHP, JCAHO, AC)</p> <p>H = Hierarchy of effectiveness, F = Feasibility, M = Measurability</p>				

Administration / Monitoring	H	F	M	Y/N Comments
A1.** Insulin is never borrowed from or shared with another patient.				
A2.** Organizations monitor the use of 50% dextrose and glucagon as triggers for case review to determine if that use was associated with insulin therapy and/or oral hypoglycemic agent, e.g. glyburide.				
A3.* All insulins are measured using insulin syringes marked in "units", i.e. not tuberculin syringes.				
A4.* Hypoglycemia "rescue" agents (dextrose and glucagon) are readily accessible throughout the organization. A standard method for initial management (e.g., protocol or algorithm) of hypoglycemia with directions to call the physician for further treatment is approved, established, communicated, and readily available to caregivers.				
A5. Rapid-acting insulins (and rapid-acting insulin mix products) are administered only when meals are being consumed or present on the unit available for the patient to start to consume within 15 minutes. This can be accomplished by implementing a policy and procedure that has been created and approved by the organization (i.e. MAR policy).				
A6.** Insulin infusions are administered using smart pump technology with Drug Error Reduction software (DERS) utilized that incorporate hard and soft limits, maximum and minimum infusion rates, alerts, and override criteria.				
A7.* All automated blood glucose monitoring equipment is subject to regular testing and calibration.				
A8.* Pharmacy-generated MARs include specific administration times for all scheduled insulin doses and clearly discriminate between insulin types when a patient is prescribed more than one type of insulin.				
A9. Standards for minimum frequency for monitoring of Blood Glucose is established by the organization.				
A10. The following independent double check (DC) processes in place: <b>a)*</b> When insulin orders are manually transcribed, the transcribed insulin orders and Blood Glucose/Blood Sugar monitoring orders are DC. <b>b)*</b> whenever insulin products are dispensed from the pharmacy or placed in unit-based medication dispensing cabinets. <b>c)*</b> measured insulin doses before administration <b>d)**</b> double check of the insulin infusion product and IV pump settings are completed each time a new insulin IV infusion bag is hung <b>e)</b> Barcode technology is used to minimize dispensing and administration errors				
Supported by *1, **2, ***3 of the major sources of references (ISMP, ASHP, JCAHO, AC) H = Hierarchy of effectiveness, F = Feasibility, M = Measurability				